

Introduction to OLJ Volume 26, Issue 3

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On behalf of our editorial board, authors, reviewers, staff, and the Online Learning Consortium (OLC), which sponsors our work, I am pleased to present another issue of *Online Learning*. Our June issue contains a broad collection of articles grouped into four sections. The first group of papers relate to faculty and professional development, followed by a group of empirical studies on a range of issues. This issue also features two qualitative studies, a book review, and a review of literature.

In “Improving Retention and Student Success Online Utilizing the Community of Inquiry Framework”, Michelle L Rosser-Majors, Sandra Rebeor, Christine McMahon, Stephanie Anderson, and Yolanda Harper of University of Arizona Global Campus, join Andrea Wilson of Walden University and Laura Sliwinsk of Colorado Technical University to investigate faculty professional development on the COI framework and its impact on several important outcome measures. Using the concept of instructor presence as a single term to capture teaching presence, social presence and cognitive presence, the authors developed a series of modules designed to support faculty to implement these concepts effectively in their online courses. Courses were evaluated with a rubric by multiple raters before and after the training to assess whether improvement was achieved. The authors also investigate course pass rates, course drop rates, and faculty satisfaction with the professional development experience. The researchers found that exposure to the training modules positively and significantly affected course pass and drop rates while controlling for several other potential predictors (e.g., years of experience teaching) of these outcomes. However, there was an interaction with overall annual performance assessment whereby more successful faculty benefited more from the training. Faculty were also satisfied with the experience of participating in the training. The results suggest that this form of faculty development may be helpful for improving essential student outcome measures in online environments and that more research is warranted.

The next paper in this section is “Online Presentations with PowerPoint Present Live Real-Time Automated Captions and Subtitles: Perceptions of Faculty and Administrators” by Anymir Orellana, Georgina Arguello and Elda Kanzki-Veloso of Nova Southeastern University. One way to make instruction more inclusive is through Universal Design for Learning. Within UDL, the use of live captioning is recommended to may make instructional materials such as lecture more accessible. A relatively recent advance in captioning was recently made available through Microsoft PowerPoint Live (MSPL) automated captioning and subtitles, now available in more than 60 languages. This software, which is commonly used, may represent a cost-effective mechanism by which institutions can support accessibility and compliance with federal legislation. However, relatively little research has been conducted on its usability and utility in instructional settings. This study investigates challenges, potential uses, and benefits participants encounter as presenters and as viewers with MSPL. Overall, the study found that participants did not encounter technical challenges that they could not overcome, though there were some technical difficulties. Network speed was a significant obstacle that prevented proper use of MSPL. In general, results indicate that MSPL is an easy-to-use and helpful tool to provide captions/subtitles for English and Spanish-speaking audiences. Interestingly, few study participants identified increased accessibility for the hearing impaired as a use of the software but were instead more focused on the language translation functionality. The authors recommended more research with other audiences to improve our understanding of this tool.

In “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” William Stewart of Hankuk University of Foreign Studies, together with Youngkyun Baek and Patrick Lowenthal of Boise State University investigate the experiences of exchange students in Korea during the second wave of the pandemic there. The authors investigated the shift that has occurred as emergency remote teaching (ERT), implemented in haste and with little planning, has gradually become sustained remote instruction, supported by more knowledge, experience, and resources. The study is based on two main questions, the first of which asks whether exchange students’ experiences with remote teaching, support, and course structure change when ERT is sustained over consecutive semesters. The second question investigates whether ERT improve when it becomes Sustained Remote Teaching (SRT). Using Performance Improvement Theory as a guide to their study, the authors find that only 20% of the benchmarks for improvement saw statistically significant positive change with mean score increases ranging from roughly 4-10%. The study concludes the lack of improvement in most benchmarks may be a cause for concern given the sizeable financial and human resources invested in educational continuity from the onset of the pandemic.

In “Relationships Between Online Student Engagement Practices and GPA Among RN-to-BSN Students” Kathryn Rioch and Jennifer Tharp of National University of Health Sciences at The King’s College note that online nursing programs are growing rapidly to address a national nursing shortage in the US. Success and persistence in these programs are tied to student engagement with the academic and social environments in which they study. In online environments, this may be a function of students’ experiences of the development of an effective and supportive academic and social community. Using the Community of Inquiry framework as a measure of engagement, the authors seek to determine relationships between the subscales of the COI survey (teaching, social, and cognitive presence) and student reported GPA. The authors conclude that some of the variances in reported cumulative GPA can be accounted for by levels of online engagement within this study population. The study includes recommendations for practice based on these findings.

The next paper in this section is “Predicting Social Presence in Videoconference-supported LMS Courses: Mediation through L2 Writing and Speaking Strategies” by Daniel Bailey of Konkuk University’s Glocal Campus, South Korea, and Norah Almusharraf and Asma Almusharraf of Prince Sultan University, Saudi Arabia. This study investigated how second language writing and speaking strategies relate and how they shaped the development of social presence in fully online English as a Foreign Language courses. The researchers examined how both linguistic strategies impact social presence and knowledge construction in courses that use the LMS for writing tasks and videoconferencing for speaking activities. The results showed that all variables have a positive relationship.

The next paper, “Academic performance in distance education: Quizzes as a Moderator Variable and Students’ Perception and Expectation through Linguistic Analysis” is by Laura Parte and Lucía Mellado of National Distance Education University of Spain. This study examined the relationship between assessment types and student behavior, linguistics styles, and academic performance. The main objective of this study was to examine the effect of assessment modalities on academic performance. The results show that both quiz modalities (self-evaluation and summative quizzes) are positively associated with academic performance.

Also, on the topic of learning assessment is “A Comparison of Three Assessment Types on Student Engagement and Content Knowledge in Online Instruction” by Lynda Randall and Jessica Jaynes of California State University, Fullerton. This study examined the efficacy and utility of a multimedia

discussion tool for enhancing student retention of content knowledge. Specifically, this mixed methods study examined the effectiveness of the tool in promoting retention of key concepts, as well as student perceptions of the efficacy of the tool in enhancing their learning. The authors suggested that the process of creating presentations with the tool support more active and engaged rehearsal strategies than conventional learning activities such as reading. Results indicated that the more active learning supported by the tool led to greater retention of content and that student liked using the tool.

The COVID pandemic has caused a great deal of turmoil in the education sector, but it was particularly difficult for younger students in primary schools. The next paper is “An Overnight Educational Transformation: How did the Pandemic Turn Early Childhood Education Upside Down?” by Sinem Aslan, a research scientist at Intel Corporation; Qi Li, a lecturer at Open University of China; Curtis Bonk, Professor of Instructional Systems Technology at Indiana University; and Lama Nachman, an Intel Fellow and director of the Human & AI Systems research lab there. This study investigated how public and private school teachers experienced online learning in early childhood education during the COVID-19 pandemic. Specifically, the authors ask how teachers experienced online learning in early childhood education since the outbreak of the COVID-19 pandemic, what challenges such teachers had when teaching online, and what suggestions they had for addressing these challenges. Using interviews with 15 teachers, the study explored issues such as what a typical day looked before and after the onset of the pandemic, teachers’ priorities for online learning, role of parents, monitoring student emotions, during online learning, student learning outcomes and other themes. The study highlighted the teachers’ efforts to implement developmentally appropriate learning activities for students despite the rapid transition to online instructional environments.

In “Facilitating Cognitive Presence Online: Perception and Design” by Julie McCarroll and Peggy Hartwick of Carleton University, the authors seek to demonstrate how lesson design, scaffolding, and a blend of synchronous and asynchronous delivery methods contribute to students’ experiences of cognitive presence as described by the four phases of the Community of Inquiry framework. This study surveyed students from three sections of an English for Academic Purposes course delivered entirely online. The authors also analyzed lesson plans seeking to document cognitive presence. Both students and instructors completed the standard COI survey. While student participants consistently reported lower levels of CP than teachers in the triggering event and exploration phases, results were mixed for the integration and resolution phases. Notably, student-reported experiences of the triggering event, integration, and resolution phases, increased with each iteration of the lesson plan, signifying that task design and facilitation play a key role in students’ experience of cognitive presence.

The next paper in this section is “The Effects of Nudges on Students’ Use of the Diagnostic Assessment and Achievement of College Skills” by David Franklin and Heidi Andrade of the University at Albany, SUNY, Jason Bryer of the City University of New York, Angela Lui, of Rutgers University, and Diana Akhmedjanova of Khalifa University. The purpose of this study was to understand the effects of nudges (various kinds of reminders) on online students’ use of the Diagnostic Assessment and Achievement of College Skills (DAACS) assessments and on their first semester course completion. DAACS is a suite of free, online assessments, feedback, and resources intended to improve student success in college. Results show that some nudges influenced students’ completion of the DAACS assessments and on accessing the feedback. Numerous types of nudges were sent; *performance* nudges did have a positive effect on students’ completion of the DAACS compared to a control group, while the *social norms* nudges did not. The study provided insight on the impacts of other kinds of reminders that encourage learners to access resources known to be helpful to their success and suggests directions for future research.

In “Face-to-Face vs. Online Asynchronous Teaching in a Conservation Biology Course” authors Carrie Wells and Michelle Pass of the University of North Carolina at Charlotte join Jane Walsh of the

University of Kentucky investigate student performance in two modes – a face-to-face section of a biology course and an asynchronous online section of the same course. The authors argue that pedagogy rather than technology account for course outcomes, all else being equal. They collected data on course performance, a collaborative writing assignment, and on survey items. They conclude, as have thousands of previous studies, that no significant differences exist between the two instructional environments.

The “Impact of Attitudes, Beliefs, and Cognitive Reflection on the Development of Critical Thinking Skills in Online Students” is by Boban Simonovic, Katia Vione, Dean Fido, Edward Stuppel, James Martin, and Richard Clarke of the University of Derby in the United Kingdom. These authors argue that there is little consensus on how to define, measure, and nurture critical thinking (CT) skills through educational effort in online environments, despite the wide appeal of critical thinking as central to the goals of higher education, productive employment, and effective civic participation. Through their research, the authors integrate contemporary accounts of CT into an intervention designed to improve students understanding of CT and their academic performance. Their findings are that CT can be taught and that an intervention based on “how to think” can help online students develop CT, strengthen their confidence in it, and help students improve their academic performance.

The final paper in this section is “Effect of Feedback with Video-based Peer Modeling on Learning and Self-efficacy” by Wadi Eghterafi, Mary C. Tucker, and Icy (Yunyi) Zhang, of the University of California, Los Angeles and Ji Yun Son of California State University, Los Angeles. The goal of this study was to determine the relative efficacy of various approaches to providing rich, process feedback in asynchronous online instruction. The authors tested the effect of three types of feedback on students’ learning and transfer of concepts. Randomly assigning 57 students to a worked example condition, 54 to a mastery condition, and 51 to a coping condition, they found that students in the mastery condition rated their self-efficacy higher and scored higher on a delayed class quiz than students who viewed a worked example. The results show how the design of feedback can lead to measurable differences in student learning.

The next section includes two qualitative investigations. Jonathan Becker and Michael Schad of Virginia Commonwealth University are the authors of the first of these, “Understanding the Lived Experience of Online Learners: Towards a Framework for Phenomenological Research on Distance Education”. This paper has three broad goals including advocating for phenomenological research on distance education, critically reviewing existing phenomenological research in the field, and developing a comprehensive framework for future phenomenological research on distance education. Arguing in part that phenomenological research on the lived experience of online learners can help us see these experiences in a new way the authors note that this perspective can help educators and be more empathic teachers. Further, they claim that much of the existing phenomenological research on distance education suffers from poor conceptualization and design and is not methodologically rigorous. Finally, the authors provide a more comprehensive framework for new phenomenological investigation relevant to online and distance instruction.

The second qualitative study is “A Case Study Approach to Exploring Resilient Pedagogy during Times of Crisis” by Katie Clum, Liz Ebersole, David Wicks, and Munyi Shea of Seattle Pacific University. In this study, the authors conduct interviews with students and faculty to better understand the application of resilient pedagogy in the global pandemic including instances of extensibility, flexibility, and redundancy, which are principles of this approach to education. The paper included case studies of previous disruptions to education in South Africa, New Zealand, and the United States to shed light on the emergency remote teaching (ERT) during COVID. The authors concluded that effective implementation of ERT will ultimately look more like authentic online learning and reflect attributes of resilient pedagogy, including institutional and pedagogical extensibility, flexibility, and redundancy.

The next two sections include reviews; the first is a book review and second is a literature review. In the book review Don Olcott of the University of South Africa provided a summary and some

recommendations on the second edition of “Leading the eLearning Transformation of Higher Education: Leadership Strategies for the New Generation”. His summaries will help readers identify sections of the book which may be relevant for their interests. Olcott finds that the book has strengths but also offers some suggestions on what may be missing for a potential third edition.

The final paper in this issue is “Community of Inquiry Framework: Research Trends Between 2000-2020 by Yusuf Ziya Olpak of Kırşehir Ahi Evran University, Turkey. Research on the Community of Inquiry model is vast, and this article attempts to provide some parameters on this longstanding area of investigation in online learning. Specifically, the author sought to answer the following questions about Social Science Citation Index (SSCI) published articles on the COI including preferred keywords and words in the abstract; when, where and who is publishing on this topic; what academic disciplines are represented; who the study subjects are and what are the course delivery methods, and which articles are most widely cited. This kind of scoping article can be useful to provide the contours of a branch of inquiry.

We hope that these new studies provide guidance for researchers and practitioners seeking to understand how students and faculty learn, teach, and assess in online environments. Please read, share, and cite this work and consider submitting your own rigorous original research to OLJ.

Improving Retention Factors and Student Success Online Utilizing the Community of Inquiry Framework's Instructor Presence Model

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Abstract

Considerable research on effective instruction in the virtual classroom exists. Yet very little is known about the extent to which instructor presence (IP) based on the Community of Inquiry model (CoI), are directly related to retention and student success. CoI includes three components of IP: teaching (TP), cognitive (CP), and social (SP). These IP engagement strategies have been suggested to improve outcomes if effectively applied in the virtual classroom. Attrition rates, retention, engagement, and student and instructor success rates are critical aspects of an effective virtual classroom and identifying practices that support these efforts is essential. This study suggests that CoI engagement strategies, when applied by instructors to the online classroom effectively, can improve factors associated with retention and success. To prepare instructors, we designed and utilized a series of seven self-paced interactive modules. With the training, the educators were able to engage with students more effectively by integrating best practices associated with IP. Course dropout rates and student success rates both significantly improved ($p = .05$; $p < .001$ respectively) after these engagement strategies were more efficaciously integrated into the classroom by the trained instructors.

Keywords: Instructor presence, instructor effectiveness, retention, student success, Community of Inquiry (CoI)

Rosser-Majors, M. L., Rebeor, S., McMahon, C., Wilson, A., Stubbs, S. L., Harper, Y., Sliwinski, L. (2022). Improving retention factors and student success online utilizing the Community of Inquiry framework's instructor presence model. *Online Learning*, 26(2), 6-33.

The number of online courses has surged over the past 20 years, increasing concerns about effectiveness and retention (Lee & Choi, 2016; Sorensen & Donovan, 2017). In 2017, there were over six million students enrolled in online courses (U.S. Department of Education, 2019). This is an increase of two million students over a five-year period (U.S. Department of Education, 2017). Although student enrollment in secondary education has dipped, students taking courses solely online grew by 15.4% (Lederman, 2018). In addition, 35.3% of post-secondary students in the U.S. were enrolled in online institutions (National Center for Education Statistics' Integrated Postsecondary Education Data System, 2018).

Online classes are growing in popularity as students and employers recognize the flexibility and value of these courses. Now, given the COVID-19 pandemic, many higher learning institutions were forced to shift to offering courses online and this trend may permanently drive more students to earn credits or entire degrees online (Gallagher & Palmer, 2020; Smalley, 2020). While online courses offer students flexibility and increased health safety, there remains the issue of student retention and success at the postsecondary level that all institutions will have to address. Researcher and educational stakeholders must acknowledge that “the necessity for improving quality teaching has never been as compelling” (Saroyan & Trigwell, 2015, p. 92).

Literature Review

Student Retention and Success

Student retention and success have been common concerns for traditional as well as online educational institutions (Gyrurko et al., 2016; Lee & Choi, 2011; Sorensen & Donovan, 2017; Tinto, 2012); however, it has been suggested that online learning has predominantly more challenges in these areas than traditional learning institutions (Allen & Seaman, 2015; U.S. Department of Education, 2019). Identifying ways to improve these factors has been a common thread of research since online education has become a viable option for learners (Allen & Seaman, 2017; Sorensen & Donovan, 2017).

Understanding why students drop out of school is important in learning how to improve retention rates (Bawa, 2016; Sorensen & Donovan, 2017; Tinto, 2012). Retention rates are described as the number of students who return to the same university year after year to continue their education (National Student Clearinghouse Research Center, 2019). One factor affecting retention is course dropout rates. Dropout rates have been defined in numerous ways, but essentially whether a student drops from a course, or from the institution, the consequences to retention are similar (Xavier & Meneses, 2020). Data underscore that 40% to 80% of online students drop out of school prior to completing their degrees, which is suggested to be 10% to 20% higher than students attending traditional institutions (Christensen & Spackman, 2017). Hart et al. (2017) found that students were less likely to succeed in online courses than they were in face-to-face formats, even with the same instructor. This disproportion has increased the need for those in higher education to more effectively identify how to better support students with the goal of earning their degree online (Xavier & Meneses, 2020). Hence, strategies that address specific dropout factors as well as success are important considerations for online learning institutions.

The Drop Factor

“To improve retention rates, a better understanding as to why students drop out of online education is needed” (Sorensen & Donovan, 2017, p. 207). The research suggests many factors for why students leave school, including personal situations (Evans, 2020), job-related issues, feelings of isolation (Collins et al., 2019; Lederman, 2020), a lack of belonging, competence, and autonomy (Chen & Jang, 2010), self-efficacy (Bawa, 2016), motivation (Lederman, 2020), and depleted resources and support (Stoessel et al., 2015). But addressing the factors as separate components may not be the solution. Lee and Choi (2011) researched retention associated with online learning for a decade and suggested that no one factor is a primary cause for dropping out of school. Rather they suggest that it is an “interaction of numerous factors that eventually lead to a student to complete or not complete a course” (Lee & Choi, 2011, p. 615).

The Pass Factor

One important factor related to retention and course progression is course success (Chang & Kim, 2021; Hart et al., 2017). Students who struggle to pass their courses often experience financial challenges, are in jeopardy of being on academic probation, and eventually drop out. Hart et al. (2017) suggests that students taking courses online have lower course success than traditional students do, further supporting the importance of addressing how to support online learners in passing their courses.

Engagement

Both student and instructor engagement have been connected to retention and student success (Collins et al., 2019; Rosser-Majors et al., 2021). Gray and DiLoreto (2016) suggest that “active learning and student engagement is imperative for increased student learning and ultimately retention” (para. 4). However, this engagement must be encouraged and purposefully applied by the instructors (Garrison et al., 2000; Gray & DiLoreto, 2016); the research suggests it is one of the most important variables affecting student learning and outcomes (Collins et al., 2019; Gray & DiLoreto, 2016), as successful faculty engagement positively influences retention and student satisfaction in online programs (Anderson & Elloumi, 2008; Garrison, 2009; U.S. Department of Education, 2019). However, effective training about engagement is an important element in the preparation of online instructors (Gyurko et al., 2016).

Although effective engagement with students is necessary by instructors, professional development opportunities aligned to crucial areas of teaching practices is rarely offered (Lackey, 2011; Palloff & Pratt, 2013). Bawa (2016) suggests that institutions are not doing enough to develop instructors to better support students’ needs in the online learning context and suggest that institutions tend to just create more courses with higher enrollment numbers. In addition, identifying what constitutes successful faculty engagement can be challenging (Mandernach et al., 2015; Sliwinski & Rosser-Majors, 2018). The key proponents of instructor presence (IP) engagement strategies based on the CoI model suggest that instructor engagement is vital in contributing to the “dynamics of an online educational experience” (Garrison et al., 2010, p. 6), yet the satisfaction and efficacy of an instructor must also be considered, as this variable too, can affect an instructor’s quality of teaching (Dietrich, 2015; Holzberger et al., 2013; Toropova et al., 2020) even with effective development, as well as the sustainability of the engagement strategies learned.

Instructor Efficacy and Satisfaction

Although teaching quality has a direct correlation to the learning environment, its sustainability can also be affected by instructor satisfaction (Toropova et al., 2020) and self-efficacy (Holzberger et al., 2013), which in turn, affects an instructor's level of interaction with students (Jamieson & Shaw, 2019). Numerous factors impact instructor satisfaction negatively in the online classroom: i.e., large time commitment, the challenge level (Seaton & Schwier, 2014), the increased workload (Bolliger & Wasilik, 2009), lack of student relationships (Lloyd et al., 2012), and the efficacy for mastering online teaching (Buchanan et al., 2013), which is also suggested to “influence the amount of stress and anxiety that people experience as they engage in an activity” (Doménech-Betoret et al., 2017, para 4).

For those who teach online, personal satisfaction and growth are reported to be highly important to one's rationale for teaching online (Green et al., 2009). Other factors suggested to contribute to instructor satisfaction include serving vulnerable populations who may not otherwise have a chance to earn a college degree (Dufner, 2018), and being valued and respected for their work by university leadership (Friedman et al., 2017). Hence, personal, psychological, environmental, institutional, technical, and pedagogical factors should all be considered when developing strategies that increase efficacy (Holzberger et al., 2013; Toropova et al., 2020). Hence, an important course design element is the deliberate acknowledgment of time-in-class restraints and how the course structure can better support the level of instructor engagement that is necessary to engage online learners successfully. The assessment of the level of instructor satisfaction in this modality is crucial to maintaining sustainability that supports student success and retention factors (Al-Samarraie et al., 2018; Dietrich, 2015).

COI: An Engagement Processing Model Utilizing Instructor Presence Applications

Instructor presence, based on CoI, comprises the interactive teaching engagement strategies based on cognitive, teaching, and social presences, and has been suggested to be a key factor in improving students' success and retention in online learning environments (Dixon, 2010; Rebeor et al., 2019). Each area of presence relies on the others to effectively improve engagement and motivation in an online course. It is much more than logging into class on a regular basis or replying to a student in a way that does not encourage meaningful thought or further exploration. Effective IP is composed of TP, SP, and CP and the coordination of all three of these components is critical in the online classroom. CoI is directly related to instructor behaviors which attempt to increase critical thought and deeper application by students.

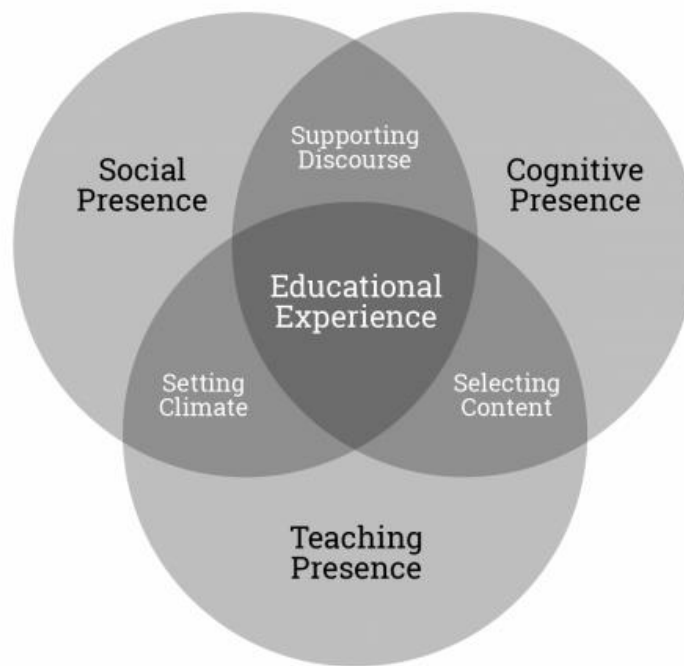
IP based on CoI, is founded on the seminal work of John Dewey (1859-1959) and has been a predominant foundation for research in online learning since the late 1990s (e.g., Dixon [2010], Popescu & Badea [2020], and Krzyszkowska & Mavrommati [2020]), and has been accommodated to numerous research projects. In fact, the CoI model “is one of the most extensively used frameworks in online teaching and learning” (Castellanos-Reyes, 2020, p. 558).

The basic premise and goal of this model of formal education...was the creation and sustainability of a community of inquiry. The goal was to define, describe and measure the elements...The framework attempted to outline not only...social, cognitive, and teaching presence...but also the dynamics of an online educational experience (Garrison, 2009, p. 5).

The engagement strategies associated with IP are diverse (Garrison et al., 2009), and they have been applied to online learning for over the past two decades (Popescu & Badea, 2020). During this time, researchers have modified, recreated, and repurposed the IP (CoI) components to reflect advancing technological applications as well as researched-based findings associated with online learner needs (Garrison et al., 2009). However, the original CoI model (Garrison et al, 1999) (Figure 1), as applied to this research, suggests that three elements, TP, SP, and CP are essential to “the quality of the educational experience and learning outcomes” (p. 92) and instructor engagement in the online course context.

Figure 1

The Community of Inquiry Model (CoI)



Note. CoI suggests that IP includes social, cognitive, and teaching presence. Each component supports the other through the application of appropriate discourse, the setting of the online learning environment’s climate, and the appropriate use of content. From “Critical Inquiry in a Text-Based Environment: Computer Conferencing in Higher Education” by Garrison, D. R., Anderson, T., & Archer, W., 1999, *The Internet and Higher Education*, 2(2-3), p. 88. Copyright: Creative Commons Attribution-ShareAlike 4.0 International License.

Garrison and colleagues later also developed a 34-item instrument, which was found to be “a valid, reliable, and efficient measure of the dimensions” of the CoI framework (Arbaugh et al., 2008, p. 133). This instrument measures student perceptions of IP applications (engagement strategies). Using this assessment tool, researchers have supported its validity for reporting student perceptions of IP (Caskurlu, 2018; Stenbom, 2018). This assessment was used as a guide for creating examples in the training modules detailed in the methods section of this paper.

Cognitive, Social, and Teaching Presence

As noted, research suggests numerous factors that affect retention and student success in the online learning modality, and similarly, the variables associated with CoI have been suggested to positively affect many of these factors. Hence, IP engagement strategies may support improvement in student success as well as a decrease the likelihood to drop out from school by more effectively encouraging the learner's participation and deeper engagement (Dixson, 2010; Hwangji, 2020; Martin & Bolliger, 2018). Yet, the research is not definitive about the direct relation of IP to retention and student success. One online editorial did note—based on interviewees, including professors and students—that feelings of connectedness to the instructor, course materials, and peers, could in turn, potentially affect dropout rates positively (Carr, 2000).

The CoI model emphasizes the need for instructors to be present in the online classroom by applying practices associated with the symbiotic elements of TP, SP, and CP (Garrison et al., 2010). However, in our review of the literature there was a lack of information regarding what exactly IP engagement strategies look like, specifically, especially with the present, ever changing technological options associated with the online learning environment. To develop successful examples, one must also understand each component of IP.

Teaching Presence

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” (Anderson et al., 2001, p. 33). Teaching presence embodies how classes are facilitated, designed, and organized. Effective teaching presence provides students with ease of access to all parts of the online classroom (Garrison et al., 2000). It entails providing resources to improve student outcomes and timely feedback to improve learning and comprehension. Clearly communicated expectations, instructional clarity, easily accessible resources, and timely feedback are examples of teaching presence.

Cognitive Presence

Cognitive presence is the fostering of intellectual curiosity, critical thinking, and creativity, encouraging students to explore and participate (Garrison et al., 1999). These factors can be accomplished in many ways such as encouraging thought and reflection within online discussion boards (Christensen & Spackman, 2017; Hwanglu, 2018) or providing effective feedback on assignments, ensuring understanding by asking questions in the discussions, or by sharing relevant knowledge from the course text and professional experience in the discussion (Garrison et al., 2000). However, to encourage this level of engagement, students must trust the environment, which is stimulated by SP.

Social Presence

Social presence is critical to successful IP engagement strategy applications. It has been shown to reduce feelings of isolation, improve retention rates, improve academic performance, increase self-efficacy, and reduce feelings of isolation (Collins et al., 2019; Lederman, 2020). Social presence is much more than showing up for class. It is showing students the instructor is a real person behind the computer screen who is willing to be there to guide the student to success.

Identifying strategies that positively affect students' success and course completion rates is imperative, but complicated. Just looking at one variable provides limited perspectives.

However, by seeking out the factors suggested by research that affect areas of concern and merging the information that research does support may be a good place to start. Strengthening IP is one way to potentially improve student retention factors and success, and hence this study identifies the variables that IP strategies are suggested to improve, disseminates clear guidance (in the form of training modules) to instructors, measures the level of IP application improvement by these instructors, and lastly analyzes these practices.

Purpose of the Study and Research Questions

The purpose of this study was to identify whether key strategies founded on the principles of IP when applied effectively would improve retention factors and student success in online courses. The rationale for creating such training utilized a quasi-experimental, causal comparative design to determine the influence of instructors' participation in the IP training on TP, SP, and CP, as well as to determine if these applications would affect course pass rates and dropout rates.

Prior to the first training module launch, the research study was approved by an Institutional Review Board (IRB). The study followed OHRP guidelines (<http://www.hhs.gov/ohrp/>) for protection of human subjects. Results were only accessed by the investigation team. To preserve confidentiality, courses selected for examination, as well as the participating instructors, were randomly coded. Written consent was obtained prior to any examination of courses. A pre-launch self-assessment identifying pre-dispositions about IP was distributed to all instructors and included the opportunity to participate in the study. Only consenting instructors (both full and part-time) aligned to the online university participated in this study.

The research questions:

1. Will a significant improvement in instructor presence engagement strategies within the learning environment be significant pre-exposure versus post-exposure of completing the IP training modules?
2. Do course pass rates significantly improve in courses that are instructed by participants who completed the IP training modules?
3. Do course drop rates significantly improve in courses that are instructed by participants who completed the IP training modules?
4. Do instructors experience satisfaction with the IP training and applying the strategies within their courses?

Methods

Participants

The participants in this study were instructors at a fully online for-profit university and were aligned with the health and behavioral science programs. Initially, 81 of 217 instructors in the college agreed to participate in the formal research (as the training was also part of an institutional initiative offered to all faculty by the college). The final number of participants to

complete the modules was 47 of 81. Of the 34 instructors who did not complete the training, 14 had left the university. The remaining 20 instructors completed the training but after the deadline for the formal post-analysis research. Table 1 identifies participant demographics.

Table 1
Participant Demographics

Demographic	Descriptor	
Gender	Male: 13	Female: 34
Employment Status	Full-time: 8	Part-time: 39
Degree Level	Terminal degree: 35	Master’s Degree: 12
Program Alignment Level	Master’s: 16	Bachelor’s: 31
Instructor’s Department Affiliation	Behavioral Sciences: 25	Health Sciences: 22
Longevity (Years) with the Institution	2 years: 3	7 years: 19
	4 years: 3	8 years: 8
	5 years: 6	10 years: 4
	6 years: 4	
Experience (# of courses taught at the institution)	13-22: 4	60-69: 7
	30-36: 4	70-85: 5
	41-49: 7	90-125: 7
	51-57: 7	153-190: 3

The instructors’ courses that were later evaluated for IP engagement strategies totaled 188 (94 pre- and 94 post-training). Thirty-seven of the instructors taught undergraduate courses; the ten remaining taught master’s courses. See Table 2 for pre- post- course sizes.

Table 2
Rubric Evaluated Course Sizes Pre- Post-Training

Course Size Breakdowns: # of students	Pre-training Course: # Instructors	Post-training Course: # instructors
< 9	11	11
10-15	14	14
16-20	8	9
21-25	10	10
26-30	4	3

Participants were provided with a series of seven self-paced interactive training modules highlighting specific methods designed to enhance TP, SP, and CP in the online classroom. Strategies were designed based on research findings utilizing the CoI framework assessment tool (e.g., Damm, 2016), as well as our current teaching application practices and observations of courses for over a decade.

The Intervention

Development and Dissemination of the Modules

The goal of the development of the IP-based self-paced interactive training modules was to develop the participants’ knowledge about IP based on CoI. Strategies included sharing specific examples and interactive self-evaluation opportunities. Specifically, we designed examples that we determined would support the variables that are suggested to affect student success and retention.

The final product included seven training modules that specifically addressed the components of IP: TP, SP, and CP. The content was developed over the period of one year, using scholarly resources and the foundations of Garrison’s model and assessment tool (Arbaugh et al., 2008) to not only develop instructor knowledge about the framework, but to also offer concrete examples of how to apply the concepts within the online environment using interactive content and strategies. Examples used in the self-paced training were identified and collected from the virtual classrooms of faculty who exhibited high levels of each component with their permission and were also created by our team and media specialist. Table 3 lists a portion of the application examples for each area of IP that were included in the training modules.

Table 3
Instructor Presence Application Examples

Teaching Presence	Social Presence	Cognitive Presence
ANNOUNCEMENTS		
<ul style="list-style-type: none"> • Clear, thorough, and organized expectations, • Consistent and weekly engagement • Elaboration about weekly activities included 	<ul style="list-style-type: none"> • Warm and motivating tone • Contains video, audio, images, or quotes • Opportunity for students to “see” and get to know the instructor as more than just someone behind a computer 	<ul style="list-style-type: none"> • Encourages critical thought/expansion of knowledge • Learning style options provided
BIOS		
NA	<ul style="list-style-type: none"> • Includes pertinent information • Welcoming tone • Suggests a real person behind the screen 	<ul style="list-style-type: none"> • Includes professional interests/research/publications piquing interest and dialogue from students • Connects professional expertise to content
FEEDBACK		
<ul style="list-style-type: none"> • Rubrics provided and aligned to activities 	<ul style="list-style-type: none"> • Responds in a personal manner to all students’ introductions • Refers to the student by name. • Salutations • Demonstrates positive regard and emotions, such as respect, empathy, and enthusiasm. (Use of emoticons, humor, self-disclosure, etc.) 	<ul style="list-style-type: none"> • specific responses • relevant • additional examples or resources are shared • critical content insight shared • extend their thinking on the topic, • prompt for elaboration, • inquire about examples of their main points, • challenge their assumptions and defend their main points,

- Genuine interest in who the student is
- are contextualized/aligned with the student's original posting,
- requires students to consider, apply, evaluate, defend and/or explain information
- encourages dialogue

The modules were then developed and disseminated to health and behavioral sciences instructors who had consented to participate. The modules were organized as the following:

- Module One: Introduction to Instructor Presence
- Module Two: Cognitive Presence: Part One
- Module Three: Cognitive Presence: Part Two
- Module Four: Social Presence: Part One
- Module Five: Social Presence: Part Two
- Module Six: Teaching Presence
- Module Seven: It's a Wrap: Applying All Three Areas of Presence Together (Included a post-assessment)

The modules were launched as each module's development was completed. The subsequent launch and roll-out of modules occurred over a period of a year and six months.

Instruments and Measures

Instructor Presence Applications Rubric

To assess the level of IP applied to the classroom, two analytical rubrics were developed by the researchers: one for pre-module training and one for post-module training. As noted above, the rubrics were created using the CoI 34-item instrument (Arbaugh et al., 2008) as a guide. This tested rubric identified applications perceived by students as IP applications and were used to identify areas that should be assessed within the online classroom. In addition, the rubrics were calibrated by our team to establish inter-rater reliability (intraclass correlation coefficient [ICC = .9]). The "reliability value ranges between 0 and 1, with values closer to 1 representing stronger reliability" (Koo & Li, 2016, p. 155). Total courses assessed equaled 94 pre-training and 94 post-training.

It was necessary to create two rubrics since the learning management system (LMS) had also changed at the same time the IP modules were launched. Changes were minor and included the removal of assessment areas associated with the LMS that no longer were available or became available. For example, there was a "Meet Your Instructor" tab in the pre-training LMS that was no longer available in the new LMS. This area was removed in the post-training rubric. Also, an additional grading feedback area was included in the new LMS.

Each of the areas of presence reflected differing applications to assess: CP included 12 applications; SP included 31 applications, and TP included 20 applications (19 areas for the pre-training rubric due to plagiarism detection system not being able to be monitored by reviewers in the pre-training LMS.) (See Appendices C and D for more detail.) An analytical rubric was chosen since it specifically measures performance from differing lenses (Brookhart, 2013), and provides a more accurate profile of the strengths and weaknesses in one's performance

(Gronlund, 1998). Using the rubric, TP, SP, and CP were rated separately. Then, a final overall rating was averaged.

Extraneous Variables

Our research protocol also included extraneous variables (EVs) that could have potential effects on course drop and pass rates to further support, or refute, any findings of our principle analysis, as simply looking at IP applications could potentially create less credible findings since research has suggested that it is the interdependency of factors that affect retention and success (Sorensen & Donovan, 2017). We included demographic data, as well as department affiliation (behavioral or health sciences), student surveys, and performance ratings that were collected at the end of the module dissemination. Table 4 provides a definition for each EV.

Table 4
Extraneous Variables and Descriptions

Variable	Description
Longevity	The number of years that the instructor had been employed with the university. Groups were created: Years (2-6) and (7+)
Experience	This was based on the number of courses that the instructor had taught. Groups were created: 0-49, 50-99, 100+.
Program Alignment Level	Identified if the instructor was aligned to an undergraduate or graduate program.
Instructor’s Department Affiliation	Behavioral Sciences (n=25) and Health Sciences (n=22)
Degree Level	Instructor’s highest degree level: masters or terminal degree
Performance Ratings (IQR, FSDA, EOCS)	
A third of the scores were identified as the “High” category and the lower third of scores as the “Low” category	
Instructional Quality Review (IQR)	The IQR Scale is a Likert scale ranging from 0-4: “0” being “Not Observed”; 4 being “Distinguished”. The IQR is performed annually by fulltime faculty who lead the course associated with the instructor.
Faculty Support Development Associate Score (FSDA)	Reflects a more frequent monitoring of required participation in the classroom by instructors. The FSDA score was based on institutional engagement requirements and were weighted as follows: <ul style="list-style-type: none"> • Announcements: 10% • Response to Students: 10% • Instructive Feedback: 30% • Discussion Forums: 35% • Posting Grades: 15% The Likert scale ranged from 0 (not posted) to 4 (exceeds expectations).
End of Course Survey (EOCS)	This survey reflects student perceptions in each course and is cumulative. The scale is a Likert scale ranging from 0 (Strongly Disagree) to 4 (Strongly Agree). The scale included seven questions related specifically to the course perceptions, eight questions specifically related to the perceptions associated to the instructor, and one question about the student’s overall academic experience.

Instructor Satisfaction

As noted above, the satisfaction of the instructors was also important to include in our analysis since this can affect instructor behaviors in the classroom, including the potential for sustainably applying IP practices (Holzberger et al., 2013; Jamieson & Shaw, 2019; Toropova et al., 2020). The evaluation of satisfaction was a self-reported post-survey asking instructors to rate their satisfaction using a numerical scale (1=Not Satisfied; 10=Very Satisfied), a semi-dichotomous scale (Yes/No/Maybe), as well as an open-ended comment question:

1. Rate your current level of satisfaction regarding the Instructor Presence Development Series. (1=Not Satisfied; 10=Very Satisfied)
2. If you increased/improved your presence, do you believe it increased your teaching enjoyment based on the results? (Yes/No/Maybe)
3. Do you feel that the professional development series on instructor presence was worth the time needed to complete them? (Yes/No/Maybe)
4. Please share any additional comments you would like to provide related to the topic of instructor presence in online courses.

Course Pass and Drop Rates

Course pass and drop rates were assessed through the institution's data management system using Excel. Each course that was assessed for IP applications were also analyzed for these two factors by taking the original number of enrolled students in the course and dividing by the number of students who completed the course, as well as the final number of students who passed the course. For the undergraduate courses a D- was considered passing. For graduate courses, a C was considered a passing grade.

Data Collection

During data collection, confidentiality was of the utmost importance. First, the instructors were coded to deidentify and as the information was collected it was aligned to the coded individual. Specific collections included 1) demographic characteristics, 2) extraneous variables, 3) performance ratings, 4) IP pre- and post- strategy application scores, and 5) course drop rates and students pass rates (pre- versus post-). The demographic characteristics, EVs (gender, employment status, degree level, program alignment level, department affiliation, longevity with the institution, experience, and performance ratings), and drop and success rates were identified using the institutional data base. Pre- and post-training IP application strategies were scored based on the IP rubric created by our research team, as elaborated in the Instruments and Measures section. Satisfaction of the instructors was collected with a self-reported survey. Figures 4 and 5 note the questions and results.

To maintain the data, preparing it to be analyzed by SPSS, Excel was used, organizing the instructors' demographic characteristics, EVs, associated IP scores pre- and post-, other indicated performance measures, as well as the qualitative satisfaction data. Once all data was organized SPSS was used to analyze it.

Data Analysis

SPSS was used to analyze the quantitative data. To address satisfaction, comments were coded as being satisfied (y), not satisfied (n), or unknown (uk). An omnibus test using MANOVA was used to legitimate rejection of the null hypothesis in the design since the IP variables were highly correlated. T-tests were used post hoc to determine the precise location of the significant differences. Wilks' lambda was performed on the EVs: longevity, experience,

program alignment level, instructor's department affiliation, degree level, performance ratings, and student ratings (Table 4).

Results

Research Question One: Will a significant improvement in instructor presence applications within the learning environment be evident pre-exposure versus post exposure of the IP training modules?

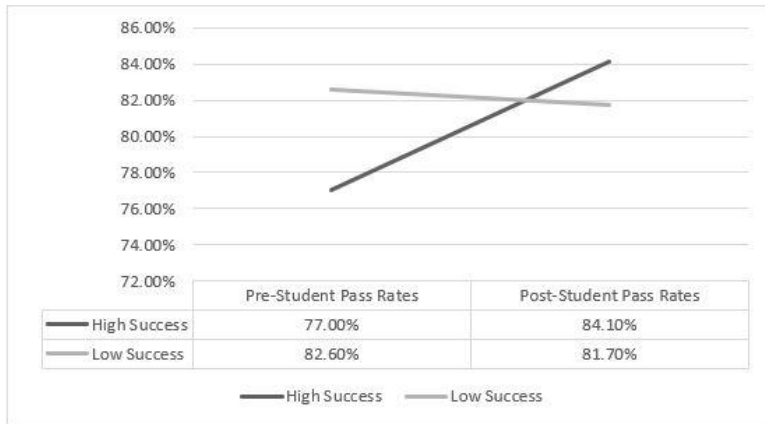
The paired samples two-tailed t test reflected significant improvement of IP strategy applications in all areas of IP pre-training versus post-training: social presence ($p = .000$), $t(46) = -5.20$; cognitive presence, ($p = .000$), $t(46) = -6.45$; and teaching presence ($p = .008$), $t(46) = -2.79$.

Research Question Two: Do course pass rates significantly improve in courses that are instructed by participants who completed the IP training modules?

Based on the paired samples two-tailed t test, significant improvement in course pass rates in courses that were taught by instructors who had been exposed to the IP training modules, ($M = -3.34$, $SD = 11.39$), $t(46) = 4.8$, $p = .05$) was evident. To account for EVs (longevity, experience, program alignment level, instructor's department affiliation, degree level, performance ratings, and student ratings) that could potentially affect the improvement in pass rates pre to post exposure, an analysis using the multivariate test, Wilks' lambda, was performed. All of the identified variables were not significant ($p < .01$): degree level ($F [1, 45] = .66$, $p = .42$, $r^2 = .01$); program alignment level ($F [1, 45] = .55$, $p = .65$, $r^2 = .01$); number of courses taught ($F [2, 44] = .12$, $p = .89$, $r^2 = .01$); instructor's department affiliation ($F [1, 45] = 4.45$, $p = .04$, $r^2 = .09$); performance scores ($F [4, 41] = .30$, $p = .87$, $r^2 = .03$), and experience ($F [1, 45] = .44$, $p = .51$, $r^2 = .01$); and longevity ($F [1, 45] = .48$, $p = .49$, $r^2 = .01$).

To further identify outside factors that could contribute to the student pass rates, the holistically analyzed variable of "performance scores" was broken down by three components: End of Course Student Survey (EOCSS), Faculty Activity Report (FAR), and the Instructional Quality Review (IQR, an annual performance assessment). For the mixed design ANOVA, simple categorical representations of each were created by grouping the upper third of scores as the "High" category and the lower third of scores as the "Low" category. Hence, a third of the data points in the middle were removed from the analysis. The original scores were condensed to the high and low ratings overall, so the decision to create the two categories was made. For EOCS, FSDA, and IQR High/Low, there were no main effects on success. With regard to interaction effects, the EOCS and FSDA also had none. However, there was a marginally significant interaction effect of IQR High/Low for success ($F [1, 33] = 4.29$, $p = .05$, $r^2 = .12$) and for drop out ($F [1, 33] = 4.36$, $p = .05$, $r^2 = .12$). The High IQR group (higher quality review scores) experienced a greater improvement pre-to-post in student success (Figure 2).

Figure 2
Estimated Marginal Means for Course Pass Rates

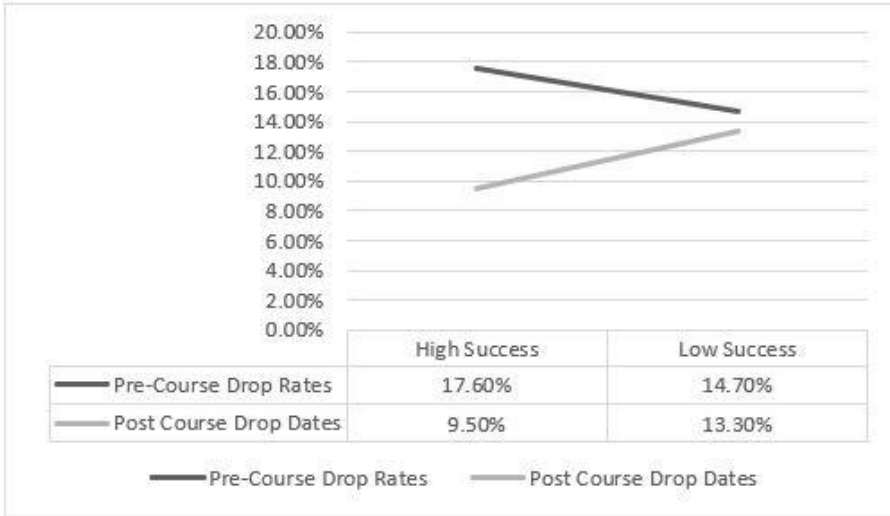


Research Question Three: Do course drop rates significantly improve in courses that are instructed by participants who completed the IP training modules?

Based on the paired samples two-tailed *t* test, course drop rates did improve significantly ($M = 5.45$, $SD = 9.34$), $t(46) = 4.00$, $p < .001$). Again, to rule out other variables affecting the success rates, an analysis using the multivariate test, Wilks' lambda, was performed on the EVs. All of the identified variables were not significant ($p < .01$): degree level - ($F [1,45] = .05$, $p = .83$, $r^2 = .001$); program alignment level - ($F [1, 45] = .13$, $p = .72$, $r^2 = .003$); number of courses taught - ($F [2, 44] = 1.53$, $p = .23$, $r^2 = .07$); department affiliation ($F [1, 45] = .71$, $p = .41$, $r^2 = .02$); performance scores ($F [4, 41] = .71$, $p = .95$, $r^2 = .02$); and longevity ($F [1, 45] = .48$, $p = .49$, $r^2 = .01$).

As applied to success, a mixed design ANOVA was also analyzed for EOCS, FSDA, and IQR scores individually. Similarly, there were no main effects on course drops. The EOCS and FSDA also had no interaction effects. There was a marginally significant interaction effect of IQR High/Low for success for drop out ($F [1,33] = 4.36$, $p = .05$, $r^2 = .12$). As was with success, the High IQR group (higher quality review scores) experienced a greater improvement pre-to-post in both the drop rates (Figure 3).

Figure 3
Estimated Marginal Means for Course Drops



Research Question Four: Do instructors experience satisfaction with the IP training and applying the strategies within their courses?

Figure 4 and Table 5 include the results of the satisfaction survey questions. Most of the instructors were satisfied with the new engagement strategies as applied in their courses.

Figure 4
Satisfaction of the Instructors with IP: Numerical Scale.

Very Not Satisfied	1	2	3	4	5	6	7	8	9	10	Very Satisfied
# of participants				1		1	4	8	6	20	
%				2.5%		2.5%	10%	20%	15%	50%	

Table 5
Satisfaction of the Instructors with IP: Semi-Dichotomous Scale.

If you increased/improved your presence, do you believe it increased your teaching enjoyment based on the results?		
Yes	Maybe	No
86.5% (32)	13.5% (5)	0
Do you feel that the professional development series on instructor presence was worth the time needed to complete them?		
Yes	Maybe	No
83% (39)	12% (5)	5% (2)

* Responders were also asked for a rationale. Overall instructors expressed feelings of increased efficacy, enjoyment, and improved student success in their courses. In addition, they felt the engagement strategies were a helpful addition to their strategy toolboxes. The specific qualitative results can be reviewed in Appendix A.

Please share any additional comments you would like to provide related to the topic of instructor presence in online courses. See Appendix B.

Interaction Effects of IQR for Course Pass Rates and Course Drop Rates

The analysis also offered additional information that is helpful to addressing online learning concerns. There was a marginally significant interaction effect of IQR High/Low for course pass rates ($p = .046$) and for course drops ($p = .045$), suggesting more effective applications by high performing instructors. Study findings also indicated that IP applications were significantly higher ($p < .01$) in faculty who completed the training modules, as compared to pre-training application assessments.

Discussion and Recommendations

Importance of Instructor Presence Applications Training

Based on our findings, this research suggests that instructors' exposure to, and application of IP practices in the classroom, positively and significantly affect course pass rates and drops, which in turn affect student success and retention. Our findings support current research in the field connected to online teaching best practices and student achievement (Oyarzun et al., 2018; Popescu & Badea, 2020; Tyrväinen et al., 2021). Providing development opportunities for online instructors to be more effective at engaging with their students may be an important part of addressing the concerns associated with student success and retention in the online learning setting. We suggest that training offer specific applications rather than simply IP concepts, as well as using strategic measures to encourage accountability.

Instructor Presence Training Effects on Student Success and Retention Variables

Course Pass Rates

Course pass rates are an important factor when addressing student success (Kauffman, 2010). As our results suggest, instructors who were trained in utilizing IP engagement strategy applications experienced improvement in passing rates by their students. This finding further supports current research associated with teaching practices and improving pass/success rates (Hughes et al., 2021)

Course Drop Rates

As noted, course drop rates in online courses are a significant concern associated with online learning courses, which in turn affect overall retention. Our results indicated improvement in course drop rates in online courses where the instructors were trained in applying the IP strategies. Previous research has also suggested that the methods employed by instructors matters to lower the likelihood for dropping out of courses and programs (Budiman, 2018)

Instructor Satisfaction and Instructor Presence Training

Although specifically targeted online learning studies are limited, organizational research (Reissova & Papay, 2021) has suggested that employees (instructors) who are less satisfied with their teaching experiences may be less likely to perform at optimal levels. This satisfaction is also considered cyclical: When the students are satisfied, instructors are satisfied (Moore, 2002, as cited by Bollinger et al., 2014). One element affecting satisfaction of instructors is an unbalanced workload, which was one concern about the post-effects of our training protocol. However, although applying IP strategies can take additional thought, planning, and purposeful

engagement, the majority of participants were pleased with the new procedures, expressing satisfaction with the practices as well as the increased engagement experienced by their students.

In addition, the EVs were not found to be significant predictors for either course pass rates or drop rates, further strengthening the results of this study. The marginally significant interaction effect of IQR High/Low may suggest that those with higher performance experienced increased benefit using the strategies, or potentially felt more efficacious to do so, supporting previous research that suggests that performance ratings can positively affect retention, persistence, and student success (Jacob et al., 2017; Pascarella et al., 2008).

Limitations

Although these findings offer pertinent information to the academic community about engaging online students to improve success and retention factors, the study is limited. First, data were not collected over subsequent remote terms or from other universities, which limit sustainability or more generalizable findings. Second, the length of time it took to disseminate the modules was over a year. Having the training offered sequentially and more quickly could affect the results, both positively and negatively. The small sample size also affects the generalizability of the findings.

Implications and Future Research

Our findings support the growing evidence that online teaching strategies not only differ from face-to-face instruction (Paul & Jefferson, 2019), but must also be tailored to fit the context of the learning environment and its learners (Kim et al., 2019). In addition, it suggests that developing instructors associated with applicable strategies is necessary, as these practices may be limited by instructor self-perceptions and their ability to successfully teach online (Sliwinski & Rosser-Majors, 2018). IP, based on CoI, offers specific areas of consideration that can be applied to the identification and application of successful online teaching strategies as demonstrated by our research findings. These emerging online teaching and online design strategies are important to acknowledge when tackling the impeding concerns associated with retention and student success in the online learning environment.

It is becoming more evident, based on the growing research discoveries aligned to IP (Oyarzun et al., 2018; Popescu & Badea, 2020; Rosser-Majors et al., 2021; Tyrväinen et al., 2021), that all three IP components (teaching, social, and cognitive presence) must be addressed in unison, rather than as separate strategies, to develop specific and replicable strategy applications to improve variables associated to retention and student success. Educational administrators and leaders must consider how these practices can best be delineated to their instructors and to their course designers to develop the foundational advantages of these practices based on their own student populations, course design and timelines, as well as instructor motivation.

We also recommend future research that addresses IP sustainability potential, diverse instructor needs and satisfaction and the effects of performance, as well as replicated studies using the IP rubric to establish it as a valid and reliable tool for evaluating IP practices within classrooms.

Conclusion

The educational landscape is always evolving, and various reasons exist why students of all ages seek online learning to complete college credits or an entire program of study. Acknowledging the challenges online institutions have experienced related to student success, retention, and graduation rates, and identifying sustainable online practices is essential. Effective instructional practices that evolve with technology must be applied to improve online learning outcomes and the results of our research are promising in the area of teaching methods associated with online education.

Data Availability Statement

Raw data for this study can be obtained by writing to Michelle.Majors@UAGC.edu

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 Arizona Global Campus, USA.

The authors declared that they received no financial support for the research, authorship, and/or publication of this article.

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Appendix A

Instructor Rationale: Research Question #4

Question: If you increased/improved your presence, do you believe it increased your teaching enjoyment based on the results?

YES
83% (39)

“I was a bit hesitant at first to try some of the social presence ideas to show emotion or disclose myself too much. Now I think it is a great way to connect and build trust. It engages me more too.”

“...Just a short note on my experience with video responses and the impact on instructor surveys and retention. My survey percentages for the 1/22 course were the best I have ever. May be an anomaly, but according to student responses it was directly connected to video responses for all DQ's and announcements. I believe that retention was better too because of personal touch...Glad I did the training modules to find out this option existed.”

“Thank you for offering such an incredible training. I think that we can all get a little bit stuck doing things just one way, and this has certainly opened by eyes to some to some amazing new strategies to apply in my classroom. I am so excited to get started!”

“I found it a good learning experience to give me the scholarly background for why these interrelated concepts are important for student learning and retention. I find myself already using some of these techniques in my current class.”

“It is encouraging seeing students succeed.”

“Yes, I see more engagement, critical-thinking and reflection by my students with original and peer replies.”

“Teachers should also be learning and receiving benefit from their own activities. Gratification regarding student learning is one area that is important for instructor morale.”

“Since presence foster's student success, and I am driven by their successes, increased presence does lead to more exciting / enjoyable outcome.”

“Hearing positive feedback from students as well as fulfilling a challenge to continue to grow as a teacher has been satisfying.”

Improved self confidence that I will be making a difference

“I am enjoying my teaching experience very much. I think that resources we are being provided by the department administration are excellent. The faculty engagement is extremely helpful in engaging with the students that need improvement in the class. I really am grateful for the opportunity...”

“Yes, I think if I learned feedback with video or explaining grading both the students and I would accomplish more engagement.”

“It is more fun to engage and ensure that students are learning and understanding, rather than merely grading.”

“Teaching in an online setting is much more enjoyable when you can see student engagement increase due to the instructor being more present and finding ways to make the classroom more interactive and fun.”

“I love this series and greatly appreciate the time and attention that was put into their development. I hope to see updates or refresher courses over the next few years.”

“Overall, just excellent material that bridged theory with the provision of realistic tools.”

“GREAT course”

“Thank you for your commitment to teaching excellence in the classroom.”

“Thank you so much! I found the modules to be very informative, engaging and helpful in continuing to assist me in effectively engaging my students!”

Improving Retention Factors and Student Success Online

Maybe
12% (5)

I enjoy being present as an instructor. It is fulfilling and makes the experience very rewarding. Seeing the difference it makes in students' lives makes it worthwhile; however, I am also feeling incredibly burnt out. There is not enough time to spend in the classroom and to be present, and I end up feeling like I am performing more poorly because I can see where I am failing - even when I know I am giving it everything I can.

Not sure yet.

Yes, my teaching enjoyment is based upon student success.

It seems as though work requirements are steadily increasing over the years while pay is not climbing at the same rate. It feels as though we are implementing some of these new strategies essentially on volunteer time, which decreases enjoyment in a teaching job since it is a job.

I am not sure. Again, I have just completed this series.

No
5% (2)

It is about the same.

Appendix B: Post Training Survey: Open-Ended Comments

Please share any additional comments you would like to provide related to the topic of instructor presence in online courses.

None, I can think of beyond shrinking the classroom sizes to give us the time to spend more time with the students.

It is extremely critical for instructors to catch students early before they fall through the net of giving up, develop a recovery plan for them and help them stay focused on their academic goals and achievements. When students know that their professors care, this can help them care about themselves.

A written transcript of ALL videos should be provided as an alternative method of completion of the series.

I love this series and greatly appreciate the time and attention that was put into their development. I hope to see updates or refresher courses over the next few years.

I hope that we can continue to support the use of classroom enhancement tools so that we can provide the best education for our students.

Overall, just excellent material that bridged theory with the provision of realistic tools.

liked the diverse layout and strategies used to teach presence; kept me interested!

GREAT course

It was wonderful course and more should be done.

No other comments at this time.

you did a great job

I loved this series and would love to be a part of it in the future

Be watchful of using "humor" in the classes. These students have very diverse personalities and may become offended. Always be respectful, flexible, empathetic, and available.

Thank you all so much for the series. I expect to learn more as I review the slides over and over.

Thank you for your commitment to teaching excellence in the classroom.

These were really well done as training modules! Thank you! Nice job :-)

Thank you! XXX offers high quality professional development and I appreciate it.

Thanks for all the wonderful resources.

Thank you so much! I found the modules to be very informative, engaging and helpful in continuing to assist me in effectively engaging my students!

the training was GREAT!

Online Presentations with *PowerPoint Present Live* Real-Time Automated Captions and Subtitles: Perceptions of Faculty and Administrators

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Abstract

Captioning of recorded videos is beneficial to many and a matter of compliance with accessibility regulations and guidelines. Like recorded captions, real-time captions can also be means to implement the Universal Design for Learning checkpoint to offer text-based alternatives to auditory information. A cost-effective solution to implement the checkpoint for live online presentations is to use speech recognition technologies to generate automated captions. In particular, *Microsoft PowerPoint Present Live* (MSPL) is an application that can be used to present with real-time automated captions and subtitles in multiple languages, allowing individuals to follow the presentation in their preferred language. The purpose of this study was to identify challenges that participants could encounter when using the MSPL feature of real-time automated captions/subtitles, and to determine what they describe as potential uses, challenges, and benefits of the feature. Participants were full-time faculty and administrators with a faculty appointment in a higher education institution. Data from five native English speakers and five native Spanish speakers were analyzed. Activities of remote usability testing and interviews were conducted to collect data. Overall, participants did not encounter challenges that they could not overcome and described MSPL as an easy-to-use and useful tool to present with captions/subtitles for teaching or training and to reach English and Spanish-speaking audiences. The themes that emerged as potential challenges were training, distraction, and technology. Findings are discussed and further research is recommended.

Keywords: Online presentation, real-time, captions, subtitles, speech recognition, universal design for learning

Orellana, A., Arguello, G., & Kanzki-Veloso, E. (2020). Online presentations with Power Point Live real-time automated captions and subtitles: Perceptions of faculty and administrators. *Online Learning*, 26(2), 34-51.

Captioning videos is beneficial to many, including individuals who are deaf or hard of hearing, hearing adults wanting to retain what is heard, and persons learning a second language (Dallas et al., 2016; Gernsbacher, 2015; Linder, 2016; Morris et al., 2016). Captioning is also a matter of compliance with accessibility regulations and guidelines, such as the Americans with Disabilities Act (United States Department of Justice Civil Rights Division, n.d.), the Rehabilitation Act Section 508 (U.S. General Service Administration, n.d.), and the Web Content Accessibility Guidelines 2.0 (World Wide Web Consortium, n.d.).

From an instructional and learning perspective, captioning is of particular applicability when aiming to implement the Universal Design for Learning (UDL) principle of providing “multiple means of representation” (CAST, 2018a; Meyer et al., 2014). UDL is an evidence-based “framework to improve and optimize teaching and learning for all people based on scientific insights into how humans learn” (CAST, 2018a, para. 1). UDL promotes inclusive pedagogy that beneficially supports diverse students and reduces the need for specific accommodations. According to CAST (2018a), the UDL Guidelines “offer a set of concrete suggestions that can be applied to any discipline or domain to ensure that all learners can access and participate in meaningful, challenging learning opportunities” (para. 1).

Offering alternatives to auditory information can allow all learners to access the content equally (CAST, 2018a), for example, with the use of “text equivalents in the form of captions or automated speech-to-text (voice recognition) for spoken language” (CAST, 2018b, para. 2). Figure 1 depicts UDL Checkpoint 1.2 “Offer alternatives of auditory information” within the UDL Principle “Provide multiple means of representation,” UDL Guideline 1 “Provide options for perception.”

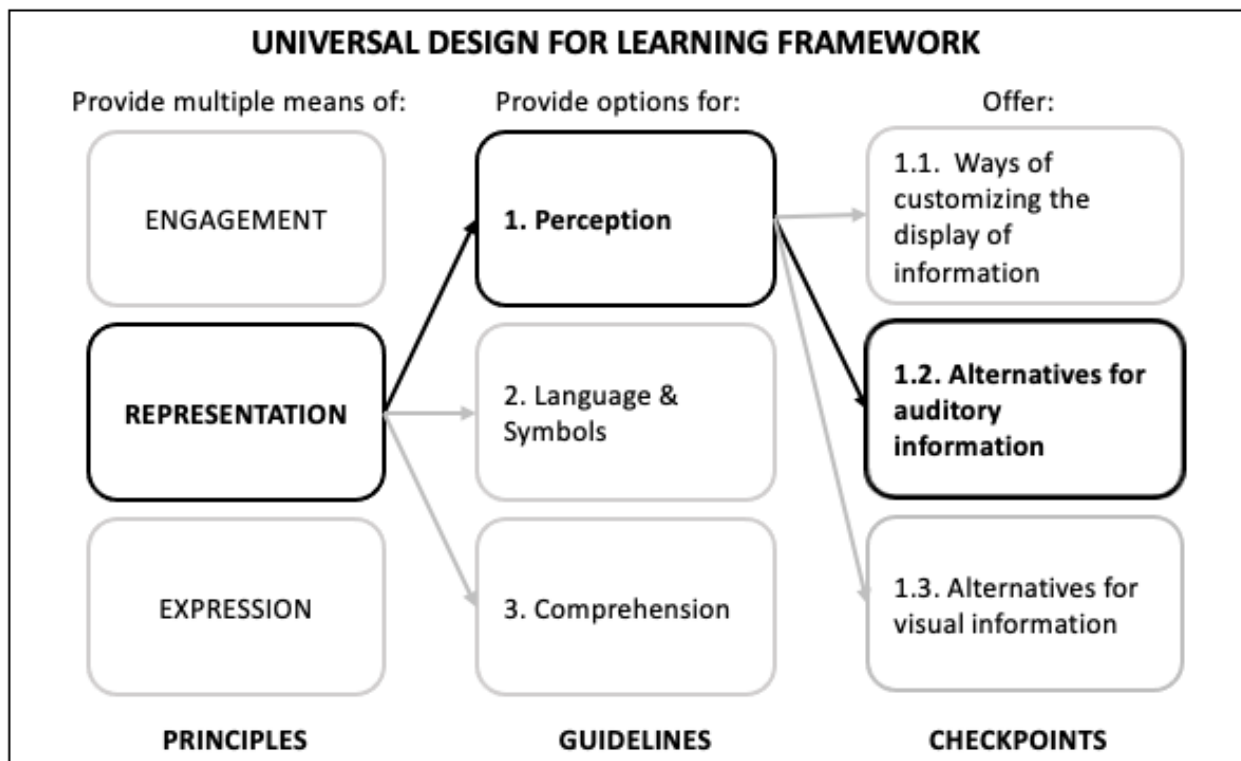


Fig. 1 Checkpoint 1.2 “Offer alternatives for auditory information” outlined under Universal Design for Learning principle “Provide multiple means of representation,” Guideline 1 “Provide options for perception” (CAST, 2018a).

Figure created by authors.

As suggested by UDL Checkpoint 1.2, real-time captions can be an alternative to auditory information when the presenter is speaking live and online. However, real-time captioning can be expensive if a human transcriber is to caption every presentation in every live session. A cost-effective solution can be speech recognition technology (SRT) to generate real-time captions and to provide a transcription of the speech (Revuelta et al., 2010). Students have found SRT beneficial in educational settings, such as in their English-language lectures (Huang et al., 2015; Huang et al., 2016) and for cross-cultural learning activities (Shadiev et al., 2018).

In 2020, *Present Live* (MSPL) became available as a *Microsoft PowerPoint* (PPT) presentation feature that allowed real-time automated captions, the translation in real-time of 12 spoken languages into more than 60 languages, the possibility of individual viewers to follow the presentation in their preferred language using their own devices, and the ability to compile a transcript of the presentation (Microsoft Education, 2020). PPT is a commonly used tool for presentations in educational settings and it can be anticipated that those with a Microsoft Office 365 license would be inclined to use it. As online instructors and administrators aim to implement UDL guidelines for inclusive learning opportunities, reach out to multilingual audiences, and comply with regulations and guidelines regarding accessibility, the following questions arise: “Would online instructors use a tool like MSPL to offer captions as a text-based alternative for auditory information when they are presenting online in real time?” “Would online instructors use MSPL to translate their spoken words when they are presenting online in real time to reach students who speak or are learning a different language?” “Would online instructors be able to use MSPL effectively, and would they find the features of captions/subtitles useful?”

Review of Related Literature

Captions are typically referred to as the transcription of the presenter’s speech in their language along with background sounds and speaker identification, whereas subtitles are referred to as the translation of the speech into a different language (3PlayMedia, n.d.; Myers, 2019; Take Note, n.d.). Closed captions/subtitles can be turned on and off by the viewer, as opposed to open ones that are always visible on screen (Bureau of Internet Accessibility, 2019). Captions/subtitles can be generated in real time or added to the recorded video offline in post-production time, and they can be generated by a human transcriber or with speech recognition technology (SRT).

Gernsbacher (2015) documented more than 100 empirical studies that showed how captions benefit a diverse population, including individuals who may be deaf or hard of hearing, hearing adults wanting to retain what is heard, and persons learning a second language. Linder (2016) surveyed 2124 students without hearing disabilities from 15 institutions enrolled in different course modalities—online, face-to-face, and hybrid—to determine how they used and perceived closed captions and transcripts for recorded videos. Respondents indicated that using captions helped them focus, retain information, overcome poor audio, access the content in quiet environments, comprehend complex vocabulary, overcome difficulty with hearing, and better comprehend English as their second language (Linder, 2016). Among the benefits of displaying on-screen subtitles are the comprehension of viewers who speak a different language, reaching a larger audience, and allowing viewers to learn a foreign language.

Dallas et al. (2016) examined the relationship between students' exposure to captions and information recalling. Dallas et al. analyzed data from 216 randomly selected undergraduate students without a hearing disability or not having English as a second language. Dallas et al. found that those exposed to captions performed better on information recall, although sophomores scored lower compared to seniors and African Americans scored lower compared to Caucasians. In general, Dallas et al. concluded that "closed captions may be beneficial for learning video-based information [and that] faculty members are encouraged to turn on closed captions when showing course-related videos in class or for online courses" (p. 62).

Morris et al. (2016) surveyed 66 students regarding their "perceived advantages or disadvantages of their experience with captioning in the current [online] course" (p. 233). Morris et al. found that 99% reported that captions helped clarify content, the spelling of keywords, and note taking. Additionally, although a 99% accuracy was reported from the captioning vendor, students noted "issues and missing spaces between words were observed, and these errors were a potential distraction, possibly limiting the value of the captions" (p. 235).

Speech recognition, also known as "automatic speech recognition (ASR), computer speech recognition, or speech-to-text, is a capability that enables a program to process human speech into a written format [and] focuses on the translation of speech from a verbal format to a text" (IBM Cloud Education, 2020, What is Speech Recognition section, para. 1). The industry standard for caption and transcript quality is at least 99% accuracy rate and, on the other hand, according to Enamorado (2019a), "typically, automatic speech recognition produces about 60-70% accurate transcripts, which means that 1 out of 3 words is wrong" (Automatic Speech Recognition section, para. 3). Additionally, Enamorado (2019b) compared the accuracy rates of two vendors and found that their measured accuracy rates fell between 84.7% and 94.4%.

In general, captions generated by SRT are not 100% accurate and often need a human to edit them for full compliance with accessibility regulations and guidelines. Typically, ASR "is good, but not good enough to remove humans from the process" (Enamorado, 2019b, Why is it 99% Accuracy and Not 100%? section, para. 2) and "is often fast, cheap, but highly inaccurate" (Enamorado, 2019a, Automatic Speech Recognition section, para. 1). Despite the typical low accuracy of text generated with SRT, students have found SRT beneficial in their English-language lectures to aid learning, to help them better understand a lesson, to allow them to take notes, and to confirm what was being said in the class (Huang et al., 2015; Huang et al., 2016). Huang et al. (2016) summarized studies that looked at how STR supports the learning of non-native English speakers and concluded that the literature showed that for the most part, students found SRT helpful during real-time lectures and as compiled transcripts. The use of SRT in the classroom can also aid awareness, attention, and meditation (Shadiev et al., 2017).

Shadiev et al. (2018) investigated the use of speech-enabled language translation (SELT) technology, which consists of SRT and computer-aided translation, to facilitate cross-cultural understanding and intercultural sensitivity. Shadiev et al. (2018) computed the accuracy and intelligibility of the 10 different languages among 21 multilingual students representing 13 nationalities. Shadiev et al. (2018) found that the texts generated were meaningful and valuable to participants in their cross-cultural learning activity and suggested "applying SELT to support student interaction in their native language" (p. 1425).

The use of SRT to generate real-time captions can also be a cost-effective solution for classroom presentations where it would otherwise be necessary to hire dedicated staff (Revuelta et al., 2010). According to Revuelta et al., the essential use of ASR technology inside the classroom is to transcribe what the instructor presents in real time. Regarding presentation tools that allow for automatic real-time captioning, PPT is a presentation application that uses cloud-based SRT for real-time captioning of the spoken words of the presenter (Microsoft, n.d.-b). The feature of PPT live captions/subtitles is “one of the cloud-enhanced features in Microsoft 365 and are powered by Microsoft Speech Services” and, to provide the service, the speech utterances are sent to Microsoft (Microsoft, n.d.-b; Important Information About Live Captions & Subtitles section, para. 1). In 2018, the PowerPoint team announced this new feature powered by artificial intelligence that would allow PPT to support “12 spoken languages and display on-screen [real-time] captions or subtitles in one of 60+ languages” (PowerPoint Team, 2018, para. 2). As of late January 2019, this feature has been available for Office 365 subscribers worldwide for PPT on Windows 10, PPT for Mac, and PPT Online. The Microsoft Education Team (2019) claimed that a benefit of this feature is having a “speech recognition that automatically adapts based on the presented content for more accurate recognition of names and specialized terminology” (Present More Inclusively with Live Captions & Subtitles in Microsoft PowerPoint section, para. 2).

MSPL for Office 365 was announced in January 2020 (Microsoft Education, 2020) and became available in PPT for the web by June 2020 (Johnson, 2020). A MSPL presentation can be shared with anyone who has internet; viewers anywhere can join the live presentation on their devices and read live captions/subtitles in their preferred language as the speaker is presenting. The live presentation can be delivered to an audience onsite or to an online audience connected to a conferencing system by sharing the screen (Microsoft, n.d.-a).

Purpose and Research Questions

The MSPL feature of real-time automated captions/subtitles can be a means to implement the UDL guideline that suggests that a way to reduce barriers is to provide a real-time, text-based alternative to auditory information. Additionally, with MSPL the viewers can follow the presentation in their preferred language. The purpose of this study was to identify challenges that participants could encounter when using the MSPL feature of real-time automated captions/subtitles, and to determine what participants describe as potential uses, challenges, and benefits of the feature. For the study, captions were referred to as the transcription of the presenter’s speech in their same language without background sounds or speaker identification, and subtitles as the translation of the speech into a different language. In particular, the focus of the study was on captions and subtitles in English and Spanish. Participants were English- and Spanish-speaking full-time faculty and administrators with a faculty appointment in a higher education institution. To address the purpose of the study, the following questions were addressed:

1. What challenges do participants encounter as presenters and as viewers with MSPL?
2. What do participants describe as potential challenges, benefits, and uses of real-time captions and subtitles with MSPL?

Methods

Setting of the Study

The institution that served as the setting of the study was a private not-for-profit university considered a majority-minority institution. The university had been recognized as a Hispanic Serving Institution with a diverse student population from more than 100 countries and more than 25% of its students identified as Hispanic. Participants of the study were affiliated to a college of the institution that offered online and onsite undergraduate and graduate programs of study. The college served students in the U.S. and several international locations, including Latin America and the Caribbean. As a result, to assist this population of students, the college offered some of the graduate programs of study in Spanish with Spanish-speaking faculty and doctoral dissertation committee chairs and members.

Data Collection

The researchers followed basic activities of *usability testing* to collect data. Barnum (2010) summarized usability as encompassing “the product’s effectiveness and efficiency for users, as they work with the product ... [and] the elusive quality of user satisfaction, which is based on users’ perceptions entirely” (p. 1). The researchers’ intent of following usability testing activities for the study was not to formally test MSPL as a product, nor to inform product developers or to conduct rigorous experimental designs that typically address three dimensions of usability (i.e., effectiveness, efficiency, and satisfaction). The intent was to use basic activities of usability testing as a study framework to identify challenges that participants could encounter as presenters and as viewers with MSPL.

Participants were observed working with MSPL performing the task of delivering and viewing a presentation with captions/subtitles meant to be “real and meaningful to them” (Barnum, 2010, p. 1). This observation activity is what Barnum describes as *usability testing*. Specifically, the researchers conducted activities of a moderated qualitative usability testing to gain an in-depth description of potential uses, challenges, and benefits of the MSPL feature of real-time captions/subtitles based on the experience and narrative of participants. According to De Blecker and Okoroji (2018) “qualitative usability studies are focused on gaining in-depth understanding based on narrative data, while quantitative studies collect numerical data to produce statistically relevant metrics” (Qualitative and Quantitative Usability Studies section, para 1). Furthermore, because of the restrictions of meeting onsite during the COVID-19 pandemic, the researchers scheduled a Zoom session with each participant to carry out what Barnum refers to as a *moderated remote usability testing* by “observing [via Zoom] in one location and the user [participant] in another location” (p. 2). After the testing session, participants were interviewed to determine how they described potential challenges, benefits, and potential uses of live captions/subtitles with MSPL.

Preparing the Moderated Remote Usability Testing

The researchers followed five steps recommended by Barnum (2010) to prepare the moderated remote testing:

1. Recruit participants. The study population included native English-speakers and native Spanish-speakers who were full-time faculty, or administrators with a faculty appointment, in a

college of the institution that served as the setting of the study. As employees of the college, all native Spanish-speaking participants were fluent in English. Additionally, as employees of the institution, all participants had licensed access to Microsoft Office 365 online to present with MSPL.

The researchers used purposive sampling to recruit 12 participants. When using purposive sampling in qualitative studies, a sample size from 7 to 12 is appropriate (Malterud et al., 2016; McCracken, 1988; Young & Casey, 2019). Similarly, for qualitative usability testing, “a small number of participants is sufficient to provide valuable results” (Bleecker & Okoroji, 2018; Qualitative and Quantitative Usability Studies section, para 2). For qualitative usability testing studies, there can be as few as 3 to 5 and as many as 12 to 15 participants (Bleecker & Okoroji, 2018).

An invitation to participate in the study was emailed to 57 potential participants. The first six English speakers and the first six Spanish speakers who accepted the invitation and met the inclusion criteria were recruited. Inclusion criteria were having experience using PowerPoint and Zoom, a headset or a microphone, fast and reliable internet connection, web camera, and a computer with a recent version of a browser (i.e., Mozilla Firefox, Google Chrome, or Microsoft Edge). Participants were encouraged to bring a smartphone or tablet with iOS version 11+ or Android version 8+.

2. Assign team roles and responsibilities. Two researchers fully fluent in Spanish and English (i.e., R1 and R2) met with each participant via Zoom. R1 moderated the session, guided the participant with a Walkthrough Protocol, troubleshoot, and compiled captions and subtitles in one language. R2 observed and took notes of the test session, collected text of captions and subtitles in the other language, completed the Walkthrough Checklist, and noted if and when the participant had issues completing each step.

3. Prepare other materials. The researchers prepared a consent form, a Walkthrough Protocol, an Interview Protocol, and a 6-minute video tutorial on using MSPL.

4. Create the qualitative semi-structured Interview Protocol. The protocol consisted of the researcher’s script and four open-ended questions about if and how the participant would use the MSPL features of captions/subtitles and about any challenges that they thought they would need to overcome when using these features. Participants were also asked to describe their role in the institution.

5. Test the test. Two faculty members with characteristics of participants validated the materials and completed the testing activity and interview.

Conducting the Moderated Remote Usability Testing

Each participant received an email with a unique link to a password-protected Zoom meeting. Before starting the usability testing, R1 made sure that the participant had the necessary equipment (i.e., microphone, browser, and/or mobile device) and asked the participant to test their network speed using the *Speedtest* website <https://www.speedtest.net>. Upon starting the testing, each participant viewed the 6-minute video tutorial, presented with MSPL three or more slides with the content of their choice, and connected as viewers to an MSPL with their devices

or with a different browser when R1 acted as the presenter.

Conducting the Interview

Upon completing the testing session, R1 interviewed the participant regarding their experience with MSPL. The video and transcripts of the Zoom interview session were recorded for each participant. Each interview lasted from 25 to 30 minutes and consisted of the following open-ended questions:

1. Demographic questions: Would you please briefly describe your primary role? In what programs(s) or courses are you involved (as teacher or administrator)? Can you describe your students or audience (e.g., general characteristics, needs, skills, online)? When you present live, do you mostly do it online or onsite?

2. Interview question 1: Would you please describe one scenario or more where you would use live captions or translated subtitles in a presentation? Describe the characteristics of the audience and the setting or type of presentation. Your audience can be onsite or online with Microsoft Teams or Zoom.

3. Interview question 2: How often would you use these features?

4. Interview question 3: How do you think a particular audience would benefit from following the presentation in their preferred language?

5. Interview question 4: Tell me about your experience with real-time subtitles in PowerPoint Live?

6. Interview question 5: Do you have anything you'd like to add or ask?

Data Analysis

One English- and one Spanish-speaking participant could not successfully present during their initial session nor a second scheduled session. Hence, data from ten participants were analyzed (i.e., five native English speakers and five native Spanish speakers). The notes in the Walkthrough Checklist taken during the usability testing were analyzed to describe the challenges that participants encountered as presenters and as viewers with MSPL.

The qualitative interview data were analyzed to determine how participants described potential challenges, benefits, and potential uses of live captions/subtitles with MSPL. A general inductive approach (Thomas, 2006) was followed. The inductive approach is used to develop “categories into a model or framework that summarizes the raw data and conveys key themes and processes” (Thomas, 2006, p. 240). Open coding was used to assign descriptive labels that came from the text of transcripts. The text was then grouped into categories and reduced until it could no longer be reduced. This process allowed the creation of essential categories that later emerged into major themes.

Triangulation (Denzin, 2009) was employed to ensure the trustworthiness of the analysis process and validity of the research process (Creswell & Poth, 2018). The interview transcripts from Zoom were downloaded, checked against the recorded Zoom session, revised accordingly, and then sent to each participant to adjust for inaccuracies.

According to Gibbs (2018), “Coding is a way of indexing or categorizing the text to establish a framework of thematic ideas about it” (p. 54). The transcripts were coded to develop categories using a member checklist process that consisted of coding separately and then meeting to reach an agreement in the categories that emerged. First, the text was segmented into sentence

fragments, sentences, phrases, and paragraphs and assigned a descriptive label (i.e., code) to each qualitative data unit (i.e., text from the interview transcript). Then, codes were grouped into categories to connect the codes and attribute meaning to the data units. The process of open coding was exhausted until all the categories were created.

Once the categories were developed, they were checked to achieve consistency amongst them. Categories were then combined to create axial codes that allowed for the central meaning of each category. Subcategories were then created, which identified the core meaning of the open codes. Last, themes started to emerge from the axial codes. This process was repeated twice for accuracy of themes. Finally, the themes that were extracted were reviewed with the transcript to confirm the meaning. A prolonged engagement technique (Lincoln & Guba, 1985) was followed by meeting several times to understand better the analysis process and the themes that emerged.

Results

Characteristics of the Participants

An inclusion criterion was that the participant had experience presenting with PPT for any of their job-related roles and using Zoom to remotely participate in the study. In general, participants used multiple delivery methods (e.g., onsite, online, and hybrid) when performing their roles. However, because of the COVID-19 pandemic at the time of the study, they had been delivering all their synchronous meetings and class sessions online via Zoom.

Out of the ten participants, two identified themselves as administrators with a faculty appointment. All ten taught online graduate students and two also taught onsite undergraduate students. All taught in English and two Spanish-speaking participants also taught hybrid courses in Spanish to students in Colombia, Puerto Rico, or the Dominican Republic. Seven indicated that they served as doctoral dissertation chairs or members to national or international online students who spoke their same language.

In general, participants described their typical graduate student population as non-traditional working adults who were mainly technologically proficient. Six who taught in English indicated that they interacted with students who had English as their second language (e.g., Spanish, Haitian Creole, Portuguese), Spanish being the predominant language. In general, the participants highlighted that these diverse students were proficient in English, but their primary language of listening and speaking was some other language.

Potential Uses and Benefits of MSPL

The central theme that emerged as potential uses of MSPL was the possibility to deliver online presentations for training and teaching, especially during the COVID-19 pandemic. This was a surprising theme perhaps because of participants' experiences during the pandemic. For example, participants stated that most presentations moved to Zoom because of COVID-19, which made perfect timing for the use of MSPL. Following is an excerpt from a participant's Zoom interview transcript:

Because of COVID I think most of them [students] had experience using Zoom. Maybe we could use for some sessions ... PowerPoint live, and all the students are from the U.S. so we will not use Spanish I could see using PowerPoint live to present the workshop and use subtitles. I would use them in English.

Two other themes emerged as potential uses and benefits of MSPL captions/subtitles: English-speaking audiences would be able to verify the information from the speaker, and captions/subtitles would be beneficial to several audiences (e.g., English-speaking students, English- and Spanish-speaking doctoral dissertation chairs, and students with English as a second language). The following are excerpts from participants' Zoom interview transcripts that support the themes:

Teaching classes to students that speak Spanish. I think students would like it, those students who want to have their primary language, their first language, but would also like to get exposure to English.

I have a student who is English speaking ... from Jamaica, and I have a student who is Spanish speaking. He is proficient in English, but I think that ... I might ask him or let them know that we can do this, and he may opt to do the subtitles on his device in Spanish. It would benefit them to have the captions for subtitles so that they'd be able to make sure that they're getting all the information that you're providing.

Any dissertation-related presentation could have been done using it so they can still see this good. You know the Puerto Rican, or any international student as well, would benefit from this.

Another theme that emerged was the benefits of using MSPL as a friendly and easy-to-use tool that allows access to the presentation using any device and helps the viewer confirm what the speaker is saying. In relating how friendly and easy MSPL was to use, one participant stated, "I did not find it distracting as a presenter to have the subtitles underneath, which, you know, you might think that would be distracting to have the constantly appearing under your presentation, but I didn't find it distracting at all." Another participant shared how subtitles can help students who may not understand teachers or other students who speak in a different accent than their own to connect with what the speaking is saying. Participants also described that MSPL would be beneficial to special education students who are hard-of-hearing, non-English-speaking international students and doctoral dissertation chairs, and English-speaking students in conference settings.

Potential Challenges When Using MSPL

The following themes emerged as potential challenges when using MSPL captions/subtitles in live presentations:

1. **Training.** Participants described that the presenter would need training and a "refresher course." The audience would need tips on accessing the application, connecting to the presentation, and accessing the transcripts of the captions and subtitles.
2. **Distraction.** Participants described that when the speaker constantly checks for accuracy, they may cause the presentation flow to stop and thus, cause a potential distraction; additionally, talking too fast may cause many errors and, therefore, distraction when reading the captions/subtitles. One participant explained the distraction that may arise from using captions and subtitles by stating, "Our challenges would be that

perhaps the captions are coming too fast for some people who may need to have them at a slower pace.”

3. Technology. Participants indicated that adult learners and faculty, who are not technology savvy, might need extra training. Participants also wondered how onsite viewers would be able to read the captions/subtitles if they were not connected to the MSPL presentation, and how transcripts could be forwarded to those, online or onsite, who could not connect to the MSPL presentation.

Technology Used by Participants During Usability Testing

All participants used a laptop as presenters, out of which only one was an Apple Mac computer, and the rest were Windows-based. As for the browsers that participants used, eight used Chrome, one used Microsoft Edge, and another used Firefox.

To connect to the MSPL presentation when acting as a viewer, one participant used a second browser window and nine used a smartphone (seven used iPhones with iOS 11 or higher and two used a device with Android OS 8 or higher). The average speed of participants’ network connection, measured as megabytes per second (Mbps), was 200.6 for download speed, varying from 31.66 to 400.53; and 100.33 for upload speed 4.64 to 531.18.

Challenges Encountered by Participants During Usability Testing

All participants were able to complete the testing as presenters and as viewers without significant challenges. Few ran into technical challenges before starting the testing session. If the participant was not able to resolve during a first session, a second session was scheduled.

One participant ran into several technical issues during the first session: not being able to log in to the institution portal using Chrome, a “freezing” Zoom session, problems with Bluetooth microphone, MSPL not yielding the QR code or link for viewers to connect, and MSPL suddenly stopping. The participant tested with several browsers and computers (e.g., Microsoft Edge and Chrome with a Windows computer, and Chrome and Firefox with an Apple Mac). During the last try with Microsoft Edge, the “Present Live” icon was not available and MSPL appeared unstable. During a second scheduled session, the participant completed the testing session using Firefox and a Windows computer.

Limitations of the Study

The limitations of the study were as follows:

1. The study was limited in the diversity of the sample. Additional information may have been learned from experiences of users from other institutions or educational settings.
2. The researchers conducted a qualitative usability testing study with a small sample size suitable for qualitative research. The researchers did not seek to conduct a quantitative usability testing study to collect numerical data or obtain statistically relevant metrics of MSPL.
3. Although MSPL allowed real-time captions/subtitles in various languages, English- and Spanish-speaking faculty were available for the researchers to recruit through purposive

sampling. Additionally, the researchers, who were native Spanish speakers fluent in English, needed to be able to read the captions/subtitles in both languages.

4. Participants used MSPL to present online only due to COVID-19 and, thus, were not able to comment on their experiences using MSPL in an onsite context.
5. Participants used MSPL in a testing scenario and, thus, they were not able to comment on their experiences using MSPL in their typical presentation scenario.

Discussion of the Findings

Findings were expected to help educators select presentation tools, such as MSPL, that allow automated real-time captioning when implementing UDL guidelines, specifically Checkpoint 1.2, which suggests that offering alternatives to auditory information can enable all learners to access the content equally. Diverse learners can benefit from real-time captions/subtitles, including those with hearing disabilities, have English as their second language, or want to retain the information by reading what they hear. Findings could also help faculty and administrators decide on tools to comply with accessibility regulations and guidelines.

By the time of the study, only *Google Slides* (Google, n.d.) as a presentation application allowed for real-time automated captions. MSPL was selected for the study as a licensed application that was readily available to the participants of the study. Additionally, unlike *Google Slides*, MSPL generated real-time captions/subtitles in various languages other than English and allowed the viewer to select the language of their choice. It is worth noting that MSPL was not formally tested as a product, nor were rigorous experimental designs for usability. Thus, findings were not meant to be used to inform product developers nor for product endorsement.

Challenges Encountered by Participants During Usability Testing

During the testing session, participants did not encounter technical challenges when using MSPL that they could not overcome by themselves or with the assistance of the testing moderator, nor did they describe potential challenges that they thought could not be resolved with proper training or tools. All who completed the testing session were connected to a stable internet with a network speed higher than the highest minimum recommended broadband by Zoom (Zoom Video Communications, n.d.) for the presenter, corresponding to high-definition video (i.e., speed rates of 3.8 Mbps for upload and 3.0 Mbps for download), and also higher than the recommended broadband as an attendee, corresponding to 1.2 Mbps download speed for high-definition video. The network download speed was higher than the 6 Mbps as the minimum recommended by the Federal Communications Commission (2020) for high-definition video teleconferencing. On the other hand, those who could not complete the testing, but were still able to stay connected via Zoom, had networks with download speeds of 2.07 Mbps and 5.99 Mbps, and upload speeds of 0.0Mbps and 0.13Mbps, respectively.

Given the performance values of participant's networks, the following can be concluded: (a) download and upload speeds as low as 31.66 Mbps and 4.64 Mbps, respectively, were appropriate to hold a Zoom session as an attendee and to present using MSPL features of captions/subtitles, and (b) upload speeds lower than 1 Mbps can prevent the proper use of MSPL

as a presenter. Overall, it can be concluded that the network speed was a significant obstacle that prevented the proper use of MSPL.

Participants' Descriptions of Potential Challenges, Benefits, and Uses of MSPL Real-Time Captions/Subtitles

Overall, participants described MSPL as an easy-to-use and helpful tool to provide captions/subtitles and reach English and Spanish-speaking audiences. It was surprising that only one participant mentioned accessibility as a reason for using captions and that none emphasized the inaccuracies of the captions. One participant voiced the benefit of MSPL for a Spanish-speaking student in their class, saying, "It's kind of [an] exciting idea to be able to speak in English, and other students see it in English, but for him to be able to have that choice of having an English or Spanish [translation] is a great idea." All participants described the features of captions/subtitles as a "benefit for all" for various scenarios (e.g., presentations, training), primarily online, and to multiple types of audiences (e.g., English, and non-English speaking students, and Spanish-speaking dissertation chairs). For instance, regarding the benefits of using MSPL, one participant stated, "I mean, this is something that is professional development for me. I mean, this is useful stuff." It can be concluded that MSPL can help provide a text-based alternative to auditory information presented live, as suggested by UDL Checkpoint 1.2.

After a more in-depth review of the interview transcripts and after further discussion, it was apparent that the pandemic influenced how participants perceived the uses and benefits of MSPL. For example, all mentioned benefits for class and meeting presentations online only, in a world where no traveling would be possible as in the time of a pandemic.

Recommendations

As more presentation applications with SRT-based real-time captions/subtitles become available and the existing ones improve their technologies, the possibilities of using them in the day-to-day presentations in classrooms or training are likely to increase. Although studies show the potential value of SRT for increasing inclusiveness, accessibility, and communicative ability with multilingual audiences, more research is needed to support the usefulness and effectiveness of presentation tools such as MSPL in classroom settings. A venue for this line of inquiry is through a better understanding of students' experiences in various scenarios (e.g., online, onsite, and hybrid) and for different types of students (e.g., with and without learning or hearing disabilities, undergraduates, graduates, native and non-native English-speakers).

The ten participants resided in the United States and were English and Spanish native speakers. Further research is recommended with a larger sample size and with participants who speak other languages and from different institutions. Furthermore, participants did not fully act as a presenter with an authentic audience and further research is recommended in more realistic scenarios where the presenter speaks freely to their typical audience and with more and relevant presentation slides. It can also be beneficial to include an audience connected from other countries or places where participants might need to overcome different technological and technical barriers.

Participants perceived MSPL as an easy-to-use tool and all agreed that training would be needed before its use. If and when a new tool is to be introduced and training provided, it is recommended that the reality of the participants is considered because it could influence how the

usefulness of the tool is perceived. Participants could dismiss the potential benefits of the tool because of more significant issues taking precedence in their lives, such as the pandemic.

Ease of use and perceived usefulness of a tool are essential factors to consider when deciding to use a tool like MSPL. It is also important to evaluate if the tool generates quality captions and subtitles measured by their accuracy and intelligibility. Hence, a comprehensive evaluation of the usefulness of MSPL should include determining the quality of the captions/subtitles it generates to determine to what extent MSPL can “accommodate individuals in the audience who may be deaf or hard of hearing” (Microsoft, n.d.-b, para. 1) and allow those who speak a different language from the presenter to comprehend the subtitles effectively.

Technical (e.g., poor network speed rates, poor microphones) and technological challenges (e.g., outdated software, hardware, versions of mobile devices and browsers) encountered by participants led to reflection about the working-from-home situation confronted by many because of the pandemic. If leaders of institutions expect faculty and staff to work from home efficiently, they must foresee these challenges and provide proper tools, training, and assistance.

Sudden instability of MSPL is also a significant issue that prevents its use and cannot be resolved by the user. It is not uncommon for cloud-based services to become unavailable because of outages or become unstable because of updates or maintenance. After conducting the study, it was noted that the interface of MSPL had changed regarding placements and labels of options and the placement of the presentation link for viewers to connect to the presentation. Changes in the interface and functionality of applications also affect training materials, such as printed tutorials or videos. Thus, it is recommended that training materials be revised frequently. Users are given training “refreshers” before using the tool, and that users be aware that technology “can go wrong” and should have an alternative plan.

Finally, having conducted a remote usability testing via Zoom presented challenges and opportunities for the researchers. Challenges included moderating the session remotely and troubleshooting without physically being able to assist the participant. On the other hand, the opportunities outweighed the challenges: Being able to record the interview video with Zoom allowed for validation of what was heard and observed; obtaining Zoom’s automatic transcripts, although not 100% accurate, facilitated the data collection and analysis; the possibility of scheduling individual sessions without the need of physical rooms or the commute saved time and resources; and using MSPL in real time with Zoom allowed participants to experience MSPL as presenters to a remotely located audience and as remote viewers connected to the presentation.

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 Nova Southeastern University, USA.

The authors declared that they received no financial support for the research, authorship, and/or publication of this article.

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An Overnight Educational Transformation: How did the Pandemic Turn Early Childhood Education Upside Down?

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Abstract

Since the spring of 2020, many early childhood education programs (pre-K, K, 1st, and 2nd grades) had to close as governments around the world took serious measures to slow down the transmission of COVID-19. As a result, the pandemic forced many early childhood teachers to start teaching online and continue supporting their students remotely. Unfortunately, there were few lessons that these teachers could learn from experience to cope with this change since online learning in early childhood settings had been scarce until the outbreak of the pandemic. In response, the goal of this interview study was to investigate how early childhood teachers in public and private schools implemented online learning during the pandemic, the challenges they encountered when teaching online, and their suggestions to address these challenges. The results showed that the teachers did not sit still and patiently wait for the re-opening of the schools. Instead, they took assorted initiatives to support their students' learning and development remotely. They faced several challenges on the way but also suggested various methods to address these challenges through developmentally appropriate technology use. The results of this study have implications for teachers when early childhood programs return to normal. The study creates opportunities for future research to gain greater understanding of the design and implementation of online learning activities with young learners.

Keywords: early childhood education, technology integration, online learning, COVID-19 pandemic, distance education

Aslan, S., Li, Q., Bonk, C. J., & Nachman, L. (2022). An overnight educational transformation: How did the pandemic turn early childhood education upside down? *Online Learning*, 26(2), 52-77.

The shutdown of schools in early 2020 due to the COVID-19 pandemic forced a shift from face-to-face to online and hybrid classes. All educational stakeholders including teachers found themselves during what seemed to many like a dramatic transformation without adequate time to prepare. As a result, they had to ramp up quickly. Although this sudden shift in educational delivery systems foundationally impacted all education levels from pre-school to higher education and beyond, perhaps the most impacted group was early childhood educators with preschool and early elementary children. In response, the goal of this study was to investigate how public and private school teachers experienced online learning in early childhood education during the COVID-19 pandemic. Aligned with this goal, there were three major research questions that the study aimed to address:

RQ1: How did the teachers experience online learning in early childhood education since the outbreak of the COVID-19 pandemic?

RQ2: What challenges did they have when teaching online?

RQ3: What suggestions did they have for addressing these challenges with the technologies they wished to have?

Literature Review

COVID-19 Pandemic Turned the Education Upside Down

As an impact of COVID-19 pandemic, most K-12 school buildings closed in the spring of 2020 in the United States. These building closures impacted at least 55.1 million students in 124,000 public and private schools at the peak (*Education Week*, 2020). Globally, more than 1.5 billion students in over 180 countries (Miks & McIlwaine, 2020), of whom 155 million children at preschool level, were affected by the largest disruption to education since the creation of the United Nations in 1945 (UNESCO, 2020; United Nations, 2020). More importantly, almost half of the parents started working remotely because of the pandemic, and 75% of employed parents had children staying at home with them during work hours (U.S. Chamber of Commerce Foundation, 2020).

Many early childhood education programs had to close as governments around the world took serious measures to slow down the transmission of COVID-19 (Silverman, 2020). According to UNESCO (2020), the closure of schools and other institutions caused immense threats to young children's development in many aspects including social protection, health, nutrition, learning, and social-emotional development. While facing the unprecedented financial and enrollment difficulties due to this public health crisis (NAEYC, 2020), many early childhood programs made efforts to provide learning opportunities and care to their students at distance. Some programs resorted to online and blended forms of learning, whereas others relied on simple photocopying of materials and printing paper packets as well as offering educational radio, television, and other forms of instruction (Kanwar & Daniel, 2020; Miks & McIlwaine, 2020; Richards, 2020; Theirworld, 2020).

Certain Effective Teaching Principles Before the Pandemic Did Not Transcend the Medium

Based on a survey study, Jelinska and Paradowski (2021) found out that teachers are more likely to manage the transition to online environments in the pandemic "... if they had prior experience with remote instruction, taught in the higher education sector, or taught using real-time synchronous modalities" (p. 303).

Nonetheless, many teachers in the U.S. were barely required to prepare for remote teaching in case of any public emergencies. Drawing upon their professional training and in-person teaching practices, teachers have their own beliefs of effective teaching principles. However, the implementation of these principles can be significantly different between in-person learning settings and online settings (Kennedy & Archambault, 2012).

These differences were previously studied in the related literature. For instance, in Miller's study (2021), the teachers were concerned that interaction and socialization did not occur in online learning. Seeing students' body language and facial expressions is a way to maintain constant and meaningful communications. When the communication is moved online, teachers must find other ways to connect with their students (Miller, 2021). Other than teacher-student communication, Kim et al. (2014) argued that interaction with peers would play a supportive, social role in students coping with difficulties. In online math learning environments, these researchers found that the students were unable to interact with their peers as they would do in in-person classrooms. Such critical elements in effective teaching principles cannot transcend the medium, which presents challenges for teachers to maintain high-quality instruction in a different modality of learning.

The Pandemic Made the Long-Standing Issues More Visible

Since the pandemic touched most lives around the world in the early 2020, the need for transformative educational practices with rich and thoughtful technology integration has never been more apparent. There are very limited lessons that teachers could learn from their own past experiences to cope with the online learning situation that the pandemic created. Nevertheless, this does not necessarily mean that K-12 online learning research and practice is scant. Since the last two decades, the field has been not only growing rapidly in publication volume but also maturing by including more data-based studies (Arnesen et al., 2019). Nonetheless, the challenges discussed and addressed in these studies are the ones that online learning still faces today including the ones related with technology (Arnesen et al., 2020).

Without a doubt, one critical challenge is unequal access to technology resulting in the digital divide (Basu, 2020; Jaggars, 2021). It is a long-standing issue as online learning or blended learning emerged as an alternative or compensative option for in person learning. Scholars expressed concerns about the inequalities in household income and regional infrastructure (Jaggars, 2021). The divide is exacerbated by the pandemic due to the massive school closures. On one hand, students from low-income households could not participate in online learning because they do not have access to computers and internet connectivity. On the other hand, the situation could be worsened by underfunded districts or schools unable to equip students stuck at home (Basu, 2020). Without effective measures to bridge the digital gap, it is possible that disadvantaged students may fall further behind their peers. Besides access to computers and the internet, Resta et al. (2018) noted the concept of digital equity should be expanded. Other dimensions of digital equity encompass access to meaningful, high quality, and culturally relevant content, access to creating, sharing, and exchanging digital content, access to educators who know how to apply digital tools and resources, and access to research on the application of digital technologies to enhance learning. In such sense, the digital divide issue applies not only to students but also to teachers who attempt to provide high-quality online instruction but with limited access to technology and associated resources.

The digital divide was not the only barrier that teachers faced in this new modality of learning. Although early childhood teachers are the primary adopters and implementers of changing educational paradigms (Jamil et al., 2018), they have still struggled with barriers that prevent them from successfully integrating technology into their teaching (Nikolopoulou & Gialamas, 2015). Blackwell et al. (2014) categorized these barriers into intrinsic and extrinsic barriers. The intrinsic barriers encompass pre-existing teaching beliefs, attitudes toward educational value of technology, and comfort with technology, whereas the extrinsic ones include lack of time, training, professional development, and access to sufficient technological support. Aubrey and Dahl (2014) added that these barriers also involved the lack of vision of an effective technology-embedded learning environment, challenges of transitioning children's use of technology in the home to formal schooling, and various issues of working with parents. Another barrier could be attributed to the administrative level to effectively implement new technology tools and resources. For instance, Blackwell et al. (2014) argued that despite millions of dollars spent on teachers' access to emerging technologies, there was insufficient time and support for teachers to understand how to use technology effectively in their classrooms.

When the pandemic hit the education world in 2020, these challenges and barriers were already there. However, the impact of them was not as visible as when teachers had to fully transitioned to online learning. Despite scattered literature to draw upon, teachers were struggling with both long-standing challenges and newly emerged ones when they were forced to an unfamiliar modality to teach and support their students (Bonk, 2020). The current study can provide practice-based evidence of the teachers' experience in implementing online learning during the pandemic crisis. Concerns regarding young children's development during the pandemic call for a stronger connection between schools and families to support their young learners. The current study was an opportunity to gain more understandings of the design and implementation of online learning activities to support young children's development. As many educators foresee that education will not return to previous norms, patterns, and procedures when schools reopen, the results of this study have implications for teachers to consider a so-called *new normal*, that might bring more online learning opportunities and stronger connections between schools and homes.

Methods

Data Collection and Analysis

To address the research questions of this study, 15 teachers in early childhood education (pre-K, K, 1st, and 2nd grades) were recruited to be interviewed (see Table 1 for a summary of teacher profiles). There were a set of criteria for recruitment such as diverse set of grade levels, locations, types of schools (i.e., private vs. public), and years of teaching experience. The teachers worked in various U.S. states including the ones which were highly impacted by the pandemic (e.g., New York, New Jersey, and California). Eight of the teachers were teaching at private schools while seven of them in public schools. All the teachers had at least eight years of experience as an in-service teacher. There were some teachers with special profiles. For example, Teacher 1 had a specific teaching role as a technology teacher; Teacher 6 was teaching at a public school, but the school was considered affluent; Teacher 12 was already teaching at an online school before the pandemic, so her experience was rather different than the other teachers; and Teacher 15 was teaching students with special needs.

Table 1
Summary of Teacher Profiles

Teacher	School	Grades	Years	State	Remarks
1	Public	K, 1st, 2nd	15	New York	Technology teacher
2	Public	K	20	California	
3	Public	PreK	15	New Jersey	
4	Public	1st	9	Texas	
5	Public	1st	21	New Jersey	
6	Public	K, 1 st	13	Florida	With high SES
7	Public	1st	16	N. Carolina	
8	Private	PreK, K	30	Georgia	
9	Private	1st	30	California	
10	Private	PreK	8	California	
11	Private	K, 1st, 2nd	12	N. Carolina	
12	Private	K, 1st, 2nd	15	Maryland	Already an online teacher
13	Private	1st	9	N. Carolina	
14	Private	K	20	New Jersey	
15	Private	PreK	37	New York	Special education teacher for students with special learning needs (the school is free of charge for them)

The interviews conducted online using an audio-conferencing technology by one of the researchers of the study. The semi-structured interview protocol (see Appendix A for the questions) had both experience and opinion questions (Fraenkel & Wallen, 2008; Merriam, 1991). These questions were targeted to understand the teachers’ background, the impact of the pandemic on their educational practices, the major challenges encountered with online learning, and suggestions for addressing these challenges. Each interview took around one hour and was audio-recorded for analysis. To analyze the interview data, audio recordings were transcribed verbatim.

Content analysis was implemented by one of the researchers of the study on verbatim transcriptions to detail emerging codes and categories (Creswell, 2009; Krippendorff, 2004; Weber, 1990). These codes and categories were then outlined and summarized in a spreadsheet to identify similarities and differences across the teachers. Corresponding tables and figures were finally created to present qualitative results in a reader-friendly format. Note that, to ensure internal validity (i.e., trust value) and reliability (i.e., consistency) of the results, this study used triangulation by involving multiple teachers from both public and private schools (Merriam, 1991). We presented the results in a way that the readers could see how many teachers or which teachers we derived a certain result from. External validity (i.e., transferability) of the study was enhanced by providing rich description of the qualitative results with excerpts from the teachers (Merriam, 1991).

Findings

Teachers' Experiences About Online Learning After the Pandemic (RQ1)

In this section, we outline the interview results starting with how a typical day looked before and after the pandemic. We then explain the findings related to the teachers' priorities for online learning, role of parents in online learning, and critical learning outcomes along with problems that online learning introduced to address these outcomes. Finally, we describe the results for monitoring student emotions, behaviors, and performance during online learning, implementation of the group work before and after the pandemic, and technology use during online learning.

Typical day before and after the pandemic. In their interviews, the teachers were asked to explain a typical school day before the pandemic. Although there are some differences in terms of the activities based on the school type (public vs. private), student ages, and teacher profiles, there are some common activities discussed by several teachers. These include assembly time, whole-group/small group teacher-led instruction (i.e., mostly targeting math, reading, writing, and science), small group/individual work on various stations, playtime (i.e., inside or outside), and special lessons (i.e., art, physical education, and music).

In their interviews, the teachers were also asked to explain their typical day at home after they started working remotely due to the pandemic. An example of the felt chaotic shift in teacher's schedules due to the pandemic is captured in the quote below.

I tend to run a very organized and scheduled routine [prior to the pandemic] ... The children transition very well when there's a set schedule, they know what's coming next, so there're no surprises... [But after the pandemic with online learning], there is no typical day ..., it's been challenging in terms of structure and schedule ... (Teacher 15, 2020)

Such daily structural challenges and apprehensions about the dynamic and quickly evolving nature of course schedules and agenda were apparent in many of our teacher interviews. During a typical day at home, the teachers indicated that they did whole group/small group/1:1 teacher-led video meetings and expected students to do offline individual work on the learning activities with the parent facilitation. See Figure 1 for a detailed breakdown of the typical day after the pandemic, along with the information about the specific tasks mentioned by each teacher in their interviews.

Figure 1
Typical Day After the Pandemic

Activities	Teachers														
	Public							Private							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Online Meetings															
Full Class Video Conference		■				■	■		■	■	■	■	■	■	■
Small Group Video Conference	■		■	■	■	■	■	■						■	
1:1 Student Video Conference										■	■	■	■	■	■
Video Conference with Parents								■							
Audio Conference with Parents												■			
Students' Offline Study															
Students' Offline Work on Activities		■	■	■	■	■	■	■	■	■		■		■	
Offline Communication															
Offline Communication with Students	■												■		
Offline Communication with Parents		■		■	■			■	■		■	■	■	■	
Teacher Duties															
Planning, Content Creation, Feedback	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Teacher Professional Development	■										■				■
Staff Meetings with School Personnel				■			■							■	■

Note. This figure and the other figures in the Results section have a similar formatting structure to enable readers to review the key results for each section visually. The teachers are represented with numbers on the x-axis (e.g., Teacher 1, Teacher 2, etc.) along with their school type (i.e., public vs. private). The key results are shown on the y-axis along with high level categories in bold text. A dark shade on the column of the specific teacher indicates that the specific result was reported during the interview. For instance, for Online Meetings category, only Teacher 12 (who worked in a private school) indicated conducting audio conferencing with parents.

As illustrated in Figure 1, while use of small group videoconferencing was pointed out by most of the public-school teachers in their interviews, none of them mentioned that they implemented 1:1 video conferencing with their students. In contrast, almost all private school teachers mentioned that they implemented 1:1 conferences with their students using synchronous video. During these 1:1 conferences the teachers explained that they did tutoring, talked about how the students were doing, asked whether the students had any problems in accomplishing learning tasks, and, more importantly, checked on their students’ mental states and attempted to get them back in a positive mindset.

Teachers’ priorities for online learning. In the interviews, the teachers indicated that their priorities for online learning included academic progression, social connection, student engagement, and social-emotional development (see Figure 2 for more details). However, the teachers also reported some major concerns around these priorities after starting teaching online. These pervasive social concerns are exemplified in the following quote.

This is not how I do my job; my job is social, emotional. It's interacting, it is singing songs, it's being silly, it's giving a hug when somebody falls. It's ... one to one personal ... [T]he kids are missing out on so much. It's not just academic, it's missing out

on the community that we had in the classroom, they're missing their friends, they're missing interactions... (Teacher 5, 2020)

In addition to such social and emotional priorities, there, of course, were important achievement outcomes that they were held accountable for. In terms of academic progression, the teachers explained that they first attempted to maintain the knowledge especially in the first few weeks of the pandemic, and then they started to teach new concepts. Both Teacher 7 and Teacher 14 indicated that they initially focused on social emotional development or social connection because they thought online learning classes would happen only for a month; however, as the time progressed, they changed their focus to academic progression as well.

Figure 2
Teachers' Priorities for Online Learning with Rank Order

Priorities	Teachers															
	#1	#2	#3	Public							Private					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Academic Progression	■		■		■	■	■	■	■	■	■	■	■	■	■	
Social Connection		■	■		■		■	■	■	■		■	■	■	■	
Student Engagement		■	■	■		■					■			■	■	
Social-Emotional Development					■		■									

Role of parents in online learning. In their interviews, the teachers were asked to discuss their expectations from the parents concerning student learning during online education. The top three expectations of the teachers for the parents were: (1) supporting their child during assignments, (2) providing technical support to the child, and (3) supporting the child in scheduling their day. See Figure 3 for all expectations indicated by the teachers. However, it is important to note that in their interviews, the teachers also pointed out that living conditions of student families was quite varied. As Teacher 3 explained,

...[S]ome families live five or six in a one-room apartment. So, that's gonna impact whether or not you can focus on the task that the teacher is asking you to do. (Teacher 3, 2020)

Even if the pandemic were to end, there would still be abundant differences in family backgrounds, expectations, and available educational resources.

Figure 3
Teachers' Expectations from Parents

Expectations from Parents	Teachers														
	Public							Private							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Support the child during assignments	■	■		■				■			■	■	■	■	■
Provide technical support to the child	■	■		■					■					■	
Support the child in scheduling their day							■	■	■	■					■
Inform the teacher about learning progress	■		■	■				■	■					■	
Attend video meetings with the teacher								■	■						
Motivate the child for learning	■										■				
Read and respond to the emails					■						■				
Check calendar posted for learning activities					■	■									
Monitor the child for being on track					■	■									
Provide feedback for activities to the teacher					■	■									
Get materials ready for the assignments											■				
Monitor the child's emotions and support											■				
Attend the orientation at the beginning												■			

In their interviews, the teachers also discussed engagement levels of the parents and communication methods between the teachers and the parents. The results revealed that engagement varied across different parents with low, moderate, and high engagement. The results also made apparent that the teachers used various methods to communicate with the parents including e-mail, video meeting, and text. See Figure 4 for more details about parent engagement and parent-teacher communication methods.

Figure 4
Parents' Engagement Levels and Parent-Teacher Communication Methods

Parent Engagement Level	Teachers														
	Public							Private							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Low Moderate High 	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Parent-Teacher Communication Methods															
E-Mail	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Video Meeting	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Text (e.g., Phone messages, Bloomz, Remind)			■	■	■	■	■	■	■	■	■	■	■	■	■
Phone Call			■	■	■	■	■				■	■	■	■	■
Message (e.g., Seesaw, Google Classroom, ClassDojo)	■	■	■	■	■	■	■								■
Announcement (e.g., Seesaw)		■		■											

Important learning outcomes. In their interviews, the teachers were asked to explain important learning outcomes for their students. The teachers indicated that they followed academic standards of their states for specific grades although private-school teachers pointed out that they tend to progress faster than the public schools. To address these learning outcomes, the teachers used various instructional materials during online learning including online videos, teacher-created videos, manipulatives, worksheets, physical puppets (during video meetings), various websites, textbooks, online quizzes, articles, virtual field trips, scavenger-hunt activities,

resources readily available at home (e.g., pennies), modeling clay activities, presentations, online games, songs, books, forms to collect data, whiteboards, etc.

In their interviews, the teachers also discussed the specific subjects that they found the most challenging to teach at distance. Nine out of 15 teachers indicated math as the most challenging subject because of the following: (1) not being aware of how the students solved the questions and how much help they got from their parents; (2) lack of 1:1 guided practice during video meetings; (3) difficulty in providing hands-on learning at distance; (4) lack of resources at home; (5) lack of teacher modeling for abstract concepts; and (6) not being able to assess the students in real-time and provide feedback. As noted in the quote below, Teacher 5 elaborated on these challenges.

... [Math is] the hardest to teach in distance learning. ... [T]he problem is the content and being able to assess in real time what that kid understands in math. ... [A]t this level, everything math wise, for the most part, is kinesthetic, it's all hands on, it's build this, [it] is take your tens and ones sticks out, ... it's all that kind of stuff. (Teacher 5, 2020)

See Figure 5 for the other challenging subjects (e.g., reading, writing, science, and robotics) as pointed out by the teachers along with their rationale for why they found it challenging.

Figure 5

The Most Difficult Subjects to Teach Online Along with Teachers' Reasoning

Subjects	Teachers														
	Public							Private							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Math															
Reading															
Writing															
Science															
Robotics															
Math															
<ul style="list-style-type: none"> - Not being aware of how the students solved the questions and how much help they got from their parents - Lack of 1:1 guided practice during video meeting because of time - Difficult to provide hands-on learning at distance (especially for students with special learning needs) - Lack of resources at home (e.g., manipulatives; even virtual manipulatives) - Lack of teacher modeling for abstract concepts (e.g., using manipulatives) - Not being able to assess the students in real-time and provide feedback 															
Reading															
<ul style="list-style-type: none"> - Not being able to assess students in real-time and provide feedback (e.g., not being able to see where they are moving their fingers while reading; sometimes it is unclear if kids sound right without seeing their video with lip movements) - Not being able to show/demonstrate/model the concepts to the students - Lack of resources at home (e.g., books) - Lack of small reading groups 															
Writing															
<ul style="list-style-type: none"> - Lack of observation by the teacher while students are writing (e.g., are they holding pencils right?) - Not being able to show/demonstrate/model the concepts to the student - Not being able to provide socio-emotional real-time feedback to the students 															
Science															
<ul style="list-style-type: none"> - Lack of resources at home (science supplies) 															
Robotics															
<ul style="list-style-type: none"> - Lack of resources at home (physical robots) 															

Monitoring student emotions, behaviors, and performance during online learning.

When asked what student states the teachers would need to monitor when teaching at distance, 11 out of 15 teachers indicated emotional engagement (e.g., whether a student is confused, frustrated, happy, sad, nervous, shy, etc.). For instance, as Teacher 11 mentioned,

[W]hen I’m in the Zoom® call with them [as a whole class], I would always look in for their body language, for ... their face, facial expressions to see whether they were confused or happy, or sad, or, ... sleepy ... And when we did one-on-one [on Zoom®], it was very easy for me to, ... know whether they were confused or not, ... because I could see their face and, or they would tell me. (Teacher 11, 2020)

As the above quote signals, assessing student emotional states is critical to online course success. In addition to emotional engagement, 9 out of 15 teachers wanted to understand the level of parent involvement in student performance (e.g., whether a student is completing their assignments on their own or if parents are doing on their behalf). Similarly, 7 out of 15 teachers indicated behavioral engagement (whether a student is on-task or off-task) as another critical state that they would like to track when teaching at distance.

Additionally, the teachers also noted several other student states in their interviews as important to track during online learning. Such states included: (1) performance (i.e., comprehension, understanding instructions/materials, holding pencil/crayon correctly, being able to complete tasks, using instruments correctly, fluency in reading, and how many correct/wrong answers they provide), (2) real-time meeting participation (i.e., asking questions or speaking out during the meetings), (3) social engagement (i.e., level of collaboration/conflicts, bullying, relationships, playing together, etc.), (4) tiredness, and (5) explaining their problem-solving. See Figure 6 for more details on student states when learning online.

Figure 6
Important Student States to Monitor for the Teachers During Online Learning

Important Student States	Teachers														
	Public							Private							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Emotional Engagement	■		■	■	■	■	■	■	■	■	■	■	■	■	■
Parent Involvement in Performance			■	■	■	■	■	■	■	■	■	■	■	■	■
Behavioral Engagement			■	■	■	■	■	■	■	■	■	■	■	■	■
Performance		■				■	■	■	■			■	■	■	■
Real-Time Meeting Participation				■	■	■	■					■	■	■	■
Social Engagement			■	■	■							■	■	■	■
Tiredness				■	■						■				
Explaining Problem Solving					■										

In their interviews, the teachers also indicated that if they were provided with these states in the form of learning analytics (e.g., amount of time that a child is confused/off-task/bored or times that a parent solve a problem on behalf of a child, etc.), they would leverage these analytics to implement the following interventions with their students: (1) scaffolding (e.g., guiding students to learn); (2) understanding root causes of student states to further support students; (3) adjusting

the difficulty level of content based on performance and engagement; and (4) verbal interventions (e.g., calling out specific students and asking questions).

Group work. In their interviews, all 15 teachers indicated group work as a critical component of learning activities in their classrooms. However, after the pandemic began, none of the teachers were able to implement group work. As one teacher expressed,

I know as the kids get older, the opportunity to work in groups is even more [possible], because they're more tech-savvy. So, right now, it's hard for a kindergartener to get on, and like search for another student in their class, and try to do something [online].
(Teacher 12, 2020)

Of course, there were caveats and options related to group work. For example, five of the teachers (Teacher 4, 6, 9, 12, and 15) indicated that they used breakout rooms to have small group instructional time (e.g., reading based on ability level), while Teacher 13 indicated that if the students wanted, they could do collaboration, but it was student-driven. Therefore, there was no curriculum-driven group work occurring after the start of the COVID-19 pandemic. Despite this lack of curriculum materials emphasizing group activities, as noted above, all teachers indicated that group work was a high priority for early childhood education; however, they were typically unable to effectively foster it remotely. See Figure 7 for the benefits of group work the teachers pointed out as well as the reasoning for why they could not implement it remotely.

Figure 7
Group Work During Online Learning

Subjects	Teachers														
	Public								Private						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Group Work [Before Pandemic]															
Group Work [After Pandemic]															
Breakout Rooms															
Student-Driven Collaboration															
Benefits of Group Work															
<ul style="list-style-type: none"> - Learning from each other - Learning to work with each other - Learning to take turns - Learning to share toys/materials/manipulatives - Getting peer feedback/tutoring 															
Why Not Group Work?															
<ul style="list-style-type: none"> - Kids do not usually have a dedicated PC – they use their parents' PCs. - Kids at this age are not independent learners yet, they need adult support. - Kids have lack of resources at home (e.g., robotics, manipulatives, Internet speed, etc.). - Kids at this age cannot navigate with the technologies to collaborate on their own, they need adult support. - Scheduling smaller groups to work together is difficult. 															

Technology use. In their interviews, the teachers discussed about the major technologies they were using during online learning. Zoom®, YouTube®, and Seesaw® were the top three technologies reported by the teachers. With an emphasis on the lack of training on these new tools during online learning, Teacher 11 explained:

I don't feel ... tech-savvy ... This was very ... difficult for me since I had to learn different platforms and I also didn't wanna overwhelm, not only myself but parents who may not know different platforms. So I kind of stuck with the same things, I did Zoom, I did Google Drive ... (Teacher 11, 2020)

The teachers also reported various other technologies they were using which included Learning Management Systems, video-meeting apps, communication apps, game-based learning activities, screen-recording apps, etc. The teachers indicated that they liked these technologies when they are easy to use, involve interactive content (fun and engaging), and provide real-time feedback to students. They also indicated the following points as issues when they were using various technologies: (1) managing multiple tools for different tasks; (2) online access requirement being a barrier for students lacking internet connection; (3) privacy issues reported over some of these apps; (4) difficulty in using these apps; (5) needing to buy a paid version of the apps for using full features; (6) managing the sign-up process—making sure kids do not forget their passwords; and (7) a lack of collaboration features in these tools.

Teachers' Challenges with Online Learning (RQ2)

Many of those we interviewed assumed the role of online instructor despite their marked preference for in person instruction. Such a longing for physical classroom spaces is seen in the following quote.

... I feel like we did the best we could, 'cause we didn't have a choice ... because it was mandated. But as far as, in a normal year, would I choose online education versus school, it's a 1 [out of 10], because they don't get the interaction with me, or their friends, or manipulatives, or anything. (Teacher 9, 2020)

Teacher ratings of online learning environments, however, were quite varied. In their interviews, the teachers were asked to rate their current experience with online learning on a scale of 1 to 10 (1 = very bad experience... 10 = very good experience) and explain their reasoning for this rating. As Table 2 illustrates, one of the teachers rated their experience with online learning as a “one” out of ten or a really terrible experience, whereas two of the teachers rated it as high as a “ten.” Interestingly, the average public school teacher rating was around 6.7 out of 10, whereas for private schools it was around 5.5. Figure 8 summarizes the challenges described in the teachers' rationales for their ratings.

Table 2
Teachers' Ratings of Online Learning Experience Along with Their Rationale

Teachers (Public)	Rating	Rationale for the Rating
1	5/10	- Lack of student engagement - Lack of teacher knowledge of home context (what is happening at home—e.g., who is doing the work, how much do parents contribute to student work, etc.)
2	7/10	- Difficulty in managing professional (teaching) and personal (parenting own kids) tasks at the same time - Too much screen time - Lack of hands-on experience (e.g., use of manipulatives)
3	5/10	- Lack of student engagement
4	8/10	- Lack of hands-on experience - Lack of physical interaction between teachers and students - Lack of parent support - More personal time for teachers
5	5/10	- Lack of physical interaction between teachers and students - Lack of classroom community and socio-emotional learning - Parents being stressed out - More opportunities for professional development (e.g., tech skills improvement)
6	10/10	- High parent engagement because of established strong relationship with parents - More opportunities for digital social engagement between kids (e.g., lunch together, movie together, virtual field trips, etc.) - More opportunities for differentiated instruction - More 1:1 time with individual students
7	7/10	- N/A
Teachers (Private)	Rating	Rationale for the Rating
8	7/10	- Lack of physical interaction between teachers and students
9	1/10	- Lack of physical interaction between teachers and students - Lack of hands-on experience (e.g., manipulatives)
10	6/10	- Unpredictable behaviors of younger kids during live meetings (e.g., crying, screaming, etc.) - Parents' conversations with kids out of school context during live meetings (e.g., I will take a shower)
11	3/10	- Too much screen time - Lack of hands-on experience - More 1:1 time with individual students
12	10/10	- N/A
13	8/10	- Online learning working for introvert teachers - Prior experience with online learning
14	3/10	- Too much workload on teachers - Kids' emotional challenges
15	6/10	- Hard to teach new skills through online learning - Online learning being hard for young kids - and even harder for kids with special needs - Parents' being stressed out - Lack of student engagement

In addition to the synthesized challenges that we gathered from the teacher ratings of online learning experiences, at the end of the interview, we specifically asked the teachers to summarize their major challenges with online learning. Figure 9 outlines these challenges for students, teachers, and parents as reported by the teachers. The top three challenges reported by these teachers for students were: (1) low engagement, (2) lack of socialization/interaction, and (3) lack of hands-on activities/exploration/play. For instance, one teacher stated,

... [T]he biggest challenge is student engagement. ... [A] lot of students are just not doing anything ... [and] I don't know what the reason is: ... if it's issues that they're having with the work, they're not coming to see me when I have my open hours, they're not communicating with me. ... [W]hen I do try to communicate with them, ... I'm not getting responses ... (Teacher 1, 2020)

Frustration seems imminent felt in the above quote where students were not communicating their problems and challenges with the teacher during online office hours and yet are not making any course progress.

Figure 8

Summary of Rationales for Teacher Ratings of Perceptions With Online Learning

Students

- Lack of student engagement
- Too much screen-time
- Lack of hands-on experience (e.g., use of manipulatives)
- Lack of classroom community and social-emotional learning
- Unpredictable behaviors of younger kids during live meetings
- Kids' emotional challenges
- Lack of physical interactions between students and teachers
- Online learning being hard for young kids

Teachers

- Lack of teachers' knowledge of home context
- Difficulty in managing personal and professional life
- Too much workload on teachers
- Hard to teach new skills in online learning

Parents

- Lack of parent support
- Parents' being stressed out
- Parents conversations with kids out of school context during live meetings

In contrast to the above student challenges, the top three challenges they reported challenges for teachers like themselves were: (1) monitoring progress/behaviors/emotions, (2) lack of experience/support in online learning, and (3) personal and professional life balance. Finally, the challenges that these teachers mentioned that related to parents included: (1) lack of engagement/support, (2) lack of technology/use, and (3) following up with the schedule of activities.

Figure 9
Teachers’ Major Challenges with Online Learning

Major Challenges	Teachers														
	Public								Private						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Students															
Low engagement	■		■	■			■				■	■			
Lacking socialization/interaction					■	■			■						■
Lack of hands-on activities/play/exploration											■			■	■
Inequality of resources at home		■	■							■					
Following up with the schedule of activities								■							
Lacking classroom discipline									■						
Amount of screen time			■												
Teachers															
Monitoring progress/behaviors/emotions									■	■			■	■	
Lack of experience/support in online learning			■					■							
Personal and professional life balance		■													■
Coordinating schedule with parents/students				■											
Assessment													■		
Parents															
Lack of engagement/support				■			■								■
Lack of technology knowledge/use				■						■					
Following up with the schedule of activities								■							

Teachers’ Suggestions for Online Learning (RQ3)

Online environments forced teachers to contemplate how to make learning engaging and interactive. Teacher 7, for instance, had a vision what online learning for her students would be like if it was more gamified.

I ... wish that I could create ... a videogame where I am a character. And I give them [students] explicit instructions on what they need to learn for the day, and their goal, and it’s like little games where they are learning, but they’re learning through play, because they have to be engaged and motivated to make online learning work, and if they’re not engaged, they just turn the thing off. (Teacher 7, 2020)

Such expressions indicate that, despite being overwhelmed with the demands of online teaching and learning, teachers were reflecting on how to be more innovative in their pedagogy and relate better to these young children, even in the early days of the pandemic.

To expand on these innovative ideas, at the end of the interview, we introduced a hypothetical scenario to the teachers and asked them to imagine that they had a magic wand which could create a new technology for them to address some of the major challenges that they discussed during the interview. We specifically asked them to describe features and functions of such a technology to help them as a teacher and support their students’ learning. In Table 3, we paraphrased their quotes to succinctly summarize the major points they made to describe the technologies that they deemed useful.

Table 3

Teachers' Wish-list of Technologies to Address Online Learning Challenges

Interview Excerpt (*paraphrased to succinctly summarize the major points*)

For Teachers (Public Schools)

Teacher 1: I wish I had a virtual classroom where me and my students could work together, and I could help in real-time whenever needed. In this virtual classroom, I can create objects (virtual/physical) (e.g., robotics) and these objects can be manipulated by multiple students at the same time.

Teacher 2: I wish there was easy-to-use technology which could serve multiple functions. I also wish that during our live meetings, we could use a technology like smartboard in the classroom for real-time teaching.

Teacher 3: I wish I had a technology which could support online video conferencing with no internet connection issues. I could get inputs from my students in real-time to customize meeting content. I also wish that the students could have more interactive content: They could manipulate physical objects and share their work through a white board. I wish the technology could also enable language translation in real time to support teacher communication using home-language.

Teacher 4: I wish I had a technology which would provide more interactive content: Me and my students could move physical objects around – we could manipulate them together – and we could see who would be manipulating and how (physical to digital). I also wish I could change the camera angle to see other things in the space (e.g., when kids are reading a book, following their finger).

Teacher 5: I do not think there is any way that technology can replace face-to-face interactions because I want my students to do hands-on activities, use manipulatives, hold real books.

Teacher 6: I wish I could have more live lessons with active participation from my students. I also wish my students could have more technology-based hands-on activities and tangibles.

Teacher 7: I wish I had a technology which would enable role-playing video game incorporating academics where I, as a teacher, would be one of the characters providing goals for the day and my students would play little games where they would learn through play. The teacher could be the wizard to give instructions and demonstrate how to do things.

For Teachers (Private Schools)

Teacher 8: I wish I had a technology which could support easy video conferencing with minimum parents' technical support (e.g., for joining a meeting). It enables students to reach their teachers easily if they have any questions. I could change the view of the camera to see their work in details or their faces. I also wish my students would have more interactive content with manipulatives enabling my real-time monitoring and feedback.

Teacher 9: I wish I had a technology which could enable easy online video conferencing with minimum technical support from parents – almost like a simple click for the students to start the meeting. I also wish I could do small group work through breakout rooms but with insights for me to get involved if necessary.

Teacher 10: I wish I could have a technology that would enable my students to provide real-time feedback to their peers or me during meeting conversations: For instance, emojis or thumbs-up to indicate things like "Good job" etc. for positive reinforcement. I also wish that we could have more interactive content.

Teacher 11: I wish I could have an easy-to-use technology that would enable my students to play together. I also wish that this technology could support kids to have side conversations and meet independently to work together without a teacher. I wish my students could have more interactive, colorful, and engaging content.

Teacher 12: I wish I had a technology to support minimizing privacy issues (e.g., student names when creating different account) and it would enable them to work on activities nurturing social skills.

Teacher 13: I wish I had a technology that would give insights about students' hands-on performance during synchronous meeting: I would ask 'show me 2 tens and 3 ones', I would observe them doing, and the technology would detect whether my students doing right/wrong and report back to me.

Teacher 14: I wish I had a technology that would enable my students to easily navigate to their meetings; play together with manipulatives (virtual/physical), get different roles like dramatic play to nurture their soft skills (e.g., use of puppets), play interactive games. I wish I could still monitor them.

Teacher 15: I wish there was a store where I could click and download pre-made lessons with learning objectives. I also wish that there was a technology which would enable me to speak to the other teachers and learn from them.

To synthesize the information provided in Table 3, the teachers' technology wish-list primarily focused on technologies that are (1) easy to use, (2) include interactive, engaging, and customizable content through play-based learning activities, (3) provide real-time analytics (e.g., performance analytics, emotional states, non-verbal interactions (e.g., thumbs-up), etc.) to teachers for monitoring student progress and providing feedback accordingly, and (4) involve physical manipulatives during learning activities. Moreover, the teachers requested technologies which (5) provide advance communication and collaboration tools (e.g., side channel conversations among students), (6) enable teachers to control physical spaces of students (e.g., changing camera angles to see how a student manipulates a physical object on his desk), (7) require minimal technical support from parents, and (8) address security and privacy issues.

Discussion

The COVID-19 pandemic and its impact on the massive closure of schools make research on K-12 online learning much needed. The interviewees in the study were among the myriad of impacted teachers who had not been able to meet their students face-to-face since the outbreak of the pandemic. What is reassuring is that these early childhood teachers did not sit still, patiently waiting for the re-opening of the schools. On the contrary, based on the interviews, all 15 teachers who participated in the study took assorted initiatives to support their students' learning and development remotely. Insights from the 15 teachers in this study shed light on several pedagogical implications for early childhood educators transitioning their conventional face-to-face instruction to online settings. Such implications are based on the know-how gained from the teachers' experiences with online learning, the challenges that they faced since the outbreak of the pandemic, and the suggestions they provided to address these challenges through technologies, resources, and support structures they wished to have both now and in the future during online learning. The remainder of this section will discuss the results with the relevant implications for research and practice.

Teachers' Experiences: Many Changes Occurred, But Learning Objectives Remained

The interview results show that the teachers had experienced several changes after the pandemic disturbed their typical school day. First, they found out that in online settings they could not operate the same organized and scheduled routine with their students as they had employed for onsite learning. Although almost all teachers were caught unprepared for this change, they demonstrated concerted and carefully planned efforts to help their students continue learning remotely. These efforts included creating learning packages with instructional materials for the students to use at home; holding online meetings for maintaining social interactions and tutoring in real-time; creating assignments for enabling students to continue learning and practicing new skills; and constantly communicating with parents to support their children at home. Naturally, there were myriad other tasks and activities that these teachers engaged in to help their students find success online; it was a continually evolving process. This finding is consistent with the recent study by Rodriguez et al. (2021), as they reported 75 rural teachers in Mexico remained resilient and creative to provide the best possible learning environment for their students during the pandemic.

Despite the transition to online settings and many other changes along with it, both public- and private-school teachers attempted to follow the academic standards of their states during online learning. The study found a variety of instructional approaches that were applied in

online learning settings, covering both the methods and materials appearing in conventional face-to-face classrooms and the tools and content that are more commonly observed in online learning (see Hanover Research (2015) for an extensive list of principles for effective online course design at the K-12 level). The diversity of the instructional activities and content indicates that the teachers made extensive efforts and attempts toward effective and engaging online practices, and, accordingly, intended for optimal learning results. Additionally, their pedagogical practices imply that the teachers were aiming for developmentally appropriate and inclusive (Darby, 2020) learning activities when designing and implementing their virtual classes. Such efforts are consistent with U.S. Department of Education's (2016) recommendations for developmentally appropriate technology use and aligns well with the legions of educational resources that have emerged during the COVID-19 pandemic (e.g., Educating All Learners, 2020).

Although both private and public schools shared many commonalities in various mandates to transition their classes to online settings, the results imply some differences in terms of how they handled this transition. There seems to be slight differences in terms of resources, instructional methods, and technologies that the private and public teachers chose to use, their priorities for online learning, and their expectations for parent involvement. The most salient difference found in the present study, however, relates to 1:1 coaching sessions with the students. When examining the data, we found that seven of the eight private school teachers applied 1:1 video conferences with their students to understand their difficulties in carrying out online learning tasks and their overall emotional well-being, whereas none of the public school teachers reported implementing such personalized coaching sessions. We believe that one potential reason could relate to the class sizes given that the average number of students for the public school teachers in this study was roughly 20 students per class, whereas for the private school teachers, it was about 14 students. Other potential reasons for this intriguing difference in the use of video conferencing for learner coaching could include prior training, expectations, incentives, and collegial support. Clearly, this finding and potential implications merits follow-up investigations in larger-scale and more focused studies.

Teachers Challenges: To Keep the Same Teaching Principles and To Commit More

Although the student learning had been moved online, the teachers still wanted to be able to practice the same teaching principles that they used to employ in “normal” school days for high-quality education. First, they intended to provide personalized guidance and hands-on learning experience to enhance students’ comprehension, but they discovered that it was highly challenging to do so in an online format, particularly when teaching certain subjects such as math. Second, the teachers pointed out that close-up observations, real-time feedback, and modeling and demonstrations were critical pedagogical strategies for math, reading, and writing, and the teachers felt that online environments made it difficult to conduct such instructional activities.

Third, the teachers recognized the benefits of group work as an effective way to encourage peer learning, collaboration, and sharing. This study revealed that the teachers were not able to implement curriculum-driven group work after the pandemic. A major reason behind this was that the teachers perceived that their young students lacked sufficient resources, tools, technological skills, and independent learning abilities to carry out virtual group work. The challenges to carry out close-up observations and group work in online learning settings were

also identified in previous research (Kim et al., 2014; Miller, 2021). Miller suggested that teachers need to find other ways to maintain constant and meaningful communication with their students. Fourth, the teachers reported that the students did not have the supplies and tools for the experiments and hands-on activities at home, which were critical for science and robotics classes. Therefore, the findings indicate that, despite various technological tools and resources, online learning, at least at present with the current conditions, could not substitute for face-to-face learning in many key aspects.

Not only did these teachers face obstacles to keep conducting what they had done in onsite learning settings, they were also challenged to commit more time and energy to support their students at distance. To address this challenge, the teachers expected more parent involvement and facilitation where and when it was applicable. The interview results suggested that parent facilitation helped to engage young learners in virtual learning. The teachers' reflections also indicated that parent involvement became salient when the students encountered a technical problem at their end (e.g., logging into an online meeting) or when they needed an adult to monitor their learning process and set rules for their use of technologies (e.g., helping with scheduling a stay-at-home learning day). It must be pointed out, however, as the related literature shows, the lack of communication between parents and teachers has been an issue even in conventional face-to-face settings (Aubrey & Dahl, 2014).

In comparison, the findings of the current study indicate that teacher-parent communication became even more critical for online learning environments as the early childhood teachers could only rely on the parents to provide corresponding support and assistance when they delivered learning materials in real-time or offline. In effect, the teachers needed close collaborations with the parents to achieve anticipated learning outcomes. Toward this end, the results showed that teachers had applied various methods to communicate with the parents (e.g., e-mails, video meeting, texts, phone calls, etc.). Unfortunately, based on their ratings, most the teachers were not satisfied with parent engagement in their children's online learning activities. In other words, there was still room for "... building stronger relationships with parents and enhancing their engagement" (NAEYC and FRC, 2012, p. 7). More importantly, while attempting to obtain increased support from their students' parents, the teachers were expected to devote more time to their own families as well. For those teachers who were also parents, they had to switch roles between life as a teacher and life as a family member supporting their own kids. As a result, balancing their personal and professional lives was another challenge that they needed to deal with when teaching from home.

As indicated earlier, most of the interviewed teachers were caught unprepared for the transition. These teachers found themselves in need of professional training and support for online learning. Going through the transition to online teaching and learning due to the pandemic is likely to encourage more teachers to enroll in courses or programs with a focus on online learning pedagogy in the next few years and beyond. Such training demands extra effort and time for teachers who intend to design and implement successful online learning activities.

Teachers' Suggestions: Access to Advanced Technologies and Concerted Efforts of All Stakeholders

Some of the challenges we discussed in the previous section could be solved as teachers, students, and parents become more familiar with online learning settings and current technologies to support those settings. Of course, some of such challenges might be addressed with continued advancements in learning technologies. Towards this end, in their interviews, the teachers expressed their wish-list for advanced technologies which could support some of these challenges by providing enhanced interactive, engaging, and customizable content; play-based learning activities involving physical manipulatives; real-time learning analytics improving the teachers' understanding of the student context; advanced communication and collaboration tools with minimal technical support from parents; and enhanced security and privacy features.

At the same time, some of the challenges have existed long before the onset of the pandemic, and, therefore, require long-term efforts from all associated stakeholders to alleviate. A key challenge is a lack of resources at home including student access to Internet or other resources for accomplishing learning activities at distance (i.e., digital divide). Additional challenges include a need for training and professional development for teachers and parents and finding balance between their personal and professional lives given the heavy workload that comes with teaching online from home.

Limitations and Future Directions

Like all studies, ours has limitations. First, we were able to interview 15 teachers across the United States. Although we attempted to diversify our participants by involving teachers from diverse grade levels, locations, types of schools (public vs. private), and years of teaching experiences, it is important to acknowledge that the results represent the experiences of the 15 teachers involved in this study and are not grounded within a large-scale data set. Nevertheless, we believe that the results of this study provide the basic foundations for future research with larger samples of teachers. Additionally, the results discussed in this study only represent the perspectives of the teachers as key stakeholders. As a future direction, it is important to understand and evaluate these results from the perspectives of other stakeholders including policymakers, school administrators, students, and parents.

Conclusion

More has been likely written and debated about online learning in terms of resources, pedagogical methods, and associated technologies, than the combined history of online learning prior to 2020 (Bonk, 2020). Despite the soaring rise of research in online learning, studies devoted to issues and challenges within early childhood education remain quite rare. This study was one small-scale investigation designed to address this research gap by interviewing 15 early childhood teachers across the United States on their instructional experiences during the early stages of the pandemic, perceived challenges with implementing online learning, and their suggestions for addressing the corresponding challenges.

The study sheds light on the teachers' efforts to implement developmentally appropriate learning activities for their students even though they had to rapidly transition to online instructional environments. Despite substantial advances in instructional technologies related to learning online, no technology can assure learning. More important are the pedagogical skills of early childhood teachers and their refinements and adjustments from various experimentations

and initiatives. This study offers some insights into these pedagogical activities. Follow-up studies might build on the present findings by looking at these challenges in online learning for early childhood and instructional practices from a cross-cultural and longitudinal perspective. Increasing insights can be used for pre-service and in-service teacher professional development and training.

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 a privacy plan and a consent form were created and approved by the Privacy and Legal Team at Intel Corporation for conducting this research with human subjects.

The authors declared that they received no financial support for the research, authorship, and/or publication of this article.

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Appendix A

Interview Protocol

Teaching Background

1. Can you briefly talk about your overall teaching experience (e.g., subject area, number of years, grade levels, etc.)?
2. What is the age of your current students? How many students do you have in your class?
3. Can you describe your typical day at school before you started working remotely due to the pandemic?
4. Can you describe your typical day at home as a teacher after you started working remotely?

Experiences about Online Learning

5. On a scale 1–10 (1 referring to very bad experience, and 10 referring to very good experience), how would you rate your experience with online learning? Why?
6. Do you/your school use a specific Learning Management System (e.g., Google Classroom, Moodle, etc.)?
7. What are your major goals for online learning and in what priority (e.g., social connection, engagement, learning new content, maintaining knowledge, play, etc.)?
8. What types of support are you expecting from parents for their child's learning? When answering this question, please consider: What is working well? What is not working so well? What do you wish to happen?—in terms of parent involvement.
9. How do you communicate with the parents?
10. What percentage of parents/students are engaged in online learning activities?
11. What learning outcomes are critical for your age group to teach?
 - a. What kind of activities/content do you use to teach these outcomes at distance?
 - b. What learning outcomes are the most challenging to teach at distance?
12. When you are in a face-to-face classroom, as a teacher, you are able to observe in real-time your students' cognitive, social, emotional, and behavioral states and if necessary, intervene accordingly. Imagine that somehow you can still be present at their homes and watching what they are doing.
 - c. What are the things you would observe and make sure they are doing those? Let's answer this question for two different scenarios: When students are learning synchronously (you are teaching them at distance in real-time) versus asynchronously (they are learning on their own).

Group Learning in Online Learning Setup

13. Before the pandemic, were you having your students get in groups and work together?
14. Do your students continue to work in groups for learning tasks despite of being remote?
15. What efficacies/barriers does online learning create for group learning?
16. Imagine that you want to setup real-time breakout rooms where pairs of students work together and you are on the side, watching a dashboard showing some analytics about what is happening in these rooms. What would be the things you would like that dashboard to show for each group so that you can go and support specific groups when necessary?

Technology Use for Online Teaching/Student Learning

17. What specific technologies are you using for teaching and student learning when working remotely?
18. What do you like/dislike about those technologies and what other technologies do you wish to have to support you when working remotely?

Challenges for Online Teaching/Student Learning

19. What are the major challenges you are experiencing when working remotely for teaching and student learning?

Suggestions for Improvement of Teaching/Student Learning Experience

20. Imagine that you have a magic wand which can create a technology for you to address all of these challenges and do whatever you want when working remotely to help your students learn. Can you describe what features and functions such a technology would have?
21. What kind of content would you like to create for your students with that technology?
22. Do you have any other comments to add before we finish the interview?

Facilitating *Cognitive Presence* Online: Perception and Design

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Abstract

In this paper, we focus on perceived cognitive presence (CP) in three sections of an intermediate level English for Academic Purposes (EAP) course facilitated online. The researchers intend to demonstrate how lesson design, scaffolding, and a blend of synchronous and asynchronous delivery create perceived CP. Data was collected from the CoI survey (Arbaugh et al., 2008), administered to both student and instructor participants, as well as an analysis of the lesson plans. Focusing on the survey questions related to the four phases of CP, researchers assigned numerical values to responses reported by participants (cf. Arbaugh et al., 2008). Student participants consistently reported *lower* levels of CP than teachers in the *triggering event* and *exploration* phases. Student participants in two of the three sections also reported *lower* levels of the *integration* and *resolution* phases than the teacher, but students in the third section reported *higher* levels. Moreover, student-reported experiences of CP in all four phases, except the exploration phase, increased with each iteration of the lesson plan. In addition, we analyze the weekly lesson plans in relation to the four phases of CP. Results demonstrate the relationship between lesson plans and perceived CP and will help to inform best practices in online learning contexts.

Keywords: Community of Inquiry (CoI), CoI survey, English for Academic Purposes (EAP), lesson plans, online learning

McCarroll, J. M. & Hartwick, P. (2022). Facilitating *cognitive presence* online: Perception and design. *Online Learning*, 26(2), 78-101.

The COVID-19 pandemic pushed many into unfamiliar teaching and learning contexts in which classroom delivery of content and interactive learning scenarios suddenly moved online. This unexpected shift was disruptive in that teachers had little time, and perhaps little knowledge or experience, to shift their familiar physical classroom-based practice to a purely online delivery. Students too were suddenly interacting through headsets and video conferencing tools which lacked the three-dimensional affordances of a physical classroom that allowed for spontaneous opportunities to interact through voice, movement, or gestures.

Forced into this context with little time to consider best practices for online design and delivery, teachers persevered, but they suddenly needed to consider the affordances of digital tools and online contexts in the design and delivery of content and class time. As a result, a critical question emerged: How can educators best engage students online to facilitate cognitive presence?

A challenge for many teachers, particularly in language learning contexts, was to create and maintain a sense of community where students not only felt at ease but were also motivated to interact and contribute as they engaged with course content through language and experience. This sense of community and view of language learning assumes a social lens in which the learner is part of a community that purposefully interacts to exchange ideas and complete tasks (cf. Lave, 1996; van Lier, 2000; Vygotsky, 2012). As practitioners, we understand that language develops when the context presents conditions that are social, dynamic, engaging, and flexible (cf. Chaiklin & Lave, 1996; Lave, 1996; van Lier, 2000); consequently, effective learning opportunities emerge through purposefully designed tasks that consider the affordances of online spaces and digital tools (Hartwick, 2018; Hartwick & Fox, in press). Similarly, as researchers, we believe that language develops through practice and interaction, which are necessary conditions of language development (cf. Vygotsky, 2012). Further, language development is not solely about the attainment of discrete skills, like vocabulary acquisition, but includes skills like collaboration, problem solving, and critical thinking (Dede, 2010). These beliefs very much shape our teaching practices and have motivated this study.

This study was designed in response to the new challenges for creating strong learning communities in digitally mediated spaces brought about by the COVID-19 pandemic and the resulting transfer of teaching in the fall 2020 to strictly online contexts. The researchers reflected on their teaching practice in relation to the *Community of Inquiry* (CoI) framework (Garrison et al., 2000), focusing on *cognitive presence* (CP). Moving away from text-based analysis used in earlier studies (cf., Garrison et al., 2000; Oriogun et al., 2005; Vaughan & Garrison, 2005), we looked at the types and timing of technologically mediated tasks in relation to the four phases of CP: *triggering event*, *exploration*, *integration*, and *resolution*. Thus, participant texts were not analyzed for evidence of CP as described in earlier studies (Garrison et al., 2000). Instead, we analyzed our lesson plans in relation to the four phases of CP.

This became important as many teachers did not have the time to reconsider their practice according to pedagogically sound practices intended to guide the delivery and design of online teaching, nor did they have time to consider the affordances of the space and tools, often new to the teacher, as important mediators of successful social interactions online (cf. Lantolf & Thorne, 2007). We chose the CoI framework as an analytical tool. We wanted to understand how the

designed tasks impacted student perception of CP with respect to the four phases. Importantly, teachers in this study did not design their lesson plans with the CoI framework in mind.

At time of writing, a Google Scholar search showed that Garrison et al.'s (2000) seminal paper on the CoI framework had over 7,000 citations. Yet, Garrison (2017) reports that few research papers focus on CP as compared to social and teaching presence. Citing Noteboom and Claywell (2010), Choo et al. (2020) argue that CP in an online environment might be the most difficult element in terms of measuring and facilitating. Further, studies to date (Garrison et al., 2000; Oriogun et al., 2005; Vaughan & Garrison, 2005) largely assess the CoI by coding the asynchronous written texts. To date, we are unaware of any studies that consider topic material in relation to the four phases of CP. This study looks for evidence of these elements and planned opportunities for thinking, listening, and expression through an analysis of lesson plans. The teacher-researchers in this study evaluated the teaching materials and workflow of their three sections to establish how teaching presence may have emerged to facilitate CP.

This study seeks to answer the following question: How does weekly task design and the facilitation of lesson plans, either synchronously or asynchronously, impact student and teacher perception of CP based on the four phases: triggering event, exploration, integration, and resolution?

We begin with an overview of literature related to the CoI framework, an explanation of our methodology, a description of the study context and analysis, followed by results and discussion. We reflect on the study's limitations as well as implications for best practices and possibilities for future research.

Literature Review

As noted, our research is primarily motivated and best understood through a social theoretical lens wherein language develops best when learners interact as part of a social group who share experiences and collaborate.

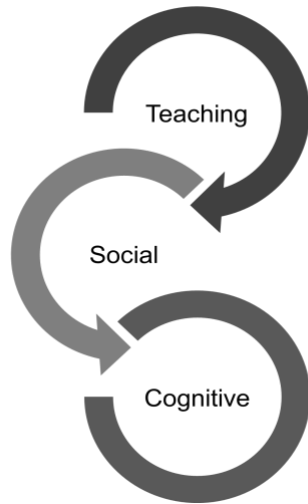
Community of Inquiry Framework

The CoI framework (Garrison et al., 2000) asserts that deep and meaningful educational experiences occur when a community of learners, who assume both the role of teacher and learner, are successfully engaged in learning activities (Garrison, 2017). The framework is based on a collaborative constructivist perspective, reflecting the view that "collaboration and constructivism respectively correspond to the teaching and learning responsibilities of an educational experience" (Garrison, 2017, p. 9). Citing John Dewey, Garrison explains that "through purposeful collaboration, ideas are communicated, and knowledge is constructed and confirmed" (p. 10). The achievement of this educational experience occurs when the three mutually reinforcing dimensions of the CoI framework (teaching, social, and cognitive presence) converge (Vaughan, et al., 2013).

Teaching presence is a necessary, unifying presence responsible for the design, facilitation, and direction of the social and cognitive presences (Anderson, et al., 1999; Garrison, 2017; Vaughan et al., 2013). Importantly, both teachers and learners assume the responsibility of teaching presence in a community of learners, with the overarching goal being for learners to gradually assume more of the teaching presence role as they develop the ability to construct and

reflect on meaning (Garrison, 2017). Based on our interpretation of the framework and for the purpose of analysis, we see teaching presence as a first step in the creation of meaningful learning opportunities (Figure 1). The design of the learning context helps to create a comfortable environment where learners engage with ease to facilitate collaboration, critical thinking, and achievement of outcomes. This design process is iterative, flexible, and constantly moving.

Figure 1
Presences in Motion



Note. Researchers' interpretation of interconnectedness of three CoI presences.

Social presence refers to learning environments characterized by “trust, open communication, and group cohesion” (Vaughan et al., 2013, p. 11). It is the students' perception of comfort and ease as they interact within a community of learners (Anderson et al., 1999). Social presence in digitally mediated contexts lacks the social and non-verbal cues typical of face-to-face interactions but may afford greater opportunity for students to “speak-up” and participate anonymously (Anderson et al., 1999). Establishing social presence online, particularly when written rather than spoken communication is relied on, can be challenging; yet, facilitators must create and sustain social presence to achieve a CoI (Garrison, 2017). They must, however, reflect the pedagogy of online learning, rather than attempting to replicate the face-to-face classroom experience (Garrison, 2017). Students typically interact first socially, and then cognitively as they collaborate and construct meaning (Vaughan et al., 2013).

CP, the focus of this study, is considered the most basic and most connected to the achievement of learning outcomes (Garrison, et al., 2000). CP, closely aligned with critical thinking, has been 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). Garrison (2017) argues that CP, a collaborative process of inquiry, includes critical thinking and listening. Learners are expected to develop greater CP as they become more competent and confident (Garrison, 2017).

CP “is operationalized by the Practical Inquiry (PI) model that consists of four phases of inquiry – triggering event, exploration, integration, and resolution” (Garrison, 2017, p. 26). The first phase, triggering event, is described as an event or experience that triggers curiosity (Garrison et al., 2000). A guiding question may sufficiently stimulate deep discussion at this stage (Vaughan, 2010). This curiosity leads to the exploration phase when learners try to resolve or make sense of what was triggered. Exploration may be characterized by participants exchanging information, or experiencing, living, or immersing themselves in a learning situation (Garrison et al., 2000; Vaughan, 2010). The third phase, integration, is described as reflective wherein the learner visibly connects and integrates what is learned and experienced. Garrison et al. (2000) explain that new discoveries and knowledge are conceptualized at this phase. The inquiry model culminates with the resolution phase whereby problems are critically assessed and solved, and new questions may again prompt the triggering phase.

CP is also supported by social presence (Kanuka & Garrison, 2004). Higher levels of social presence facilitate the collaboration and construction of meaning in learner communities. However, strategies that facilitate interaction in online learning environments are insufficient to create CP (Garrison & Cleveland-Innes, 2005). While the quantity of student interaction may be indicative of social presence, it is the quality of student interaction (collaboration) that will determine CP and, subsequently, facilitate deep and meaningful learning experiences (Garrison & Cleveland-Innes, 2005).

Participants manifest all three mutually reinforcing presences of the CoI (Garrison, 2017). For instance, Akyol and Garrison (2008) found that social presence is dominant at the beginning of the course as students develop relationships and negotiate roles; whereas cognitive and teaching presences dominate as the term progresses and students focus more on academics. Furthermore, the presences are mutually reinforcing. Choo et al. (2020) cite Noteboom and Claywell (2010) who found that high levels of CP were reported by students who also had high levels of social and teaching presences. It is at the intersection of the three presences that deep and meaningful learning experiences occur.

Method

The current study sought to identify whether the design of weekly lesson plans (synchronous and asynchronous) aligned with the four phases of CP, directly addressing the research question. The survey results were analyzed alongside the lesson plans of two teacher-researchers in order to investigate more closely the relationship between task design and perceived CP. This approach sought to map out the teacher-researchers’ practice in relation to the CoI framework, focusing on CP.

Context

As with most post-secondary instruction, courses for the current study were taught entirely online in the fall 2020 semester as a response to the global pandemic. Teacher-researchers taught three sections of an intermediate level English for Academic Purpose (EAP) course hosted on a learning management system platform (Moodle). Teachers employed available tools to mediate synchronous and asynchronous interactions, such as forums, lessons, quizzes, and interactive content. Synchronous class times, which were approximately two thirds of the regularly scheduled class time, were hosted in a web conferencing platform that facilitated text-based chats, audio and camera functionality, and a collaborative writing surface, as well as

desktop sharing capabilities. Asynchronous class times were dedicated primarily to independent work.

Fully online EAP courses presented some unique challenges for teachers as students were not only online, but often distanced geographically. Thus, students logging into a synchronous class from different time zones often resulted in a lack of participation from sleepy learners. Others lacked the confidence to participate in virtual, synchronous lessons with cameras on. Additionally, certain websites that may have been a favoured resource by teachers in face-to-face learning environments were blocked by some countries. Thus, teachers relied more heavily on personally created material. The aforementioned challenges led the teachers to continuously question how to best facilitate their classes in a fully online environment.

To deal with this novel challenge, the teacher-researchers in this case met regularly to discuss task design and facilitation of lesson plans in response to student needs. The teacher of the first iteration of the lesson each week (Wednesday morning, Section D) shared her observations with the other teacher on what worked and what did not. Collaboratively they problem solved, through regular meetings and/ or email exchanges, on how to best (and quickly) improve the task design and facilitation of subsequent iterations (Wednesday afternoons, Section C, and Thursday mornings, Section A). This included small adaptations in task design (e.g., timing, clarifications, instructions, etc.).

Participants

Participants for this study included the two teacher-researchers (n=2) and student volunteers from their three sections of intermediate level EAP (n =27). Participation was voluntary and anonymous. Intermediate level EAP courses require a minimum IELTS score of 5.5 to enter and, in this case, classes were capped at 20 students. EAP courses in this context aim to improve students' academic language, research, and learning strategies, thereby preparing them for success in a North American university.

Data Collection Methods / Tools

At the end of term, teacher-researchers completed an online version of the CoI survey (Arbaugh et al., 2008), extended to include questions related to professional development, course design, and use of digital tools (Appendix A). Similarly, all students in the teacher-researchers' classes were invited to complete a survey as well (Appendix B). The students' version included the original CoI survey questions and was adapted to include additional questions related to demographics, level of comfort and expertise with technology, and the use of digital tools. Surveys were hosted in Qualtrics, an online survey software, to ensure anonymity in the case of student participant volunteers.

Additionally, the teacher-researchers independently completed an itemized table at the end of the term which outlined their lesson plans for seven classes. Each teacher revisited their own teaching materials for these seven classes and first reviewed the overall approach and general components to their lesson before noting the details and specific activities for each. Thus, their tables, moving from general plans to specific, outlined the type of activity, task instructions, the learning context (synchronous or asynchronous), and the community of learners. Note that the CoI was used post-term as an analytical tool for research purposes rather than as a model for designing lesson plans.

Data Analysis

In order to compare perceived teaching, social, and cognitive presences, both overall and with respect to the individual phases of presences, teacher and student participant responses to the CoI survey were assigned numerical values from *strongly disagree* = 0 to *strongly agree* = 4. As per Arbaugh et al. (2008), the responses were then averaged, both for the three presences in general as well as for the individual phases of each presence. Next, focusing only on CP questions from the CoI survey (Arbaugh et al., 2008), teacher-researchers compared student and teacher responses and the student responses across the three sections.

As part of the analysis, teacher-researchers worked with the itemized tables and compared them for general similarities in approach, task, and instruction from week to week. For example, researchers looked at the two itemized tables for parallels in general task design in terms of timing and sequencing of activities, class discussion, review, breakout room tasks, and main room debrief. Each teacher-researcher reflected on how the main components of the lesson plans aligned with the four phases of CP. Next, the specific activities for one lesson plan, Week 5, were mapped out onto the four phases of CP, triggering event, exploration, integration, and resolution, by each teacher-researcher. Researchers agreed on Week 5 as it was a midpoint in term and so students were, by then, familiar with the format of the weekly lesson plans. These two data sets are discussed separately.

Results and Discussion from CoI Survey

The following results are derived from the 29 participants (27 students and 2 teachers) who volunteered to complete the extended versions of the CoI survey (Appendix A and B). The surveys included 13 questions related to teaching presence, 9 related to social presence, and 12 related to CP (Arbaugh et al., 2008). All results reported below represent averages of all student participants ($n = 27$) and averages of all teacher participants ($n = 2$). This small-scale study helped respond to our research question: How do weekly task design and the facilitation of lesson plans, either synchronously or asynchronously, impact student and teacher perception of CP based on the four phases: triggering event, exploration, integration, and resolution?

Survey Results, Overall

This section reports on averages of all three sections of students and teachers for teaching, social and cognitive presences (Table 1). Student participants in all three sections (A, C, and D, combined averages) consistently rated their perceived level of teaching presence as *higher* than teacher participants (3.31 vs. 2.85, respectively).

Also, student participants in all three sections and teacher participants (combined averages) rated their perceived level of social presence *similarly* (2.57 vs. 2.61, respectively). Whereas student participants in two sections (A and D) rated their perceived level of CP (2.76 combined average) significantly *lower* than the teacher participant (3.42), the student participants in the third section (C) reported their perceived level of CP as slightly *higher* than the teacher (2.71 vs. 2.67, respectively).

Table 1

Averages of Teaching, Social, and Cognitive Presence as Reported by Student and Teacher Participants

	Students Section A	Students Section D	Students Sections A & D	Teacher Sections A & D	Students Section C	Teacher Section C
Teaching presence	3.36	3.45	3.41	3.31	3.11	2.38
Social presence	2.62	2.4	2.51	2.78	2.69	2.44
Cognitive presence	2.94	2.57	2.76	3.42	2.71	2.67

Survey Results and Discussion of Student Perception of CP across Three Sections

Of note, while the teachers met regularly between teaching their own sections, the Wednesday morning (Section D) and Thursday morning (Section A) courses were taught by the same teacher.

Students in sections of the course who participated in lesson plans during the second (Wednesday afternoon, Section C) and third iterations (Thursday morning, Section A) reported *higher* levels of CP (2.71 and 2.94, respectively) than students who participated in the first iteration on Wednesday morning, Section D (2.57) (Table 1).

Students in sections of the course who participated in lesson plans during the second (Wednesday afternoon, Section C) and third iterations (Thursday morning, Section A) reported *higher* levels of the triggering event, integration, and resolution phases than students who participated in the first iteration on Wednesday morning, Section D (Table 2).

While exploration did not increase across the three iterations, it did increase from Wednesday morning, Section D (2.73) to Thursday morning, Section A (2.98). These sections were taught by the same teacher (Table 2).

Table 2

Averages of Student and Teacher Participant Responses to the Four Phases of Cognitive Presence (CP)

CP phase	Features of each phase	Students Section A	Students Section D	Students Sections A & D	Teacher Sections A & D	Students Section C	Teacher Section C
Triggering Event	Peak curiosity	2.77	2.33	2.55	3.67	2.48	3.0
Exploration	Seek answers or resolution	2.98	2.73	2.86	3.67	2.6	2.67
Integration	Reflect and integrate knowledge	2.95	2.60	2.78	3.33	2.78	2.67
Resolution	Critically apply and solve problems	3.05	2.60	2.83	3.0	3.0	2.33

Teacher-researchers attribute the increased student perception of CP across the three sections from 2.57 (Section D) to 2.71 (Section C) to 2.94 (Section A) (Table 1) to frequent teacher meetings and discussions. To explain, teacher-researchers met regularly to discuss task design and the facilitation of lesson plans throughout the week. The teacher-researcher of the first iteration shared observations on what worked well after her first class (Section D) and provided suggestions for improvements which were incorporated by the teacher-researcher of the next iteration (Section C). Small adaptations in task design (e.g., timing, clarifications, etc.) may explain improvements in self-reported cognitive presence. This observation seems to be supported by the literature. Garrison (2017), citing several studies, argues that “the design and nature of the task [is] the greatest factor in reaching resolution” (p. 57). Indeed, Garrison and Arbaugh (2007) explain that the design of the task must provide clear directions and all relevant information to learners, and the timing must be designed to move students through the phases of CP. Student participants in the current study reported a combined average of 3.46 with respect to the design and organization phase of teaching presence, suggesting that the students’ educational experience is improved as teacher-researchers redesign activities, improve facilitation and course delivery, etc.

Moreover, Bangert (2008) found that teaching presence, particularly the facilitation and direction phase, and social presence were associated with the resolution phase of CP. Similarly, Vaughan et al. (2013) asserts that “of all aspects of the Community of Inquiry framework, the activities of facilitation are the most critical; facilitation manages the overlaps between all three presences and is at the core of the dynamics of a community of inquiry” (p. 46). Thus, teaching presence unifies cognitive and social presences, while social presence facilitates trust and open communication in the learning environment (Vaughan et al., 2013). Students in the current study reported a combined average of 3.24 with respect to the facilitation and direction phase of teaching presence, but only 2.57 for social presence, suggesting that teacher-researchers must pay more attention to activities which develop social presence early in the semester. If students in the current study were not provided sufficient opportunities to develop relationships and trust, and subsequently a sense of belonging, they may not have fully experienced the other presences and meaningful inquiry may not occur. Thus, a lower level of social presence may impact the development of other presences, and, ultimately, the achievement of deep and meaningful learning experiences (Garrison, 2017).

However, research has also revealed that while social presence is dominant in the beginning of a course as learners develop relationships and connections, as the course progresses social presence declines and cognitive and teaching presences increase (Akyol & Garrison, 2008; Vaughan et al., 2013). Students in the current study were surveyed only at the end of the course, which may explain why the overall average across three sections (D, C, and A) of social presence was lower than cognitive and teaching presence (2.57 vs. 2.74 and 3.31, respectively).

Survey Results and Discussion of Student vs. Teacher Perceptions of the Four Phases of Cognitive Presence

As noted, CP is operationalized by four phases: triggering event, exploration, integration, and resolution. Table 2, above, shows the calculated averages for teachers and students in all sections. Here we discuss the results of the triggering event and exploration phases.

Triggering event phase. Student participants in all three sections consistently reported their perceived level of CP in the triggering event phase as *lower* than teacher participants. Sections A & D (2.55 vs. 3.67, respectively)
Section C (2.48 vs. 3.0, respectively)

Exploration phase. Student participants in all three sections consistently reported their perceived level of CP in the exploration phase as *lower* than teacher participants. Sections A & D (2.86 vs. 3.67, respectively)
Section C (2.60 vs. 2.67, respectively)

Teacher participants reported higher levels of CP in the triggering event and exploration phases, suggesting that teachers seemed to overestimate the extent to which students' curiosity was piqued as well as how motivated they were to further explore course topics. The lower reported levels of the triggering event is alarming as this first phase is "crucial to participants taking responsibility and engaging in a true inquiry process" (Vaughan & Garrison, 2005, p. 8). In their comparison of discussions held online vs. face-to-face, Vaughan and Garrison (2005) found that the latter context elicited more triggering events in learners. Participants in Vaughan and Garrison's study explained that they felt more comfortable engaging in discussions in the face-to-face context as "the physical presence provided additional communication cues such as facial expressions and body language" (p. 6). This may be particularly true of second language learners who lack the competence and/or confidence to voice opinions in English, politely interrupt a speaker, express agreement/disagreement, etc. by relying solely on verbal communication without the help of gestures, facial expressions, and so on. Indeed, teacher-researchers of the current study remarked several times over the course of the semester the frustration they felt at some students refusing to turn on cameras and microphones to participate in synchronous, breakout room activities. Additionally, several students expressed their own frustration in post-class reflection activities about their experiences participating in breakout room activities with classmates who refused to turn on microphones and cameras. While teacher-researchers at the time felt they shouldn't push students who may feel uncomfortable in online contexts to do so, in hindsight, this may have contributed to lower experiences of CP. Certainly, these students would have been disadvantaged trying to keep pace with the oral discussions of their classmates by typing responses.

Survey Result and Discussion of Student vs. Teacher Perceptions of the Integration and Resolution Phases

Table 2, above, shows the calculated averages of perceived CP for teachers and students in all sections. Here we discuss the results of the integration and resolution phases.

Integration Phase. Students in Sections A and D (combined averages) reported their perceived level of CP in the integration and phase to be *lower* than the teacher (2.78 vs. 3.33, respectively); whereas, students in Section C reported their perceived levels of integration to be *higher* than the teacher participants (2.78 vs. 2.67, respectively).

Resolution Phase. Students in Sections A and D (combined averages) reported their perceived level of CP in the resolution phase to be lower than the teacher (2.83 vs. 3.0, respectively); whereas, students in Section C reported their perceived levels of resolution to be higher than the teacher (3.0 vs. 2.33, respectively).

Resolution Phase, Final Question. Student responses (combined averages) were consistently higher than teachers (3.22 vs. 2.5, respectively) in response to “I can apply the knowledge created in this course to my work or other non-class related activities.” This was the highest reported average among student participants in all 12 CP questions.

Teacher-researchers attribute this first finding (integration) to the synchronous nature of the tasks. As previously explained, lesson plans required students to participate in synchronous, breakout room discussions to first explore and then integrate information related to the assigned task. Thus, communication in these synchronous discussions was spontaneous and immediate, as compared to the slower, more reflective nature of asynchronous, written discourse where participants are given time to consider and/or edit responses. As Weigel (2002) notes, integration is encouraged by emphasizing written rather than oral responses within online inquiry. Indeed, Vaughan and Garrison (2005) found a greater number of student comments related to the integration phase in asynchronous, online contexts as compared to face-to-face environments. This can be explained by Newman et al.’s (1997) finding that asynchronous, written communication helps students to make connections between ideas as well as Meyer’s (2003) investigation into asynchronous discussion response, wherein students were able to better recognize connections and understand other’s ideas.

Teacher-researchers attribute the second finding (resolution) to higher levels of social presence reported by students of Section C (2.69) compared to Sections A and D combined (2.51) (Table 1), suggesting that the established learning environment in Section C helped students feel more at ease. Researchers also speculate that the teacher of Section C may have prompted more frequently.

In comparing teaching presence (3.41 average in Sections A and D vs. 3.11 in Section C) and social presence (2.51 average in Sections A and D vs. 2.69 in Section C) (Table 1) to the resolution phase, we are unable to account for these differences. The only possible explanation, and as explained above, is that resolution in our EAP context does not occur after integration in the weekly lesson plans, but rather later in isolated graded assignments. Anecdotally, this is where we see students beginning to incorporate the underlying skills practiced in the weekly lesson plans as they move from the triggering event to the exploration to the integration phases.

Teacher-researchers attribute the finding from the resolution phase, final survey question to the deliberate design of lesson plan tasks which scaffolded skills necessary in future graded assignments. As previously noted, the researchers argue that the resolution phase of the lesson plans in their EAP class was not the resolution of the problem students were tasked with (triggering event), but rather the knowledge, practice, and application of academic English skills that EAP students are required to demonstrate in graded assignments as measures of learning outcomes.

Results and Discussion from Lesson Plan Analysis

To interpret the results from the itemized tables, researchers looked at the weekly synchronous and asynchronous practice, called lesson plans. Recall that lesson plans were not designed with the CoI / CP in mind. Rather, lesson plans were initially modified from typical face-to-face classroom activities using the perceived affordances of digital tools as understood at that time.

Lesson Plans, General

Over the course of the semester, learners completed and participated in lesson plans over seven classes, each lesson consisted of the same general five components: *pre-class reading activities*, *class discussion*, *breakout room activities*, *main room debrief*, and *post-class reflection* (Table 3).

Table 3
Analysis of Lesson Plans

Activity	Description	Duration / Frequency
1. Pre-class reading activities	Students completed the following activities in order: 1. Apply academic reading strategies 2. Answer ‘Guided Reading Questions’ quiz 3. Listen to a ‘Chapter Summary video’ 4. Complete a ‘Practice Quiz’	7 weeks
2. Class discussion	Anonymous polls and/or informal questions to review main concepts of the assigned reading and encourage critical thinking	Weeks 1 - 3: approximately five minutes Weeks 4 - 7: 15 to 20 minutes
3. Breakout room activities	Students were given a new content source (e.g., listening - TedTalks/YouTube and/or reading - CBC News) and a problem to solve as a team. Skills practiced: listening, note taking, reading, working in groups (expressing ideas, agreeing/disagreeing politely, turn taking in conversation, various group roles, etc.), as well as academic skills (e.g., citing, referencing, providing support for arguments).	Varied, depending on activity.

4. Main room debrief	A volunteer representative from each breakout room group presented their findings while members of other groups took notes.	Varied, increased in length over the course of the term.
	As students' competence and confidence increased, debates and/or follow-up questions became the norm, both teacher- and student-initiated.	
5. Post-class reflection	Learners completed a post-class reflection activity individually and asynchronously. Following the Rolfe et al. (2001) model of reflection, learners were asked to reflect on and describe their personal synchronous learning experience (i.e., their participation in, and the group dynamics of, synchronous, breakout room activities) and to consider how that experience may inform their future behaviour in synchronous and/or group work.	7 weeks

Lesson Plans, Results and Discussion

The Practical Inquiry model, which includes four phases, is the means through which CP is operationalized and assessed (Garrison, 2017). Thus, to assess whether the synchronous and asynchronous lesson plans (Table 3) achieved CP, teacher-researchers chose to map Week 5 of the aforementioned five components described above onto the four phases of CP. This section reports on the specifics from Week 5 lesson plan (Table 4) and helps respond to the research question, *How does weekly task design and the facilitation of lesson plans, either synchronously or asynchronously, impact student and teacher perception of CP based on the four phases: triggering event, exploration, integration, and resolution?*

Table 4

Specific Lesson Plan Activities from Week Five of Seven as Related to the Four Phases of Cognitive Presence (CP)

CP phase	Lesson plan activity
Triggering Event	<ul style="list-style-type: none"> Class discussion to review the main concepts of the assigned readings (Corrigan, 2019; Zhang & Pickwell-MacPherson, 2019) Watch and take notes on a YouTube video presenting a first-person account of the need for telesurgery (Demystifying Medicine, 2020)
Exploration	<ul style="list-style-type: none"> Teacher designates groups as either proponents or opponents of 5G in healthcare. In breakout rooms, groups must develop a supporting argument, cited in APA style, with a minimum of three pieces of evidence from assigned readings (Corrigan, 2019; Zhang & Pickwell-MacPherson,

Integration	<p>2019) and/or the telesurgery video (Demystifying Medicine, 2020).</p> <ul style="list-style-type: none"> ● After brainstorming ideas in phase two, students collaborate in breakout rooms to finalize their argument for/against 5G in healthcare. ● Back in the main room, a representative from each group presents ideas. As he/she is presenting, members from the same group voluntarily elaborate on or clarify ideas by turning on microphones and/or typing in the chat. ● Members from other, similarly designated groups (i.e., proponent or opponent) also offer and compare ideas. ● Members from dissimilarly designated groups offer ideas as a debate.
Resolution	<ul style="list-style-type: none"> ● Students complete a post-class reflection activity where they reflect on their experience participating in lesson plans. One prompt asks them how they can improve in subsequent weeks, thereby encouraging reflection on any existing issues and the offering of potential solutions. ● Students are tested on the underlying skills associated with lesson plan activities through formative assessments (e.g., writing assignments, presentations, etc.).

The first phase, the triggering event, typically presents learners with “a dilemma or problem that students could relate to, based on their experience or previous studies” (Garrison, 2017, p. 56). In this phase, the problem is conceptualized. Thus, “the educational processes would include presenting information that generates curiosity and questions” (Garrison, 2017, p. 65). In this case, the assigned readings and asynchronous activities preceding the Week 5 lesson plan discussed the pros and cons of the use of 5G telecommunications in the health sector (Corrigan, 2019; Zhang & Pickwell-MacPherson, 2019). After participating in the class discussion which reviewed the main concepts of the assigned reading, students watched a YouTube video which presented a case study on the need for telesurgery (Demystifying Medicine, 2020). This video built on students’ knowledge from the assigned readings and class discussion, and it piqued interest as it was presented in first-person format.

In the second phase, exploration, students search for relevant information and possible solutions to the problem presented in phase one. If working in groups, students are encouraged to explore ideas collaboratively to make sense of new information (Garrison, 2017). As they do so, they must “brainstorm ideas; offer supportive or contradictory ideas and concepts; solicit narratives of relevant perspectives or experiences; and elicit comments or responses as to the value of the information for ideas” (Garrison, 2017, p. 66). In Week 5, students were divided into breakout rooms and were designated the position of proponent or opponent of 5G in healthcare. Student groups were tasked with developing an argument, cited in APA style, which consisted of a minimum of three supporting points from the assigned readings (Corrigan, 2019; Zhang & Pickwell-MacPherson, 2019) and/or the telesurgery video (Demystifying Medicine, 2020).

The third phase, integration, moves the ideas generated in phase two to a more integrated and developed argument. As students collaborate to develop tentative solutions to the problem presented in phase one, they “integrate information; offer messages of agreement; build on other ideas; provide a rationale or justification; and explicitly offer a solution” (Garrison, 2017, p. 66). Teacher-researchers see this integration phase as overlapping with both the exploration phase (i.e., students collaborate in breakout rooms to first gather and then integrate information to reach a potential solution) and the third and fourth lesson plan steps discussed above. That is, during the weekly lesson plan, students seemed to complete the integration phase in breakout rooms, but later when a group representative was presenting findings to the class back in the main room, members of the same group would often turn on their microphone to elaborate or clarify the ideas presented by the representative or type such messages in the chat. In the specific case of the Week 5, where two groups were designated proponents and two opponents, members of different groups with the same designation chimed in while the representative presented findings, thus collaboratively integrating ideas both within a breakout room group as well as between groups. Additionally, members from groups with different designations offered ideas to contradict their classmates and trigger a debate.

The final phase, resolution, is characterized by offering and testing a potential solution to the problem presented in phase one (Garrison, 2017). However, the teacher-researchers argue that, in EAP, the resolution phase is less about finding a solution to the actual problem presented in the triggering event phase and more about the development of underlying academic and language skills associated with the task, such as collaboration. That is, though the focus of Week 5 was the use of 5G in healthcare, as EAP teachers, we are not concerned with whether our students actually learn about 5G or healthcare; this topic is simply chosen as a means through which to teach English through academic content. Thus, we see this phase as a resolution of issues in terms of required language and skills.

In this modified representation of phase four, the solutions offered are through the post-class reflection activity, where students are provided the opportunity to self-reflect on the inquiry process and collaborative experience (e.g., issues related to group dynamics, their own participation in the group work, etc.). Students are also prompted to reflect on how they can improve in subsequent weeks, thereby improving the conditions necessary for deep and meaningful learning to occur. Indeed, many students wrote that they were dissatisfied with their role and/or performance in group work and vowed to be more active, supportive, etc. in subsequent weeks. The testing of the issue (i.e., underlying skills) occurs through formative assessments in the class (e.g., writing assignments, presentations), where skills, such as citing and referencing, speaking, reading, etc. are formally assessed with feedback provided for future improvement.

Limitations

We recognize the limitations of this small study, namely the small number of participants and the fact that this was a convenience sample. However, we believe that the analysis of lesson plans, a novel approach, provides a meaningful way to investigate the impact of perceived CP and is a move away from text-based analysis used in earlier studies (Garrison et al., 2000; Oriogun et al., 2005; Vaughan & Garrison, 2005). In addition to convenience sampling, we chose to shift our focus from achievement outcomes in relation to all three presences and instead focus primarily on CP. Another limitation of this small study is that not all results from the

survey were analyzed. For example, questions 39 and 40 of the teacher survey asked about hours spent attending professional development workshops and the perceived impact these had on teacher preparation. While not explicitly motivated by the CoI framework, each of the teacher-researchers reported attending more than 10 hours of training and reported that this positively impacted their course design in preparation for fall 2020 teaching. Nevertheless, this was a drastic shift from familiar face-to-face contexts to fully online.

Implications

When a global pandemic forces teachers not versed in online pedagogy to teach fully online, and with very little time, what strategies work best? And what can we learn from these experiences moving forward to improve the design and facilitation of online and blended courses? As Garrison (2017) explains, “the challenge [with e-learning] is to understand how we can create and sustain communities of inquiry that will facilitate developing deep and meaningful approaches to learning” (p. 21).

We argue that the teacher or designer’s facilitation of the three presences are what lead to successful CP in our study. This aligns with Vaughan et al.’s (2013) assertion that “of all aspects of the Community of Inquiry framework, the activities of facilitation are the most critical; facilitation manages the overlaps between all three presences and is at the core of the dynamics of a community of inquiry” (p. 46). Similarly, Bonk et al. (2005), in reference to blended learning contexts, suggest that teachers should “know when to shift gears or add new tasks or resources” (p. 564), which Vaughan, et al. (2013) suggest is how CP can be achieved. This is what our study sought to understand, and Garrison et al.’s (2000) practical inquiry model helps researchers identify indicators of CP within each of the four phases.

With respect to “shifting gears” (Bonk et al., 2005), teacher-researchers of the current study make the following suggestions for task design, lesson facilitation, and future research:

At the triggering event phase, teachers can use polls embedded in web conferencing tools, or external polling software, such as Poll Everywhere, as well as external media, such as a first-person account of a topic, to pique curiosity.

At the exploration stage, teachers could prompt or scaffold the activity so that students are more likely to succeed when seeking answers. Additionally, teachers could encourage students to turn cameras and microphones on, particularly in breakout room activities where the teacher is not always present to prompt participation. Inasmuch as possible, this may help to simulate face-to-face interaction. In this way, nonverbal cues can aid in the group discussion.

At the integration stage, synchronous lesson plans could include an additional asynchronous component (e.g., a discussion forum). Potentially, students would participate more in the integration phase if they were afforded more time to respond to classmates and in less risky scenarios (asynchronously) where they can edit their responses before publishing them.

In terms of the resolution stage, teachers could take a step back, particularly in blended and online contexts, and take a macro-level view of the overall plan (i.e., how the skill relates to the overall learning outcomes of the course). When the resolution phase carries over into subsequent, graded activities, the teacher should articulate and make explicit connections for the students of

the value of practice in lower stakes assignments (e.g., post-class reflections) in relation to performance on higher stakes assignments (e.g., an end-of-term writing assignment).

Generally, teachers are encouraged to devote time early in the semester to activities designed to build student relationships and cohesion (social presence), for example, by carefully matching students according to skill level or interests and facilitating team-building activities and friendly competitions. Additionally, reflection and other academic skills need to be more explicitly taught and modeled.

Future research might consider surveying students closer to the beginning as well as the end of term and comparing perceived reports of the three presences. Also, future research might look for a correlation between perceived CP and achievement of learning outcomes.

Conclusion

This small-scale study surveyed students from three sections of a post-secondary EAP course delivered entirely online in the fall 2020 semester. As well, it analyzed weekly lesson plans through the lens of the four phases of CP. While student participants consistently reported lower levels of CP than teacher participants in the triggering event and exploration phases, results were mixed for the integration and resolution phases. Importantly, student-reported experiences of the triggering event, integration, and resolution phases, increased with each iteration of the lesson plan (i.e., course section), suggesting that task design and facilitation play a major role in students' perceived experience of CP.

Online learning requires new approaches to pedagogy. Yet, with skills, training, and informed design principles, teachers can create rich online learning contexts that stimulate curiosity and the process of inquiry, thereby facilitating cognitive presence. In retrospect, we found the CoI framework a useful model in guiding and fine-tuning our online practice. The CoI framework helps to illuminate the student's perspective of the teaching, social, and cognitive presences, which, in turn, helps teachers and designers to improve learning communities and, ultimately, learning outcomes.

Declarations

This project received ethics clearance (Project #113192) from the Office of Research Ethics, Carleton University, Ottawa, Canada.

The researchers mitigated any risk or conflict of interest. Student participation was voluntary and anonymous. Data analysis was conducted after final grades were submitted and approved.

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Appendix A

Teacher Survey

1-3 demographic information

Teaching Presence

Design & Organization

4. As the instructor, I clearly communicated important course topics.
5. As the instructor, I clearly communicated important course goals.
6. As the instructor, I provided clear instructions on how to participate in course learning activities.
7. As the instructor, I clearly communicated important due dates/time frames for learning activities.

Facilitation

8. As the instructor, I was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.
9. As the instructor, I was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.
10. As the instructor, I helped to keep course participants engaged and participating in productive dialogue.
11. As the instructor, I helped keep the course participants on task in a way that helped me to learn.
12. As the instructor, I encouraged course participants to explore new concepts in this course.
13. As the instructor, my actions reinforced the development of a sense of community among course participants.

Direct Instruction

14. As the instructor, I helped to focus discussion on relevant issues in a way that helped me to learn.
15. As the instructor, I provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives.
16. As the instructor, I provided feedback in a timely fashion.

Social Presence

Affective expression

17. As students got to know other course participants, it gave them a sense of belonging in the course.
18. Students were able to form distinct impressions of some course participants.
19. Online or web-based communication is an excellent medium for social interaction.

Open Communication

20. Students felt comfortable conversing through the online medium.
21. Students felt comfortable participating in the course discussions.
22. Students felt comfortable interacting with other course participants.

Group Cohesion

23. Students felt comfortable disagreeing with other course participants while still maintaining a sense of trust.
24. Students felt that their point of view was acknowledged by other course participants.
25. Online discussions helped students to develop a sense of collaboration.

Cognitive presence

Triggering event

26. Problems posed increased student interest in course issues.
27. Course activities piqued student curiosity.
28. Students felt motivated to explore content related questions.

Exploration

29. Students utilized a variety of information sources to explore problems posed in this course.
30. Brainstorming and finding relevant information helped students resolve content related questions.
31. Online discussions were valuable in helping students appreciate different perspectives.

Integration

32. Combining new information helped students answer questions raised in course activities.
33. Learning activities helped students construct explanations/solutions.
34. Reflection on course content and discussions helped students understand fundamental concepts in this class.

Resolution

35. Students can describe ways to test and apply the knowledge created in this course.
36. Students have developed solutions to course problems that can be applied in practice.
37. Students can apply the knowledge created in this course to their work or other non-class related activities.

Additional questions

38. For the purposes of this research, synchronous learning is defined as a learning activity that is designed for students to engage in together and at the same time via text, voice, or chat and in the same online environment. Whereas, asynchronous learning is defined as a learning activity that is designed for students to complete independently and on their own schedule. These activities may occur in the online environment used for synchronous activities, but students are not expected to be engaged together and at the same time.

39. In preparation to move to a fully online teaching practice for the Fall 2020 term, please indicate how many professional development workshops you attended as offered by the university, the unit, or outside webinars, such as those offered by Contact North.

40. What impact did these workshops have in preparing you to teach this fall, especially in terms of the choice of tools and decision as to how much time to teach synchronously or asynchronously?

41. For each “normally” scheduled 3 hour class, students and teachers were online synchronously for approximately:
42. On average, how many hours / week (outside of class time) did you expect students to be online participating in assigned ESLA activities?
43. Which types of activities did you assign to students to complete online? (check all that apply)
44. Of the activities indicated above, which three did you assign most often? (1 = most often)
45. Which of the following web conferencing tools did you use? (check all that apply)
46. What did you use web conferencing tools for in your ESLA class? (check all that apply)

Appendix B

Student Survey

Teaching Presence

1. Consent
2. Yes/ no to proceed with online survey
3. I am a student of (section)
4. I am (age)
5. My first language is
6. I am comfortable trying new technology
7. I would rate my level of computer expertise as
8. My experience learning with technology, such as chat forums is
9. I use social networking sites, like WeChat, Facebook, Instagram, TikTok, ___hours per day
10. For my classes I mostly use (desktop, laptop, tablet)
11. When I am participating with other students and/or my teacher on a video conference call, I have my camera on.

Design & Organization

12. The instructor clearly communicated important course topics.
13. The instructor clearly communicated important course goals.
14. The instructor provided clear instructions on how to participate in course learning activities.
15. The instructor clearly communicated important due dates/time frames for learning activities.

Facilitation

16. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.
17. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.
18. The instructor helped to keep course participants engaged and participating in productive dialogue.
19. The instructor helped keep the course participants on task in a way that helped me to learn.

20. The instructor encouraged course participants to explore new concepts in this course.
21. Instructor actions reinforced the development of a sense of community among course participants.

Direct Instruction

22. The instructor helped to focus discussion on relevant issues in a way that helped me to learn.
23. The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives.
24. The instructor provided feedback in a timely fashion.

Social Presence

Affective expression

25. Getting to know other course participants gave me a sense of belonging in the course.
26. I was able to form distinct impressions of some course participants.
27. Online or web-based communication is an excellent medium for social interaction.

Open communication

28. I felt comfortable conversing through the online medium.
29. I felt comfortable participating in the course discussions.
30. I felt comfortable interacting with other course participants.

Group cohesion

31. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.
32. I felt that my point of view was acknowledged by other course participants.
33. Online discussions help me to develop a sense of collaboration.

Cognitive Presence

Triggering event

34. Problems posed increased my interest in course issues.
35. Course activities piqued my curiosity.
36. I felt motivated to explore content related questions.

Exploration

37. I utilized a variety of information sources to explore problems posed in this course.
38. Brainstorming and finding relevant information helped me resolve content related questions.
39. Online discussions were valuable in helping me appreciate different perspectives.

Integration

40. Combining new information helped me answer questions raised in course activities.
41. Learning activities helped me construct explanations/solutions.
42. Reflection on course content and discussions helped me understand fundamental concepts in this class.

Resolution

43. I can describe ways to test and apply the knowledge created in this course.
44. I have developed solutions to course problems that can be applied in practice.
45. I can apply the knowledge created in this course to my work or other non-class related activities.

A Comparison of Three Assessment Types on Student Engagement and Content Knowledge in Online Instruction

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Abstract

The research described in this article focuses on determining the effectiveness of Bongo in promoting student retention of concepts in online learning. This study used both quantitative and qualitative measures to examine the effectiveness of student video presentation assignments on student retention of learning and perceptions of the assignment's contributions to learning. The quantitative methods compared the effects of three treatment conditions (independent reading, Bongo video presentation, and Bongo video presentation with Auto Analysis) on retention of concepts (quizzes administered two weeks after the presentation recordings). Qualitative analysis of student perceptions of the perceived value of Bongo in general, and specifically the Auto Analysis tool, were accomplished through video surveys, transcription, and analysis. Analysis of the data provided strong support for the use of Bongo to increase student retention of concepts, and also revealed that students held favorable perceptions of the value and utility of the tool.

Keywords: retention of learning, online instruction, video capture, online learning, engagement

Randall, L., & Jaynes, J., (2022). A comparison of three assessment types of student engagement and content knowledge in online instruction. *Online Learning*, 26(2), 102-123.

A critical challenge for online instructors is the design of high-tech, high-touch activities and experiences to promote student engagement and motivation in learning (Intentional Futures, 2017; Robinson et al., 2017). The number of U.S. students taking at least one online class increased from 5.4 million in 2012 to 7.4 million in 2019, with 37.2 percent of students enrolled in an online course by 2019 (Seaman & Seaman, 2021). The challenge to improve online learning outcomes became particularly germane in spring, 2020, as the Covid-19 pandemic forced 90 percent of U.S. colleges and universities to move to emergency online instruction (Johnson et al., 2021, p. 10).

To a great extent, Covid-19 produced a teachable moment for faculty members by creating an opportunity to expand their teaching repertoires to include more digital tools and more varied methods of engaging learners synchronously and asynchronously in the content. In a recent national survey, 97 percent of institutions reported assigning some faculty members with no prior online teaching experience to staff some of their online courses, and 63 percent of instructors reported that they changed the kinds of assignments and assessments used in their courses to better achieve meaningful online learning (Seaman & Seaman, 2021).

Meaningful online learning can be facilitated using instructional strategies that require learner articulation. Dabbagh et al. (2018, p. 105) have explained this potential as follows: “When learners articulate their knowledge to one another, they share multiple perspectives, enable feedback and commentary, engage in collaborative and conversational activity, and enhance their knowledge and understanding so that it becomes applicable to different contexts.” They noted that collaboration and communication tools are the primary vehicles for facilitating articulation.

Learning management systems and Web 2.0 tools provide almost limitless opportunities for instructors to promote student engagement in the online learning process. The typical mainstay of online discussion has relied on text-based forums. However, video-based tools may have greater potential for developing communities of inquiry (Clark et al., 2015). VoiceThread and Flipgrid are two available Web 2.0 tools with the potential to increase collaboration and dialogue. One additional tool that remains largely unexplored from a research perspective is Bongo, an online learning platform that integrates with the learning management system to allow synchronous virtual classroom meetings and a variety of asynchronous video recording assignments (individual project, Q&A, group project, and interactive video).

The Bongo student video capture tool has a unique potential to engage learners in synchronous and asynchronous online learning activities, both independently and in group collaboration. These features include virtual classroom, independent and group projects, four kinds of video capture assignments, immediate feedback of audio transcript through auto analysis, peer and instructor video and text feedback, and rubric-based assessment. In addition, Bongo offers opportunities for the development of soft skills such as communication, presentation skills, collaboration, team building, and critical thinking. In light of these potential benefits, the research described in this study focuses on determining the effectiveness of Bongo in promoting student engagement, comprehension, and retention of concepts in online learning.

Review of Literature

The growing popularity and prevalence of online instruction in higher education has led to the need for instructors to identify and incorporate a variety of evidence-based strategies for engaging learners in the content. The development of online pedagogies has also necessitated the use of varied assessment strategies that promote interaction with content as well as dialogue among students and with instructors. Although text-based discussions have dominated online instruction in the past (Legon & Garrett, 2017), emerging video technologies have shown promise for personalizing instruction and increasing cognitive engagement (Ching & Hsu, 2013; Fox, 2017; Kirby & Hulan, 2016). Both text-based and video-based technologies can provide scaffolding to help students unpack the details of textbooks and supplementary readings. Despite the obvious potential of video-based discussion and assessment tools, a dearth of research exists that investigates their impact on student learning

Text-Based Discussion

Online instructors have traditionally relied heavily on text-based discussions as a means of creating dialogue around important topics and concepts. Threaded, text-based discussions have historically been the standard method of communication among students and instructors (Legon & Garrett, 2017). One meta-analysis of 51 papers revealed that, although text-based discussions are among the preferred modalities of online instructors, these forums tend to promote low levels of cognitive engagement (Martono & Salam, 2017).

Often, text-based forums promote a narrowed learning focus in which students examine a slice of the content and post cursory responses that require little critical analysis. Further, these posts typically receive high praise from peers and instructors, reinforcing the practice of skimming the surface of readings and lectures. Jung and Gilson (2014) reported that one disadvantage of online threaded discussions is that students often relied on others' posts as opposed to completing readings. Similarly, Lieberman (2019) noted that faculty and students in general have become tired of the monotony of text-based discussions when overused as a form of assessment.

Comparisons of Text-Based and Video-Based Discussions

Researchers have only recently begun to study the relative effects of text-based versus video-based discussions in online learning (Clark et al., 2015; Swartzwelder et al., 2019). These studies have focused solely on student perceptions of the value of the two methodologies and have not yet explored their direct impact on student learning. Clark et al. (2015) compared the effects of asynchronous and synchronous video vs. text-based discussions in an online teacher education course. Through the use of participant interviews, the researchers determined that video-based discussions led to higher student perceptions of social and teaching presence. In one recent study, graduate nursing students preferred text-based discussions over video discussions as a means of promoting engagement, although investigators acknowledged that the results may have been skewed by the students' familiarity with text-based forums (Swartzwelder et al., 2019).

Video-Based Discussion Tools

Several Web 2.0 tools and web-based platforms have become increasingly popular as alternatives to text-based discussion for promoting collaboration and engagement in online learning. These tools use multimodal communication (text, voice, and video) to promote

dialogue in the online classroom setting (Saçak & Kavun, 2020). VoiceThread is a cloud-based application that allows students and faculty to build online presentations by adding images, documents, videos, and other media to which other users can add comments for discussion. The use of VoiceThread in higher education has been extensively researched and found to be effective in promoting collaboration and engagement (Ching & Hsu, 2017; Fox, 2017; Kirby & Hulan, 2016).

Flipgrid is another popular tool for engaging students in video-based discussions. This Web 2.0 tool allows teachers to create "grids" to facilitate video discussions. Each grid is like a message board where teachers can pose questions, called "topics," and their students can post video responses that appear in a tiled grid display. Research on Flipgrid has shown that students respond positively to the tool and develop increased confidence in their learning through vocal practice assignments (McLain, 2018). Flipgrid has demonstrated potential for developing a social community for online learning (Stoszkowski, 2018). In addition, Flipgrid was shown to improve student reflection (Stoszkowski et al., 2020) and connectedness (Bartlett, 2018) as well as to offer benefits as an alternative to journal writing (Sebach, 2020).

Bongo, first introduced in 2011, combines video and audio capture with several assignment options. These options include individual presentations, group projects, Q&A, and interactive videos. In addition, the platform provides virtual classroom experiences that can be set up by the instructor or students. Students can simultaneously record with their webcams while sharing the desktop (typically a PowerPoint) to create presentations. An Auto Analysis feature provides immediate feedback to the students on their lesson delivery and use of key terms. In addition, the platform incorporates rubrics for expedited grading and allows instructors to record text and video feedback.

The nature of Bongo facilitates deep processing of information as students prepare and deliver their own scripts. This form of assessment is generative in nature in that the process of constructing the response tends to promote learning as opposed to simple regurgitation (Fiorella & Mayer, 2015). The novelty of the task seems to interest the students and encourage them to dig deeper into the content. Bongo assignments also increase student accountability for learning by requiring them to provide detailed evidence of their learning. This study represents an initial effort to empirically test the value of Bongo as a tool for promoting robust learning.

Methods

Research Design

This combined quantitative-qualitative study examined the effectiveness of Bongo student video capture in promoting retention (recall) of content (key concepts), as well as student perceptions of the efficacy of Bongo in enhancing their learning. Specifically, the study compared the effects of Bongo student video capture with and without Auto Analysis features to independent reading without video capture. The context of the study was an online undergraduate course on adolescent development. Data collection and analysis entailed both quantitative and qualitative measures, including a quantitative analysis of open-ended video assessments of student retention of key concepts, and a qualitative analysis of video-based surveys of student perceptions of the value of Bongo student video capture and Auto Analysis features.

It was assumed that the process of student video capture would promote deeper engagement in readings, and additionally, that the reiterative process of completing multiple video capture presentations with immediate feedback through Auto Analysis would increase student learning and retention. The study addressed four research questions, as follows:

1. Which of the three assignment types would produce the greatest level of retention of content information (key concepts)?
2. To what extent do students perceive the value of Bongo video recording as a contributor to their learning?
3. How do students perceive that the Auto Analysis features of Bongo influenced their learning?
4. What particular features of Bongo do students perceive as most influential to their learning?

Participants

Participants in the study consisted of 27 undergraduate students in an online general education course at an urban California university. In addition to meeting the general education requirement, the course also serves as a pre-requisite for admission to the secondary education teaching credential program. Therefore, most participants were future teachers. The course on adolescent development consisted of 15 weekly modules of textbook readings, instructor video lectures, supplemental readings, online activities, and various assessments. Researchers designed three of the weekly modules as experimental modules to explore the efficacy of student video capture. A total of 24 subjects completed all 3 modules designated for data collection.

The sample consisted of 7 males and 20 females with a mean age of 22. Participants were racially, ethnically, and linguistically diverse. The majority of students (52%) were Hispanic or Latino, while the remainder were white (24%), Asian (16%), and Black or African American (8%). In terms of linguistic background, 72% of the students identified English as their primary language, 20% identified English and Spanish equally as primary languages, and the remaining 8% were non-native English speakers.

Measures

Quantitative Assessment of Retention

In order to assess student retention of concepts contained in the readings, researchers designed a Bongo Q&A assessment for each of the three readings. Students in all three treatment conditions completed the same retention quiz two weeks subsequent to the completion of each of the three modules. Each of the three Q&A assessments presented a series of three content-specific questions to which the students responded by recording with their web cameras. Following the presentation of each question, students were given one minute to prepare their thoughts followed by one minute to record their responses. The same rubric was used to score the responses for all three treatment groups and for all three modules. Traits measured in

responses to each of the three questions included relevance to the article, specificity of details, and accuracy. Appendix C contains a copy of the retention quiz rubric.

Qualitative Assessment of Student Perceptions of Bongo and Auto Analysis

Researchers also used the Bongo Q&A activity to survey students on their perceptions of the value of Bongo and Auto Analysis in promoting their learning. Students responded to three questions in this survey, as follows: 1) How did the process of creating your own Bongo presentations help you to master the content of our course, 2) In particular, how did the Auto Analysis features help you to improve your presentation skills and content knowledge?; and 3) What other aspects or features of Bongo did you find influential in your learning?

Treatment

Subjects were randomly assigned to three groups that rotated through three treatment conditions of Independent Reading, Bongo Video Capture, and Bongo Video Capture with Auto Analysis. Experimental modules took place in weeks 7, 9, and 11 of the semester. On each of these weeks, students read an assigned journal article and completed activities specified according to the treatment condition. The topics of the reading assignments for the designated modules were the teen brain (week 7), teen depression (week 9), and inclusive education (week 11). Students in two groups completed assigned interventions (Bongo video screen capture, and Bongo with Auto Analysis). Students assigned to independent reading for the given modules did not complete a video presentation.

With the web-based Bongo platform students can simultaneously record a PowerPoint and record themselves via webcam. They then submit their videos to receive personalized feedback and coaching. Bongo video presentations allow instructors and peers to record feedback as video comments, synchronized text, and rubric-based scoring. In addition, Bongo offers an Auto Analysis feature that provides immediate feedback on delivery (clarity, filler words, speaking rate) and content (key terms). Students may make multiple recordings and receive immediate feedback as many times as desired before submitting their final recordings for grading.

Over the course of the three experimental modules/topics, students rotated through the three treatment conditions, which included independent reading, Bongo, and Bongo with Auto Analysis. Table 1 describes the sequence of subject rotation through the three treatments in relation to the three modules and topics. Table 2 describes the Flesch-Kincaid reading levels (approximate grade level) of the three assigned readings.

Table 1*Subject Rotations Through Treatment Conditions*

Group	Experimental Module	Topic	Treatment
1	1	Teen Brain	Independent Reading
2	1	Teen Brain	Bongo (w/o Auto Analysis)
3	1	Teen Brain	Bongo Auto Analysis
1	2	Inclusive Education	Bongo (w/o Auto Analysis)
2	2	Inclusive Education	Bongo Auto Analysis
3	2	Inclusive Education	Independent Reading
1	3	Teen Depression	Bongo Auto Analysis
2	3	Teen Depression	Independent Reading
3	3	Teen Depression	Bongo (w/o Auto Analysis)

Table 2*Reading Levels of Assigned Readings*

Article Title	Number of Words	Flesch-Kincaid Reading Ease Score	Flesch-Kincaid Reading Level
Teen Brain	7719	38.4	13.4
Inclusive Education	7990	16.5	12.8
Teen Depression	6597	42.8	10.4

Bongo Video Capture Assignment.

For each of the three modules, students assigned to either of the Bongo treatment groups (without Auto Analysis/with Auto Analysis) were asked to create a video presentation including 5 PowerPoint slides and a script. The task required students to summarize their understanding in relation to a set of prompts, and additionally, to incorporate several key concepts and important terminology from the reading. Students recorded their narration of the PowerPoint by simultaneously capturing their webcam and desktop through the Bongo application. Table 3 summarizes the prompts and assigned readings for each of the three module topics

Table 3*Assignment Prompts for Bongo Presentation Required Readings*

Topics	Prompts
Teen Brain	Explain why brain researchers believe there is a mismatch in the development of brain regions. Discuss how this developmental mismatch can affect adolescent thinking and behavior and might predispose the teen to risky behavior.
Inclusive Education	Describe and contrast the two perspectives and situate them in the historical context of education in the United States. Discuss how legislation has shaped these two perspectives.
Teen Depression	Describe the nature and prevalence of teen depression. Discuss several other topics such as signs and symptoms, risk factors, treatment, and prevention.

Bongo Auto Analysis

The treatment of Bongo with Auto Analysis required students to make use of a built-in platform feature that allowed them to obtain immediate feedback on their delivery (clarity, use of filler words, and speaking rate) as well as content (number of keywords). Students also see a verbatim transcript of their presentation with keywords highlighted. The goal of Auto Analysis is to engage students in repeated practice and facilitate improvements in delivery and content. Students can practice their recordings repeatedly, with immediate feedback, and then submit their presentation when they are satisfied with the result.

Clarity is determined by the percent of clear (audible/transcribed) words. Auto Analysis also provides a percentage of filler words (um, ah) contained in the recording. The speaking rate consists of the number of words per minute, with an ideal rate of 135 to 185 words per minute. For each of the metrics, Bongo Auto Analysis provides a color-coding of red, orange, or green as targeted feedback for the desirable range. Figure 1 provides an illustration of a sample Auto Analysis report with a transcript, highlighted keywords, and color-coded ratings for delivery and content.

Rubrics for the Bongo assignments were available to students in the module instructions, and general attributes (duration of recording, content development, relevance and coherence, inclusion of key terms, and accuracy) were assessed consistently across the three topics. For the Auto Analysis group, the traits of delivery (clarity, use of fillers, and speaking rate) were also assessed. Descriptors for each trait allowed a rating of 0 (not established), 1 (developing), 2 (established) 3 (approaching excellence), or 4 (excellence).

Appendix A illustrates the traits, descriptors, and point allocations for the Bongo (without Auto Analysis) scoring rubric created for the purposes of this study. Appendix B illustrates the scoring rubric used for the Bongo with Auto Analysis treatment.

Figure 1
Sample Auto Analysis Report



Data Analysis

Quantitative Analysis of the Data

An analysis of variance (ANOVA) was conducted to determine whether there were significant differences in Retention by Treatment and Topic. The assumption of normality was assessed by plotting the quantiles of the model residuals against the quantiles of a Chi-square distribution, also called a Q-Q scatterplot (DeCarlo, 1997). The ANOVA was examined based on an alpha value of 0.05. Table 4 presents the Analysis of Variance for Retention by Treatment and Topic. The main effect Treatment was significant, $F(2, 76) = 16.57, p < .001$, indicating there were significant differences in Retention by Treatment levels. The main effect Topic was also significant, $F(2, 76) = 5.56, p = .006$, indicating there were significant differences in Retention by Topic levels.

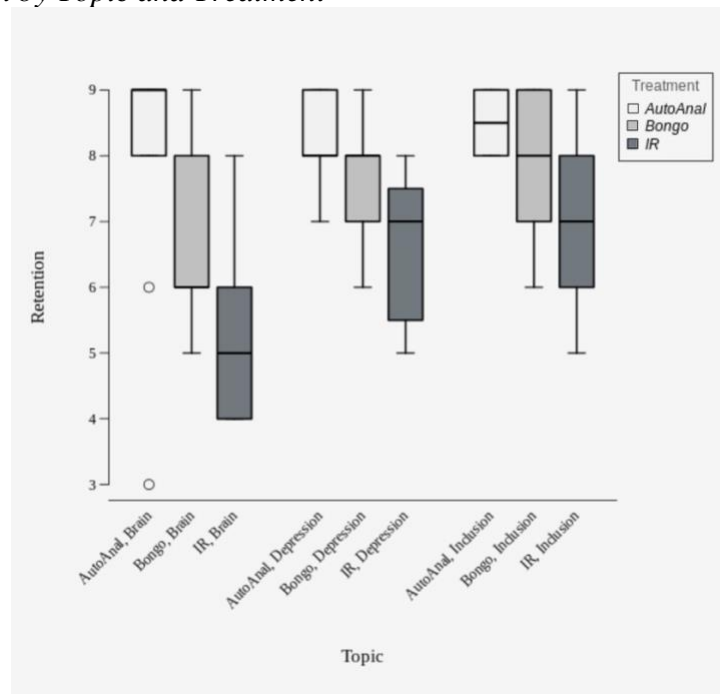
Table 4

Analysis of Variance Table for Retention by Treatment and Topic

Source	df	Sum of Squares	Mean Square	F Value	p-value
Treatment	2	49.951	24.975	16.566	1.0683e-06
Topic	2	16.755	8.3773	5.5567	0.0055937
Residuals	76	114.58			

Figure 2

Boxplot of Retention by Topic and Treatment



Post-hoc

Figure 2 presents a boxplot for Retention by Topic and Treatment. Based on this figure, on average Retention for Auto Analysis is higher compared to Bongo and IR. This is confirmed with multiple comparisons based on Paired *t*-tests between each pair of measurements to further examine the differences among the variables. Table 5 presents Tukey's HSD pairwise comparisons of Treatment means based on an alpha of 0.05. For the main effect of Treatment, the mean of Retention for Bongo ($M = 7.5185$, $SD = 1.1887$) was significantly larger than for IR ($M = 6.2593$, $SD = 1.4031$), $p < .001$. For the main effect of Treatment, the mean of Retention for Auto Analysis ($M = 8.1481$, $SD = 1.2921$) was significantly larger than for IR ($M = 6.2593$, $SD = 1.4031$), $p < .001$. These significant findings can be interpreted to indicate that the use of Bongo, both with and without Auto Analysis, produced greater recall of new concepts than independent reading alone.

Table 5

Table of 95% Family-wise Confidence Level for Treatment Means

Difference Levels	Mean	Lower Limit	Upper Limit	Adjust p-value
IR-Bongo	-1.2593	-2.0581	-0.46041	0.00093213
IR-Auto Analysis	-1.8889	-2.6877	-1.09	7.856e-07
Bongo-Auto Analysis	-0.62963	-1.4285	0.16922	0.15026

Table 6 presents Tukey's HSD pairwise comparisons of Topic means based on an alpha of 0.05. For the main effect of Topic, the mean of Retention for Brain ($M = 6.7037$, $SD = 1.8977$) was significantly smaller than for Depression ($M = 7.5556$, $SD = 1.1209$), $p = .040$. For the main effect of Topic, the mean of Retention for Brain ($M = 6.7037$, $SD = 1.8977$) was significantly smaller than for Inclusion ($M = 7.6667$, $SD = 1.2403$), $p = .006$. A likely factor in the effect of Topic on learning retention is the novelty and complexity of the text material. The teen brain article contained many references to unfamiliar scientific and neuroanatomy terms, and Flesch-Kincaid estimates of reading level were highest for the teen brain article.

Table 6

Table of 95% Family-wise Confidence Level for Topic Means

Difference Levels	Mean	Lower Limit	Upper Limit	Adjust p-value
Depression-Brain	0.82853	0.029686	1.6274	0.040314
Inclusion-Brain	1.0562	0.25739	1.8551	0.006327
Inclusion-Depression	0.22771	-0.57114	1.0266	0.77501

Qualitative Analysis of the Data

Of the total sample of 27 subjects, 24 completed the Bongo Q&A survey. Responses to the survey produced 72 minutes of recorded video, which were then converted to verbatim transcripts using the Bongo transcription tool. The process of analytic induction began with the researcher's reading and re-reading of transcripts to identify theoretical categories of phenomena (Goetz & LeCompte, 1981). Once salient themes were identified from the transcribed data, the interview data units were sorted into categories using the method of constant comparison (Glaser & Strauss, 1967). To further scrutinize the data, HyperRESEARCH™ computer software was used to code all responses to the 4 questions according to themes identified through inductive

analysis. HyperRESEARCH™ allows for the computer-assisted analysis of qualitative data through the processes of coding data, retrieving coded text, testing propositions, testing hypotheses, and analyzing statistics (Hesse-Biber & Dupuis, 2000). As a result of this analysis, the researcher interpreted and modified categories of emergent themes to adjust for negative cases (Lincoln & Guba, 1985) and revise hypotheses. The use of multiple sources (24 subjects) and multiple investigators (two researchers to conduct peer debriefings) provided two methods of triangulation (Lincoln & Guba, 1985). To accomplish peer debriefing, the primary researcher conducted analytic discussions with a colleague who had examined all the raw data and developed some interpretations. In these debriefings, the investigators probed and clarified the bases for their initial assertions, determined the extent to which the assertions matched the depth and breadth of the data, and explored working hypotheses regarding general themes.

Overarching Themes in the Data

Table 7 provides a summary of frequency counts for frequently coded categories in response to each of the three questions. Analysis of the qualitative data showed that students strongly endorsed the use of Bongo presentations as a tool for increased engagement, comprehension, and retention. They recognized the importance of focused reading and reiterative practice in mastering content as opposed to skimming the surface. Students valued the experience of presenting to the instructor and peers, and this sense of audience provided increased accountability and an imperative to analyze the reading. The process of teaching and articulating ideas helped to solidify learning and retention. Students also valued the Auto Analysis feature of Bongo and felt it helped them to improve presentation skills that would be essential in their future roles as teachers.

Analysis of the Data in Response to Specific Survey Questions.

A number of themes emerged in response to the initial research questions. The ordering of themes and subthemes are presented below in relation to the three research questions. The order of presentation of these themes and subthemes for each question represents their relative rankings in terms of importance, as determined by the frequency of coded units. These frequencies are also included in Appendix A. It is important to note, however, that the frequencies were affected by such factors as nesting of categories within coded segments and varying lengths of discourse within given coded units. In some cases, the subthemes identified had low frequencies of coded units, but the content of the categories was deemed to be particularly informative or salient.

Question 1: How did the process of creating your own Bongo presentations help you to master the content of our course, *Adolescence*?

In responding to how the process of creating Bongo presentations helped promote mastery of the course, inductive analysis revealed several dominant themes that could be categorized according to processes (deep processing/engagement/focus and reiteration/practice) and outcomes (comprehension, retention, and improved presentation skills). Students recognized that they remembered more of the concepts and understood them better as a result of the process of creating their own slides and script and recording them repeatedly until the presentation met the standards of the rubric and their own personal standards. This reiterative process of drafting/recording/revising led to deeper engagement in the content as well as a clearer focus on

key concepts and terminology. They discovered that the process of reading course content is not cursory, but rather, involves concerted effort. It is likely that this increased metacognitive awareness of reading demands will transfer to other assignments and courses as well.

Question 2: In particular, how did the Auto Analysis feature help you to improve your presentation skills and content knowledge?

In explaining how the Auto Analysis feature helped to improve presentation skills and content knowledge, students noted the importance of a sense of audience, increased confidence, greater awareness of filler words and speaking rate, increased focus on key terminology, and improved clarity. Presenting to an audience of peers and instructor, students felt compelled to do their best work and make sure they clearly understood the content. The process of articulating or giving voice to their thoughts helped students to better understand the material as well. Virtually all students overcame their initial reticence and became increasingly confident in their presentation skills. They became conscious of, and worked on, improving their speaking rate and reducing their use of filler words. By checking the frequency of their use of key terminology, students also became more astute at filtering their presentations to focus on important ideas and eliminate extraneous details.

Question 3: What other aspects or features of Bongo did you find influential in your learning?

Responses to this question were quite varied, but among the noted influential features were 1) simultaneous web camera and desktop recording, 2) Q&A assignment, 3) Auto Analysis feedback, 4) instructor feedback, 5) playback and self-analysis. Students felt that the reiterative process of creating a PowerPoint, recording themselves and the slides, watching themselves and revising/re-recording before submitting helped them to anchor their learning. They particularly valued the Auto Analysis feedback provided on their attempts, as well as the instructor's video and text feedback. The Q&A assignment also led to increased accountability for reading and learning by articulating (“saying it aloud”) led to more learning. Several students mentioned that Bongo provides a novel alternative to traditional assessments. In addition, recording time limits forced students to be succinct and precise in their presentations and to limit extraneous and redundant verbiage.

Table 7
Frequency Counts for Bongo Survey Response Themes

Question	Theme	Frequency	Selected Quote
Question 1: Promoting Learning	Deep processing Engagement Focus	14	“I think it's easy for students to say they read and just skip to, like quizzes and just try to guess their way to the answers. But having created a Bongo presentation allowed me to actually read and analyze a text so I can better understand it, ‘cause I want to make sure when I do the presentation that the people on the other side understand what I'm trying to convey as well, and so it was a really great process for me.”

Learning by teaching Articulation	10	“I feel like, personally, the most important thing about the Bongo presentations and just assignments, in general, are more so the idea of teaching the content back to someone so learning and memorizing and knowing a certain concept. The topic is good. But, while I have the ability to teach it back to someone or [repeat] it back to someone and try to explain it, I feel like that helped me really master the contents for me.”	
Reiteration Practice	8	“For each assignment that had a do a Bongo presentation, I spent significant amount of time doing the presentation or the PowerPoint and also practicing many times through creating a script and it really helped me memorize and really just understand information better because even now when I go back and re-watch some of my Bongo presentations, I still remember the information, like to this day. So, I really liked it. It really helped a lot in my opinion and helped a lot with the confusion I was having, cause I had to kind of go out and research more and flush it out for myself. So that helped a lot.”	
Retention	8	“This was the first course I've had that I had to use Bongo and honestly, it really helped me like engrave the information into my brain.”	
Comprehension	6	“The process of creating our own Bongo presentations helped me to learn more about the content in our course. It really was like an effective study tool because, um, I actually had to, like, think deeper about the topic and put it into, like, an effective PowerPoint. So, that helped me in that sense to actually, like, fully learn it.”	
Question 2: Auto Analysis	Reducing Filler Words	9	“It was really helpful for me because I say a lot of ‘uhs’ and just words that are not necessary and so really helped me improve on it.”
Improved rate of speech	8	“The Auto Analysis feature helped me, um, improve in, um, my speed. I tend to speak quick and a lot of the time what I say, you know, the point doesn't quite get across.”	
Focus on key words & concepts	8	“It shows you if you said some of the key terms correctly, like vocabulary, and it highlights how many times you use that. So, in a way, it helped me become a	

better writer knowing that . . . it just helped my content be more thorough over time.”

	Clarity	7	“It made me be a little more cautious with thinking before speaking and coming out with more clean and crisp sentences and words and how to formulate what I'm saying in a good way.”
Other Influential Features	Simultaneous webcam and desktop recording	4	“I most definitely liked this screen share that you were able to do with the Bongo presentation recording; how we were able to share our laptop screen or computer screen, as well as the front facing camera. So, in a way, it, you know, even though this is an online course, it reinforces the same way in an in class setting where you would have to maintain eye contact, where you would have to go through your PowerPoint slides and learn how to present yourself in front of people.”
	Auto analysis feedback	4	“I think it was really cool how I could, um, see my spoken words per minute or, um, how much vocabulary I was using, or if there was any repeated words, which really helped me be able to give a good a good response to the prompts of the presentations, and that really helped my learning and well speaking in general.”

Discussion of Findings

This study examined the efficacy and utility of Bongo student screen recordings as a tool for enhancing student retention of content knowledge. The research questions were:

1. Which of the three assignment types would produce the greatest level of retention of information?
2. To what extent do students perceive the value of Bongo video recording as a contributor to their learning?
3. How do students perceive that the Auto Analysis features of Bongo influenced their learning?
4. What particular features of Bongo do students perceive as most influential to their learning?

Results of both the quantitative and qualitative aspects showed support for Bongo as a valuable and popular tool. In response to question 1 (which of the assignment types produced the greatest level of retention), results demonstrated significant differences in levels of retention for both Bongo treatments (without and with Auto Analysis) as opposed to the treatment of Independent Reading. Bongo with Auto Analysis produced the highest level of content retention across topics (teen brain, inclusion, and teen depression), and this was likely due to increased

attention to keywords required to meet criteria of the rubric, as well as the reiterative aspect of practicing and repeating the presentation until a satisfactory level of performance in delivery and content was achieved.

Two factors may limit the interpretation and generalizability of these findings. First, the constraint of small sample size ($n=24$) was necessitated by the selection of one intact online class for inclusion in the study. Second, the inclusion of primarily preservice teachers might limit the generalizability of the findings to students in other academic disciplinary areas. Further research is recommended to include larger sample sizes and varied disciplinary areas to explore the potential value of Bongo more fully as a tool for promoting online learning and engagement.

Faced with the demands of balancing school and work lives, students often resort to a cursory reading of course materials such as textbooks and supplementary resources. One study of undergraduate finance majors indicated that only 24% of students read their textbooks prior to coming to class (Jones, 2011). In addition, some evidence suggests that the amount of textbook reading decreases as the semester progresses (Phillips & Phillips, 2007). A recent review of literature indicated that these patterns of college reading behavior are common across the disciplines (St Clair-Thompson et al., 2017).

The current study helped students to internalize the need for careful analysis and rigorous study of course materials, particularly those that are content dense and include many complex ideas. It is likely that this improved metacognitive ability and self-regulated learning will enhance student reading generally, not just for the duration of this experiment.

Students were virtually unanimous in the support for the value of Bongo, and especially the features of Auto Analysis. As future teachers, these students were motivated to improve their delivery skills and gain confidence in their speaking abilities. They were receptive to repeated practice to achieve levels of excellence in both delivery and content. They appreciated both the immediate feedback provided through Auto Analysis and the rubric-based and video-recorded feedback of the instructor. Students expressed a favorable orientation toward the use of an alternative to the typical reliance on text-based discussions they had experienced in previous online courses. In fact, one student recommended to a professor in her speech class that Bongo would be a valuable tool for this content area, particularly in light of the rapid shift to online instruction experienced during the initial months of the pandemic.

The results of this study provide strong support for the value of Bongo video presentations as a digital tool to enhance student learning and retention. They support the notion that multisensory learning is superior to unisensory environments, and greater resolution and retention is evident even twenty years later (Medina, 2008). And it appears that Bongo assignments can promote deep processing and sustained engagement with course materials.

Video-based assessment provides an alternative to overreliance on text-based discussion forums and contributes to the development of a collaborative and constructivist classroom. In addition, it helps students to anchor learning through repeated practice with immediate feedback. Students' comprehension is likely enhanced through the process of verbally articulating their understanding, an elaborative process that helps the brain to integrate new information with prior

knowledge. And finally, the potential for online learning is greatly enhanced through multisensory media.

Previous research has shown that video-based discussion tools such as VoiceThread and Flipgrid can promote collaboration and student satisfaction with the online learning experience. This study extends the current research base on student video capture to provide evidence of improved learning in addition to positive learner perceptions. This study demonstrated that, for this group of students, Bongo was useful in increasing content retention. The Auto Analysis feature that provides immediate feedback on the use of key terms can encourage students to hone their content focus and spend more time interacting with the target text material and concepts. Auto Analysis feedback on delivery (clarity, use of fillers, and speaking rate) can help students to become aware of their communication skills and to present their content more effectively. These skills have application in a wide variety of academic disciplines in higher education.

The use of Bongo as a discussion and assessment tool might be especially valuable in helping students to gain more meaning from their textbooks and other course readings. By spending more time with the material, crafting their own presentations, and rehearsing their understanding of the text through repeated practice, students may develop learning strategies that they can apply generally to their online and classroom readings.

Because peers and instructors can provide text and video feedback, Bongo can promote valuable collaboration in learning. The ability to hear and see the speaker should help students to feel more connected to their online learning experience, their peers, and their instructor. This study used the individual project assignment of Bongo, but future research could explore the value of group project, Q&A, and interactive video features as well.

Ultimately, it makes sense for online instructors to use a variety of discussion and assessment tools. Text-based discussion forums and varied video platforms can increase interest and engagement with online content. This study has provided support for the use of Bongo as an effective tool for helping students to reinforce their learning, as the assignments could be used to support both classroom and online learning. As an alternative to text-based discussion, Bongo has a unique ability to improve student learning and presentation skills.

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 California State University, Fullerton, USA.

The authors declared that they received no financial support for the research, authorship, and/or publication of this article.

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Appendixes

Appendix A

Scoring Rubric for Bongo Presentation without Auto Analysis

	Not Established	Developing	Established	Approaching Excellence	Excellent
Duration	There is no presentation	Video is less than 3 minutes or more than 5 minutes	Video is 30 seconds under or over the time limit	Video is 15 seconds under or over the time limit	Video is between 3 and 5 minutes
Content Development on Slides	There are no slides	1 or 2 slides, but the content is cluttered or unclear	3 slides logically organized	3 to 4 slides, clearly organized, or 5 slides with less than substantive content	5 slides, well organized, and the content is substantive
Relevance and Coherence	Content has no relationship to the article	A tangential relationship can be inferred	A general relation is apparent	A specific relationship is apparent	The content is explicitly related to the article and is coherent
Inclusion of Key Terms	The presentation contains no references to key terms in the article	There are several references to key terms, but these are simply mentioned and not explained	There are numerous references to key terms, but there is no explanation	There are 7-9 references to key terms and these are clearly explained	The presentation includes and illuminates at least 10 key terms
Accuracy	The presentation is largely inaccurate	There are numerous inaccuracies and factual errors	There are several inaccuracies and factual errors	The majority of the content is accurate and informed	All the content is accurate, informed, and sufficiently paraphrased

Appendix B*Scoring Rubric for Bongo Presentation with Auto Analysis*

	Not Established	Developing	Established	Approaching Excellence	Excellent
Duration	There is no presentation	Video is less than three minutes or more than 5 minutes	Video is 30 seconds under or over the time limit	Video is 15 seconds under or over the time limit	Video is between 3 and 5 minutes
Content Development of Slides	There are no slides	1 or 2 slides, but the content is cluttered or unclear	3 slides logically organized	3 to 4 slides, clearly organized, or 5 slides with less than substantive content	5 slides, well organized, and the content is substantive
Relevance and Coherence	Content has no relationship to the article	A tangential relationship can be inferred	A general relation is apparent	A specific relationship is apparent	The content is explicitly related to the article and is coherent
Inclusion of Key Terms	The presentation contains no references to key terms in the article	There are several references to key terms, but these are simply mentioned and not explained	There are numerous references to key terms, but there is no explanation	There are 7-9 references to key terms and these are clearly explained	The presentation includes and illuminates at least 10 key terms
Accuracy	The presentation is largely inaccurate	There are numerous inaccuracies and factual errors	There are several inaccuracies and factual errors	The majority of the content is accurate and informed	The presentation includes and illuminates at least 10 key terms
Clarity (percent of clear words)	NA	NA	Auto Analysis score is in the red range	Auto Analysis score is in the orange range	Auto Analysis score is in the green range
Use of filler words (avoiding use of "um", "ah")	NA	NA	Auto Analysis score is in the red range	Auto Analysis score is in the orange range	Auto Analysis score is in the green range
Speaking Rate	NA	NA	Auto Analysis score is in the red range Red: score <120 or >200	Auto Analysis score is in the orange range Orange: score is 120-135 or 185-200	Auto Analysis score is in the green range Green: Score of 135–185 (ideal is 160)

Appendix C*Scoring Rubric for Retention Q&A Quiz*

	Not Established	Marginal	Developed	Expanded
Question 1	Not answered	Vague, inaccurate, or irrelevant response	Accurate and relevant response, but lacking specific detail	Germane and relevant response that contains references to specific terminology and concepts
Question 2	Not answered	Vague, inaccurate, or irrelevant response	Accurate and relevant response, but lacking specific detail	Germane and relevant response that contains references to specific terminology and concepts
Question 3	Not answered	Vague, inaccurate, or irrelevant response	Accurate and relevant response, but lacking specific detail	Germane and relevant response that contains references to specific terminology and concepts

Academic Performance in Distance Education: Quizzes as a Moderator Variable and Students' Perception and Expectation through Linguistic Analysis

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Abstract

This study sheds light on the relation between assessment modalities and student behavior through linguistic styles, and academic performance. First, we examine the effect of assessment modalities (self-evaluation quizzes and summative quizzes) on academic performance. Using two modalities of online quizzes, we mainly focus on the student participation, student behavior (the work pacing and time management), type of assessment, and student characteristics. Second, we analyze the student behavior through linguistic styles and third, we examine the levels of anxiety and the expectation of success during the course. Specifically, we compare the linguistic styles of high performing students and low performing students and changes in anxiety levels and expectation of success. Methodologically, this study includes a static and dynamic perspective and combines quantitative analysis with a qualitative approach. The participants are students enrolled in Managerial Accounting for Tourism course in the academic year 2019–2020. The results show that both quizzes modalities are positively associated with academic performance. The linguistic analysis shows differences in the language between high performing students and low performing students. Finally, a pattern of changes on the students' expectations of success and levels of anxiety are identified during the course.

Keywords: academic performance, learning virtual platform, linguistic analysis, quizzes

Parte, L. & Mellado, L. (2022). Quizzes as a moderator variable and students' perception and expectation through linguistic analysis. *Online Learning*, 26(2), 124-147.

Blended and online models of learning in higher education are rapidly expanding worldwide. The report published by U.S. National Centre for Education Statistics in 2020 reveals an increasing trend in institutions and schools offering online courses at different levels, in addition to the number of students enrolled in this educational modality. In particular, the report shows 6.0 million of students enrolled in distance education modality in at least one distance education course in 2019. Kumar et al. (2019) pointed out that online education system is not merely a passing trend but a widely prevalent learning system worldwide. Furthermore, the COVID-19 pandemic forced a transition from traditional classes to online classes worldwide to guarantee student learning during the pandemic, which can create new opportunities for a wide variety of educational institutions.

Given the increasing importance of online and blended models in higher education, a fruitful area of research has emerged, especially in the last decade. Some crucial research questions are related to learning quality, interactions between instructor and students and with peers, teaching models, and student satisfaction. Student engagement and student motivation during the course are crucial variables in online learning to prevent dropouts (Alyahyan & Düşteğör, 2020; Inkelaar & Simpson, 2015). Kumi-Yeboah et al. (2020) highlight the importance of digital technologies in online settings because enhances the learning experiences, including student engagement and student performance. Consequently, instructors have the responsibility to implement appropriate strategies that promote students' active participation, engagement, and motivation during the course, which also may enhance learning outcomes.

Although online learning permits a variety of asynchronous and synchronous strategies, we believe that quizzes (both self-evaluation quizzes and summative quizzes or tests that contribute to their final grade) are a valuable tool to measure students' progress and allows a constructive learning. At the same time, quizzes contribute to students' engagement and motivation, active participation during the course, provide a quick and useful feedback during the semester (Bälter et al., 2013; Cook & Babon, 2017; Gibb & Simpson, 2005; Ross et al., 2018) and have a positive impact on grades (Förster et al., 2018). However, some research finds that quizzes are not useful in all the cases. For example, Ross et al. (2018) showed that adaptative quizzes contribute to student motivation and engagement, but they do not contribute to the final output.

This research seeks to go a step forward in the field by analyzing the effectiveness of tests and quizzes to enhance student learning and retention in distance education. We complement previous studies in the field (Bälter et al., 2013; Cook & Babon, 2017; Parte & Mellado, 2014) by including different testing modalities to analyze the students' behavior, motivation, engagement, and its association with academic achievement, in addition to a linguistic analysis of the students' expectations and perception about the success.

The first objective is to examine the effect of voluntary quizzes on academic performance, regarding a test that affect the final grade (summative quizzes) and quizzes that do not affect the final grade (self-evaluation quizzes). Specifically, the study examines the participation of students in both quiz modalities during the online course and its association with academic achievement; the student behavior (work pacing and time management) when they access and complete the task and its association with academic achievement; the association between both quiz modalities

(also accumulative quizzes) and academic achievement; and finally, the association between student characteristics and academic achievement. In terms of methodology, we used descriptive statistics, contingency tables, correlation analysis, t-tests and Mann-Whitney U tests, and regression analysis.

In an online setting, the communication and interaction between instructors and students and between peers are key variables. Psychological studies suggest that individual linguistic styles and linguistic constructions enable an understanding of personality features and traits, attitudes, thinking styles, and moreover predict the academic performance (Pennebaker et al., 2014; Tausczik & Pennebaker, 2010). Focusing on online setting, most previous research relies on the Community of Inquiry (CoI) framework to understand the dimensions of online learning (Choy & Quek, 2016; Garrison et al., 2001; Joksimovic et al., 2014; Zhu et al., 2019). Using this robust framework, several papers find associations between student linguistics styles and learning outputs (Joksimovic et al., 2014; Zhu et al., 2019).

Other traditional lines of research on psychological and educational field focuses on self-efficacy and self-determination as a strong predictor of academic performance (Bandura, 1989). Jacobi (2018) shows that self-determination theory is important to explain the needs of online students. Indeed, previous empirical studies suggest that the online tools (like quizzes) are important to enhance students' learning but also their self-efficacy, confidence and levels of anxiety influencing their learning and the outcome (Bandura, 1989; Butz et al., 2015; Pekrun, 2006). The control-value theory (CVT) explains that achievement emotions predict subsequent achievement. Based on this theory, several studies examine emotions (enjoyment, anxiety, pride, boredom, etc.), perceptions of control, value, and success in learning environments (e.g., Butz et al., 2015; Pekrun, 2006). Research suggests that regarding pre-exam anxiety, students having greater anxiety perform worse than students with less anxiety or higher levels of self-determination (Pekrun, 2006). It is noted that emotions in distance learning are mainly unexplored (Butz et al., 2015).

Building directly upon the first objective of this research, the second and the third objective of this study is to analyze student behavior through linguistic styles when they complete the quizzes and the levels of anxiety and the expectation of success during the course. First, we compare the linguistic styles of high performing students and low performing students. Second, we examine changes in anxiety levels and the expectation of success during the course. Finally, we manually read all the student answers to make additional inferences. To capture and examine the linguistic styles and draw inferences of student behavior during the semester, we use the Linguistic Inquiry and Word Count (LIWC) software that provides several categories to measure emotional, cognitive, structural, personality features and process components both in written text and verbal speech (see e.g., Pennebaker et al., 2014; Tausczik & Pennebaker, 2010).

Given the calls in academia for more research addressing critical issues in an online setting, this paper sheds light on learning assessments, linguistic styles, and student emotions and expectations during the course. To our knowledge, no research has specifically examined the relations among these together in distance learning.

Literature Review

Assessment and academic performance

Academic performance is understood as the final output of the learning process. In general, the academic performance is an indicator of the student's learning progress, the skill acquisition, and the ability and knowledge in the subject. Many researchers have focused on the factors associated with academic achievement, student academic success and student academic failure. York et al. (2015) pointed out that academic success is driven by five factors: academic achievement, attainment of learning objectives, acquisition of desired skills and competencies, satisfaction, persistence, and post-college performance. In a revision of the literature, Alyahyan and Düşteğör (2020) find that most studies have focused on five factors when studying academic success: prior academic achievement (measured mainly by grades and cumulative grade point average), student demographics, e-learning activity, psychological attributes, and environments. It is also noted that student e-learning activity information and psychological attributes are less studied compared with prior academic achievement and student demographics (Alyahyan & Düşteğör, 2020).

Howard (2020) focuses on assessments regarding three modalities: unproctored online students, testing-center-proctored, and software-proctored. The results show that the exam scores of the unproctored online students are not different to the means of the exam scores of the testing-center-proctored and software-proctored. However, unproctored online students spent more time compared with the other two groups. Using a sample of students from Distance University, Herrador-Alcaide et al. (2019) find that academic success depends on the student attitude toward the virtual learning environments, self-perception about generic skills, and satisfaction with the learning process.

Several authors point out the effectiveness of testing to enhance student learning, improve the memory and retention, motivate students, or boost academic performance (Adesope et al., 2017; Bälter et al., 2013; Cook & Babon, 2017; Gibb & Simpson, 2005; Parte & Mellado, 2014). The excellent meta-analysis published by Adesope et al. (2017) provides a comprehensive analysis to understand the benefit from the tool, the conditions where tests outperformed other tools (such as fillers, readings, rereading, etc.), the main advantages for students that take tests, and offers some guides to design and implement tests (in terms of number, time, formats, settings, etc.).

Regarding the online setting, Gibb and Simpson (2005) remark on the importance of formative assessment with proper feedback in Open University to motivate and engage students. Bälter et al. (2013) find that online quizzes with generic questions related to previous lectures to test the knowledge of the subject and limited feedback (in terms of short answers, right or wrong) are helpful for the students to test their knowledge and can change certain students' habits.

Gibbs and Simpson (2005) explain that tests and quizzes with timely feedback and assessment contribute to reinforce and enhance student learning. The importance of motivation for the learning itself and not just for a reward is also mentioned. Cook and Babon (2017) analyze online quizzes as a mechanism to motivate students with the material, to engage them in the course, to promote the knowledge of the subject, and finally to connect the students' effort with their grade. The results show that online quizzes that affect their grades are regarded positively by students. Hence, most students

highlighted that quizzes helped to understand the readings. Förster et al. (2018) show that student participation in quizzes in online setting contributes to final exam. They also detected that quizzes contributed more to grades for those students who participated less compared to student who participate more. They also find differences in gender variable. Ross et al. (2018) detected that students perceive that quizzes, in particular adaptive quizzes, is a tool that support their learning. That is, adaptative quizzes enhance student motivation and engagement but the academic achievement does not increase significantly with quizzes.

Self-efficacy, linguistic style, and academic performance

One interesting area of research examines the association between students' linguistic styles and academic performance. Psychological theories posit that linguistic styles (the words and sentences that people choose and the meaning behind the sentences) enable an understanding of personality features, attitudes, cognitive process, thinking styles, etc. In educational field, one of the most popular programs to capture the linguistic styles is Linguistic Inquiry and Word Count (LIWC) (Pennebaker et al., 2014; Tausczik & Pennebaker, 2010). The text analytic of the program is based on term frequency, which measures the number of times a word appears in a document. Pennebaker et al. (2014) identified eight standard function word categories in 50,000 student admissions essays, which correspond to more than 25,000 entering students, and predicted grades over four years. The categories selected combine students' abstract thinking and their cognitive complexity. Also, Robinson et al. (2013) confirm the results obtained by Pennebaker et al. (2014), adding more linguistics categories extracted from LIWC. Subsequent papers have also examined the relationship between students' linguistic styles and different learning strategies and learning output (e.g., Abe, 2020; Joksimovic et al., 2014; Yoo & Kim, 2013; Zhu et al., 2019), as well as its associations with students' characteristics such as gender (Robinson et al., 2013; Schwartz et al., 2013) and age (Schwartz et al., 2013).

Focusing on online setting, most recent research relies on the Community of Inquiry (CoI) model that is a robust framework to understand the dimensions of online learning in communities of inquiry (e.g., Choy & Quek, 2016; Garrison et al., 2000, 2001; Zhu et al., 2019). CoI is based on social constructivism and explains that the learning occurs when students interact with others in a sociocultural context. Considering this framework, online learning is explained through three constructs: teaching presence, cognitive presence, and social presence; the second construct becomes the most important (Abe, 2020; Choy & Quek, 2016; Garrison et al., 2000, 2001; Joksimovic et al., 2014; Zhu et al., 2019). For example, Choy and Quek (2016) find that the cognitive element is directly and positively associated with the continuous achievement and output performance in blended learning while teaching presence and social presence are indirectly associated with continuous achievement.

Furthermore, Joksimovic et al. (2014) analyzed the linguistic features through students' online discussion transcripts. They use four levels of cognitive presence according to the sociocognitive process: triggering, exploration, integration, and resolution phases. Findings reveal a pattern of linguistics style through the four levels of cognitive presence, and word count is a strong predictor of the cognitive presence. Moreover, Abe (2020) finds that word count, which is a proxy of cognitive presence, predicts academic performance using a sample of undergraduate psychology in online classes. Zhu et al. (2019) emphasize the need to promote social presence in online setting from instructors and students. The study suggests that students exhibiting higher

social presence used greater number of positive words and positive tone, which reflect their satisfaction with the course. Other signals include posted comments and claims. They also find an increase in the use of clout words (causality words), which could be indicative of confidence with their communication abilities and with the course, but at the same time could be a signal that students' cognitive processes in terms of social presence decrease at the end of the semester.

Yoo and Kim (2013) focus on students' online discussions to predict student performance. The results show that the number of answers provided to others, expressions of positive emotion, and communication about problems in an early phase are linked to student grades. Ross and Wright (2020) find that "work" words provides an indirect measure of math attitude and it is associated with the student's academic performance in an introductory finance course. According to these authors, this category is particularly interesting in Finance, because it is associated with conceptual framework and professional context, and it also reflects the effort. Although this category is not well analyzed in Education, we consider it interesting to include in business disciplines such as Accounting.

Based on previous empirical studies in online setting, this study focuses on students' linguistic styles during the course and its association with academic achievement in distance university. Specifically, this paper focuses on three objectives:

- Objective 5. Linguistic style and academic performance.
- Objective 6. Categorical language and academic performance.
- Objective 7. Narrative language and academic performance.

Self-efficacy, emotions, and expectation of success

A traditional line of research on psychology and education field focuses on self-efficacy and self-determination as a strong predictor of academic performance (Bandura, 1989; Christensen et al., 2002). Self-efficacy refers to student expectations about how well they can perform (Bandura, 1989). In an interesting study, Christensen et al. (2002) show that self-efficacy beliefs influence accounting students' academic performance and is conditioned to the student expectation (optimistic or pessimistic) about their success. Based on robust theories such as self-determination, achievement goal theory (AGT), students' approaches to learning (SAL), and social cognitive theory, extensive research examines student self-efficacy, goal orientation, intrinsic and extrinsic motivations, and self-determination, and the moderating factors that impact the relationship using different settings.

Other interesting areas of research focus on achievement emotions and achievement outputs. Control-value theory (CVT) provides a solid framework to explain achievement emotions and academic performance and successful outcomes (Pekrun, 2006). Researchers suggest that students with high levels of pre-exam anxiety perform worse than students with less anxiety or more levels of self-determination (Pekrun, 2006). Also, the literature has focused on examining emotions as a moderator factor and the relations between performance goals, achievement, self-efficacy, self-regulation, academic expectations, among others (see e.g., Butz et al., 2015). In an interesting study, Butz et al. (2015) examine the role of students' emotions (enjoyment, anxiety, and boredom), perceptions of control, value, and success in synchronous hybrid learning environments that includes traditional classes and online teaching using web

conferencing. The results of this study can be used as a baseline for future research in online setting and distance learning. Although this study focuses on hybrid learning model, to date most empirical research is based on traditional classes, leaving room for research in the online setting.

Based on previous empirical studies in online setting, this paper focuses on student anxiety levels and expectation of success. Our last objectives are as follows:
Objective 8. Changes in anxiety levels during the course.
Objective 9. Changes in success expectations during de course.
Objective 10. Student concerns about the subject.

Research Design

Context

The study was conducted in a sample of students enrolled in an accounting subject at Universidad Nacional de Educación a Distancia (UNED). UNED has a long history of offering blended and online education. It was created in 1973 through the modality of distance education and it is the main hybrid and distance learning university in Spain and one of the largest universities in Europe. In general, the students work and study at the same time. Indeed, they have limited time to be involved in the subjects, so they require a set of learning materials that allow them to take an advantage of their study time (Herrador-Alcaide et al., 2019). The language used at the university is Spanish.

The subject chosen for the study is Managerial Accounting for Tourism as students normally perceive the subject as difficult and, in general, the student motivation is low (see e.g., Holmes & Rasmussen, 2018; Parte & Mellado, 2021). Cost and Management Accounting normally is a compulsory subject for students enrolled in economics and business administration degree and for students studying Tourism. As mentioned before, the subject is a matter of considerable interest due to its application to real world. The syllabus requires both theoretical concepts and application of formulas and cost models to take decision in business scenarios. Goh and Scerri (2006) explain that hospitality students, in general, have a negative preconception toward accounting subject, described as “boring,” “numbers related,” and “difficult to understand.” However, the positive attitudes toward accounting increases when the student understand the concepts and the exercises.

The participants were students enrolled in the subject during the 2019–2020 academic year. Our role are course designers and teachers. At the beginning of the semester, we announced several online activities through the Blackboard Learn program. All the students have access to the resources provided in the learning management system. The students voluntarily attended the online activities according to the schedule announced at the beginning of the semester. In this study, students decide freely to participate in the online quizzes. That is, we do not assign student randomly to different groups (treatment and control group), because of ethical restrictions. The student responses are treated anonymously. The data from the analysis are obtained from the Blackboard Learn program and the grade program that collects students' grades.

Assessment and academic performance

During the semester, we conducted three voluntary online quizzes that did not affect their grade and a test that did affect their grade. The objective of the online formative quizzes is to provide a self-evaluation of the subject rather than an assessment with a mark. The content of the quizzes is directly related to the syllabus of Managerial Accounting for Tourism subject: quiz 1 contains basic concepts, quiz 2 comprises questions related to traditional cost models, and quiz 3 contains questions related to alternative cost models, cost-volume-profit analysis, and tools for planning and control. Cook and Babon (2017) suggest linking the quizzes with the student's grades and to focus on core materials to prepare student for the final exam. Consequently, we also provided an online test with contribution to the grade (summative quizzes) that contains questions for the eight chapters of the syllabus. Then, our project comprises both modalities of quizzes: self-evaluation and summative. In addition, we include an open question in each quiz related to student expectation of success in the subject. Specifically, we ask students about their confidence in the subject, challenges, motivations, and future perspectives. As we offer three quizzes, we have three open questions at three different times.

The self-evaluation and summative quizzes require not only a recollection of concepts but also a practical application to real world, where the students have to apply the concepts to short case studies where they need to apply cost models to find the final cost of products and services, determine margins by products and firm performance, take decisions to find the best solution for real business, etc. The quizzes are open over several weeks, and the student can choose a convenient time to complete the assessment through the Blackboard learning program, while for the test, the exact date and time is announced at the beginning of the course.

Several stages are defined to measure the effectiveness of quizzes and test in the course. First, we examine the student participation in the test and the quizzes during the course: frequency of the participation and number of quizzes attended (accumulative quizzes). As we offer two modalities, quizzes that have no effect on the grade and a test that affects the grade, the student participation could be different. Second, we analyze the student behavior when they access the Blackboard learning program and complete the task because the pacing and time management is important in distance learning. Third, we measure the contribution of the test and quizzes to the final exam grade, considering different levels of student success. Finally, we include prior academic achievement in the subject and students' demographic factors as prior studies in the field (see Alyahyan & Düşteğör, 2020 for a literature review).

Methodologically, we used the SPSS version 25 software package. For the data analysis, we used descriptive statistics, contingency tables, correlation analysis, t-test and U-Mann Whitney tests, and regression analysis. The regression analysis includes the students' final grade as the dependent variable and Test and Quizzes (number of quizzes attended) as independent variables. The regression also introduces three control variables: Repeater, Gender, and Location. The regression model is:

$$\text{Exam Grade} = \alpha + \beta_1 \text{ Test} + \beta_2 \text{ Quizzes attended} + \beta_3 \text{ Repeater} + \beta_4 \text{ Gender} + \beta_5 \text{ Location} + e$$

Prior research that included some of these control variables are Parte and Mellado (2014, 2021), Robinson et al. (2013), Schwartz et al. (2013), Tausczik and Pennebaker (2010), among others. It is also noted that most previous studies used Grades and Cumulative Grade Point Average in their models (see e.g., Alyahyan & Düşteğör, 2020; York et al., 2015). Future studies can include these variables.

Linguistic style and academic performance

As explained before, we included an open question in each quiz related to student expectation of success in the subject. Specifically, we asked students about their confidence in the subject, challenges, motivations, and future perspectives. As we offer three quizzes, we have three open questions at three different times: at the beginning, midterm, and at the end of the semester. The open questions allow a better understanding of student learning engagement and expectations. We processed the text using LIWC and read every answer individually.

LIWC was originally developed for the analysis of narrative of writing text but today it is also applied for call conferences, speech, etc. LIWC is based on word frequencies collected from word lists and calculates the relative frequency per word list in given texts. The main categories provided in LIWC are linguistic processes such as articles and pronouns, psychological processes (e.g., positive and negative emotion), cognitive processes (e.g., cause, etc.), personal concerns like work and leisure, as well as other parts of the text as assent and fillers, periods, punctuations, etc.

The first step to use LIWC is to provide the text in .txt file. Our Blackboard learning program provided the student answers in another format. Specifically, the original text is in .csv format file. We convert the .csv to a word and text file. We also reviewed manually each answer to make sure that the text is correctly translated to .txt file. Following Robinson et al. (2013), we review the misspelled words to ensure that every student's words in the text are codified in software. Later, the text files were processed using the LIWC software (Spanish version).

LIWC provide several categories according to the text introduced in the software. To select the categories associated to student performance, we relied on prior educational studies in the field (Abe, 2020; Pennebaker et al., 2014; Robison et al., 2013; Ross et al., 2018; Ross & Wright, 2020). According to these studies, linguistic style can reflect students' psychology and can be associated to student success. For example, Pennebaker et al. (2014) detect that more categorical language, thinking logically and hierarchically are associated with the use of more articles and prepositions. Yoo and Kim (2013) reveal differences in the emotions used by students: more positive emotions for successful students and more negative emotions for non-successful student. Robison et al. (2013) detect that the number of quotations also reveals differences between groups. Ross and Wright (2020) find that work words are part of an interesting category in business and can correlate in math courses and finance and accounting courses. In contrast, weak performing students use more pronouns, conjunctions, and negations, which indicate more dynamic language, intuitive and narrative thinking (Pennebaker et al., 2014), negative emotions, verbosity (present verb tense), social dimensions related to family and ingested dimensions (Robison et al., 2013).

In this study, we are interested in examining the linguistic analysis according to student academic performance. Then, we analyzed the linguistic analysis of student in two groups: students who passed the final exam (high performing students) and students who did not pass the final exam (low performing students).

Student behavior changes: emotions and expectation of success

Our last objective is to examine a pattern of change in student behavior during the semester. To address this objective, we examine the student answers in the open questions through LIWC program. That is, we use an indirect measure of anxiety and student academic expectations. We rely on LIWC to capture the levels of positive and negative expression, particularly the anxiety score and the cognitive dimension. The evolution in the variables allows us to examine the changes in student behavior. Finally, we manually analyze the students' writing to deeply examine the responses and capture the students' expectations and other dimensions.

Results

Table 1 presents the descriptive statistics. The total number of students enrolled in the course is 358. The final exam, in an ordinary session, is attended by 165 students (46.09%). The student participation and response rate to the voluntary assessments are as follows: 110 (30.73%) attended the test with contribution, 59 (16.48%) attended Quiz 1, 62 attended Quiz 2 (17.32%) and 51 (14.25%) attended Quiz 3. The descriptive statistic shows that the participation in the test is higher than the participation in the quizzes. This means that rewards and incentives are important for students. A decrease in student participation in the last quiz was noted. Only students who attended the final exam or participated in at least one quiz are included in the study.

Table 1
Descriptive statistics

	Test and Quizzes					
	Total	%	Yes	%	No	%
Exam	358	100%	165	46.09%	193	53.91%
Test	358	100%	110	30.73%	248	69.27%
Quiz 1	358	100%	59	16.48%	299	83.52%
Quiz 2	358	100%	62	17.32%	296	82.68%
Quiz 3	358	100%	51	14.25%	307	85.75%

	Gender					
	Total	%	Female	%	Male	%
Gender over total students	358	100%	234	65.36%	124	34.64%
Gender over exam	165	100%	108	65.45%	57	34.55%

	Location									
	Total	%	G1	%	G2	%	G3	%	G4	%
Location over students in Blackborad	315	100%	80	25.40%	106	33.65%	70	22.22%	59	18.73%
Location over exam	164	100%	42	25.61%	60	36.59%	35	21.34%	27	16.46%

In general, prior studies indicated that dropout rates in e-learning are higher than in traditional education. For example, Simpson (2010) shows that the dropout rate at the British Open University is around 78%. The UNED reports a lower dropout rate in comparison to other Distance Universities, but it is also a concern.

Table 1 shows that the percentage of females is around 65% and that of males is around 35%. The university also allocates student by geographical location. Further inspection reveals that the percentage of students enrolled in the subject for the first time are 66.06%, while 33.94% the students enrolled in the subject more than once, of whom 67.86% attended the exam in the preceding year, in ordinary or extraordinary session.

Table 2 shows the contingency analysis. The first row presents the quizzes attended and the accumulative quizzes during the course. The results reveal that 86 students attended one quiz, 53 students attended two quizzes, and 33 students attended all the quizzes. The second row shows that most students prefer to attend the quizzes at the end of the period; that is, near the deadline. Procrastinator students versus early completers is an interesting variable to study in Distance University. Also, the students prefer to attend the quizzes in the afternoon and evening instead of mornings or nights. This is logical because our students are working and studying at the same time and may found it difficult to attend the quizzes in the morning. It is also noted that the majority prefer to attend the assessment during the week instead of on weekends.

Table 2
Contingence analysis

		Individual quizzes				Acumulative Quizzes (at least)			
		Quiz 1	Quiz 2	Quiz 3	Total	One	Two	Three	Total
Quizzes attended	Frec	59	62	51	172	86	53	33	172
	%	34.30%	36.05%	29.65%	100%	50.00%	30.81%	19.19%	100%
		Quiz 1				Quiz 3			
		1	2	3	Total	1	2	3	Total
Week	Frec	15	8	36	59	4	8	39	51
	%	25.42%	13.56%	61.02%	100%	7.84%	15.69%	76.47%	100%
		Morning	Aft/Even	Night	Total	Morning	Aft/Even	Night	Total
Day time	Frec	15	31	13	59	20	22	9	51
	%	25.42%	52.54%	22.03%	100%	39.22%	43.14%	17.65%	100%
		No	Yes	Total	No	Yes	Total		
Weekend	Frec	46	13	59	39	12	51		
	%	77.97%	22.03%	100%	76.47%	23.53%	100%		

Table 3 presents correlation coefficients (Pearson is reported above and Spearman is reported below the diagonal). The results indicate a positive and significant correlation between the student academic performance (*Exam*) and the Test and the Quizzes ($p < .05$) and the number of times that the student attended the quizzes ($p < .05$). These results suggest that both individual quizzes and accumulative quizzes are associated to academic performance. The results also showed a negative correlation

between academic performance and the coefficient of the variable Repeater ($p < .05$). The coefficients on Gender and Location are positive but not statistically significant ($p > .05$).

Table 3
Pearson and Spearman correlation

	Exam	Test	Quiz 1	Quiz 2	Quiz 3	Quizzes attended
Exam		0.298 ***	0.318 ***	0.260 ***	0.170 **	0.293 ***
Test	0.308 ***		0.399 ***	0.423 ***	0.241 ***	0.422 ***
Quiz 1	0.312 **	0.399 ***		0.629 ***	0.523 ***	0.853 ***
Quiz 2	0.262 ***	0.423 ***	0.629 ***		0.546 ***	0.864 ***
Quiz 3	0.162 **	0.241 ***	0.523 ***	0.546 ***		0.811 ***
Quizzes attended	0.314 ***	0.421 ***	0.835 ***	0.853 ***	0.778 ***	

Note: Pearson correlation is reported above the diagonal and Spearman correlation is reported below the diagonal. * $p < .10$. ** $p < .05$. *** $p < .01$.

Table 4 provides the student performance conditioned to Quizzes modalities (Panel A) and Student behavior (Panel B). The last column shows the t-test and U Mann-Whitney test. In Table 4, Panel A, the variable Test (Quiz) takes the value 1 if the student attended the Test (Quiz) and 0 if they did not attend. The results show that the mean grade is higher for students who attended the Test (Quiz) compared to students who did not attend the Test (Quiz). Both t-test ($p < .05$) and U Mann-Whitney test ($p < .05$) reveal statistically significant differences.

Table 4, Panel B shows the student behavior when they complete the quizzes. The first line shows the differences between student categories: progressors, non-progressors, and non-completers. The variable accumulative quizzes take the value 0 if the student did not attend any quizzes during the course, the value 1 if the student attended one quiz during the course, the value 2 if the student attended two quizzes during the course, and the value 3 if the student attended three quizzes. An alternative measure is a dummy variable that takes the value 0 if the student did not attend any quizzes and the value 1 if the student attended one or more quizzes. The results show that students with accumulative Quizzes (both measures) earn higher grades in the final exam. In all cases, the mean grade is higher for students who attended the Test (Quiz) compared to students who did not attend the Test (Quiz), and the mean grade increases with the number of quizzes attended. The statistical test shows statistically significant differences ($p < .05$). This means that progressors perform better than non-progressors and non-completers. It is also noted that non-progressor perform better than non-completers.

Table 4

T-test and U Mann-Whitney test

Panel A. Quizzes modalities and academic performance

Exam		N	%	Mean	t-mean		U Mann Whitney	
					t	p-value	z	p-value
Test	Yes	85	51.52%	5.911	3.990	0.000	-3.940	0.000
	No	80	48.48%	4.181				
	Total	165	100%					
Quiz 1	Yes	50	30.30%	6.468	4.278	0.000	-3.993	0.000
	No	115	69.70%	4.465				
	Total	165	100%					
Quiz 2	Yes	52	31.52%	6.183	3.563	0.001	-3.352	0.001
	No	113	68.48%	4.561				
	Total	165	100%					
Quiz 3	Yes	43	26.06%	5.902	2.204	0.029	-2.079	0.038
	No	122	73.94%	4.780				
	Total	165	100%					

Panel B. Student behaviour and academic performance

Exam		N	%	Mean			z	p-value
					t	p-value		
Quizzes attended	0	94	56.97%	4.252				0.000
	1	26	15.76%	5.873				
	2	16	9.70%	6.719				
	3	29	17.58%	6.103				
	Total	165	100%					
Quizzes attended	1 or more	71	43.03%	6.158	4.397	0.000	-4.171	0.000
	None	94	56.97%	4.252				
	Total	165	100%					
Week - Quiz 1	Early	18	36.00%	7.128	1.331	0.190	-1.779	0.075
	At the end	32	64.00%	6.097				
	Total	50	100%					
Week - Quiz 2	Early	22	42.31%	6.205	0.051	0.960	-0.241	0.810
	At the end	30	57.69%	6.167				
	Total	52	100%					
Week - Quiz 3	Early	11	25.58%	6.555	0.921	0.363	-1.719	0.086
	At the end	32	74.42%	5.678				
	Total	43	100%					
Week panel	Early	4	26.67%	8.775	2.685	0.019	-2.225	0.026
	At the end	11	73.33%	5.736				
	Total	15	100%					

Table 4, Panel B also shows the student behavior in terms of early completers and late completers. The variable week takes the value 1 for early completion of the quizzes and 0 for completion near the deadline. The results show that students who chose to complete the quizzes at the beginning of the period (Early) obtained higher mean grades in the final exam than students who chose to complete the quizzes towards the end of the deadline. In Quiz 2, the mean grade is very similar between both groups

because the deadline for Quiz 2 is close to the test affecting the final grade, and students are interested in this test. It is also noted that the mean grade for students who complete all the quizzes at the beginning (Early) is 8.77 while the mean grade for students that complete all the tests at the end of the period is 5.74. The t-test ($p < .05$) and U Mann-Whitney-test ($p < .05$) reveal statistically significant differences. This means that early completers earn better grade than late completers.

In terms of students enrolled in the course for the first time and students enrolled in the subject more than once the mean grade is higher for the former group and the t-test ($p < .05$) and U Mann-Whitney test ($p < .05$) show statistically significant differences. In contrast, we do not find statistically significant differences due to the fact that the students attended the exam in the preceding year ($p > .05$). Also, the Gender and Location variables do not show statistically significant differences, using t-test ($p > .05$) and U Mann-Whitney test ($p > .05$).

Complementary to the previous results, Table 5 disaggregates the student grade in four levels: fail, pass, notable, and outstanding. The results indicate that in all the levels, students who attended the test and quizzes obtained higher mean grades compared to students who did not attend the assessments.

Table 5
Grade disaggregation

		Test		Quiz 1		Quiz 2		Quiz 3		Quizzes attended	
		N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
Failed	Yes	29	2.552	12	2.450	15	2.720	14	2.486	21	2.557
	No	47	2.053	64	2.205	61	2.126	62	2.189	55	2.124
	Total	76		76		76		76		76	
Pass	Yes	19	5.905	11	5.927	13	5.892	10	6.060	15	5.940
	No	10	5.690	18	5.772	16	5.781	19	5.711	14	5.714
	Total	29		29		29		29		29	
Notable	Yes	23	7.970	17	7.859	14	7.736	13	7.762	23	7.835
	No	19	7.563	25	7.736	28	7.811	29	7.797	19	7.726
	Total	42		42		42		42		42	
Outstanding	Yes	14	9.493	10	9.520	10	9.580	6	9.583	12	9.517
	No	4	9.350	8	9.388	8	9.313	12	9.400	6	9.350
	Total	18		18		18		18		18	

Table 6 presents three regression models: the first introduces the variable test, the second includes the variable quizzes attended and the third considers both variables. The regression results show that self-evaluation quizzes and summative quizzes are positive and significantly associated with good academic performance ($p < .05$). The coefficient on Repeater is negative and significantly associated with good academic performance ($p < .10$). In contrast, the coefficients on Gender and Location do not present statistical significance ($p > .05$). The evidence suggests that students who attend

summative quizzes and the self-evaluation quizzes more times perform better than those who do not attend the assessments.

Table 6
Regression results

	Coef. Est.		Coef. Est.		Coef. Est.	
	Beta	Sig.	Beta	Sig.	Beta	Sig.
c		0.000		0.000		0.000
Test	0.249	0.002			0.169	0.054
Quizzes attended			0.246	0.002	0.165	0.061
Repeater	-0.155	0.044	-0.150	0.053	-0.134	0.081
Gender	0.061	0.423	0.074	0.328	0.057	0.451
Location	0.040	0.591	0.040	0.592	0.039	0.597
R ² adjusted	0.092		0.090		0.106	

Table 7 presents the results of linguistic analysis dividing the students in two groups: students who passed the final exam (high performing students) and students who did not pass the final exam (low performing students). As expected, the results show that high performing students used more articles, prepositions, quotations, positive emotions, work accounts and work words in the quizzes. The work account is the variable with more differences. Students who did not pass the final exam used more pronouns, conjunctions, negations, negative emotions, verbosity (present verb tense), social dimensions related to family and ingested dimensions in the quizzes. The results confirm prior evidence in the field (Abe, 2020; Pennebaker et al., 2014; Robison et al., 2013; Ross et al., 2018; Yoo & Kim, 2013).

Table 7
Linguistic analysis for high performing student and low performing student

	High performing students	Low performing students
Articles	11.11	10.25
Prepositions	14.42	12.92
Quotation	0.06	0.00
Work words	1.77	1.68
Work account	6,670	2,555
Positive emotions	4.00	3.72
Pronouns	7.05	8.18
Negation	1.05	1.06
Conjunctions	4.54	4.89
Negative emotions	0.58	0.94
Verbs	2.86	3.87
* Present tense	7.69	8.57
Social	4.09	4.58
* Family	0.15	0.20
Ingestion	0.40	0.55

Table 8 shows a summary of student emotions in three instances. The results indicate that the anxiety level increases during the course and prior to the final exam. Regarding their optimism, the results indicate that the expectation of success and confidence to overcome the subject is higher in Quiz 1 than in the Quiz 2, while it was higher in Quiz 3 than in Quiz 2. This is logical because at the beginning of the course, students are generally optimistic about their success. However, in midterm, some students became less confident and some of them dropped out. The deadline of Quiz 3 is close to the final exam and most students who attend Quiz 3 expect to attend the final exam. This shows that they have studied the subject and they have a positive expectation about their success.

Table 8
Emotions

	Quiz 1	Quiz 2	Quiz 3
Negative emotions	0.55	0.70	0.94
* Anxiety	0.16	0.25	0.35
Negation	0.97	1.09	1.18
Optimism	2.17	1.78	1.84
Achieve	3.04	2.56	2.63

Closer inspection of the students' open questions reveals interesting comments. First, we identify the main areas of interest according to keywords, coincidences in short expressions, and sentences with the same meaning. Students' comments mainly focused on four topics: (1) positive comments about their expectation to success, self-efficacy and confidence to overcome the subject, (2) high motivation to study the subject, (3) practical application to the subject for real business and future work, and (4) appropriate materials to follow the course, mainly the textbook (they also appreciated the tutorials and the instructors attending the virtual forums immediately after being asked).

Approximately 72% in Quiz 1 emphasized a positive perception to success the subject. The percentage decreases in Quiz 2 but increases in Quiz 3. Representative comments about students' perceptions of their success and high motivation are as follows:

Since the beginning of the course, I am trying to follow the schedule conscientiously in order to pass the subject, possibly with a good score. I feel qualified for this and I am confident that with effort and perseverance, I will be able to reach my goal.

It has been a pleasant surprise to see that this accounting course has a different focus than the rest of the subject. I am a schoolteacher, while also studying Tourism simultaneously. I am very motivated as I am about to finish my studies. I am confident of passing this subject, although I am aware that it requires effort. I hope to achieve my goal.

I am attending the subject with a lot of confidence and encouragement.

I like the subject and I am very motivated to overcome it.

My expectation for this subject is high. I am confident that I will be able to pass the subject in the first attempt as I am quite motivated.

Approximately 25% in Quiz 1 emphasized the practical application of the subject in real world and future profession. The percentage decreases in Quiz 2 but increases in Quiz 3 (approximately 34%). Representative comments in this area of interest are the following:

I believe that it is a subject whose contents are widely applicable to real world where there is always a high labor demand. It is becoming common to find job offers, in which people need accounting knowledge and skills.

At first glance, it seems like a boring subject, a traditional accounting discipline with traditional accounting entries and account numbers, but I find it eminently practical and useful in the real world. I would like to focus on it and get a good score, which means I have understood it.

It is an interesting subject, which will be useful for future work. One of my goals is to be an entrepreneur in the tourism industry.

Approximately 32% in Quiz 1 emphasized the importance of appropriate materials to follow the course, mainly the textbook, and attention by instructors. Representative comments about students' perceptions of the materials include:

I find the book very practical because it explains all the processes step by step and applies the concepts and the theory to the case studies. At the moment, I think it can be very useful for the professional activity related to cost management, cost control, and budget in industrial and service companies. The book is one of the best for the tourism course. I agree with many of my colleagues.

Congratulations for the book because it really introduced the subject very well and with enough detail.

First of all, I would like to congratulate you for the book, it is difficult to find a book that explains the content so clearly and concisely. The structure is good. I think that in general, it is very well written, and the content is clearly explained with some very concise examples that cleared up all doubts regarding the concepts.

Negative comments mainly addressed the difficulty in understanding accounting concepts, the significant effort required, the challenges and the effort with the case studies and the difficulty to study and work at the same time.

Discussion

This study examines the relation between assessment modalities and student behavior through linguistics styles, and academic performance. The first objective of this research is to examine the effect of assessment modalities on academic

performance. The results indicate that students who attend voluntary online quizzes perform better than students who do not attend the online quizzes. In all cases, the mean grades for the former are higher compared to the latter. Furthermore, students who attend more quizzes (accumulative quizzes) performed better. A decrease in participation in the last quiz was also noted. This is logical because the students who expect to attend the exam are the most interested in the last quiz, and some students dropped out of the subject for the extraordinary session or the next year. The participation in summative quizzes is higher than self-evaluation quizzes because students are rationally motivated by a reward. The results also indicate that students who attend summative quizzes perform better than students who did not attend summative quizzes.

In terms of the student behavior, we find that early completers performed better than late completers. A preference for taking the online self-evaluation quizzes and summative quizzes in the afternoon and evening instead of at mornings and nights was also noted, due to the fact that most students simultaneously work and study at the university. The majority of students choose the weekdays and last days of the period to complete the quizzes. The results also show that progressors earn higher final course grades compared to non-progressors and non-completers.

The second objective of this study is to analyze student behavior through their linguistic styles when they complete the quizzes. Findings reveal that successful students, in terms of academic performance, use more articles, prepositions, and work words, indicating more categorical language. In contrast, unsuccessful students, in terms of academic performance, use more pronouns, adverbs, conjunctions, negations, negative emotions, verbosity (present verb tense), social dimensions related to family and friends, and ingested dimensions, which indicate more dynamic language.

Finally, the results indicate that anxiety levels increase during the course, and prior to the final exam. The results also show a pattern of change in the expectation of success and confidence to overcome the subject during the course. Further inspection of the students' answers reveals the main student concerns related to the subject and their main areas of interests.

Research Implications

To date, little research has examined the relation between several variables related to assessment and students' perception and expectation through linguistic analysis, and academic performance. Hence, the evidence in online learning systems, especially in Blackboard Learn, is in an incipient phase (Abe, 2020; Butz et al., 2015). As there is rapid growth in blended and distance learning in higher education worldwide, there are calls for more empirical evidence in student motivation, emotions, communication, and interaction, and learning styles. To fill this gap, we designed a study with implications in three different streams to the literature, assessments, linguistic style, emotion analysis, and student perception about expectations and concerns, within the context of distance education. Taken together, we consider that the study is relevant and timeless.

To address the objectives, the study uses a static and dynamic perspective, and combines quantitative analysis with a qualitative approach. The static perspective permits an early diagnosis of the student and creates opportunities for instructors and

institutions to find solutions during the early phase of the course. The research also offers a dynamic perspective by studying different modalities of assessment and students' expectation at different times. The dynamic perspective allows the revision of different strategies defined in an early stage of the course in order to enhance the learning and achieve the outputs of the course. The evidence is valuable for instructors and institutions to find solutions not only in an early phase of the course but also during the course.

Our results suggest different effects on the grades for online quizzes modalities (formative and summative) and student behavior (progressors versus non-progressor or non-completers and early completers versus late completers). We also find some different effects related to students' linguistic styles and changes in students' expectations and anxiety level. Taken together, the results could help to implement active and successful learning strategies, and continuously assess the potential problems to find solutions and conduct and redirect the situation when necessary.

Furthermore, according to the systematic review in online business education research provided by Kumar et al. (2019), the majority of the studies were conducted in the U.S. Looking at business disciplines, information systems and management and business are the most studied while accounting, finance, marketing are less explored. It is also important to mention that students normally perceive Cost and Managerial Accounting as a difficult subject and the engagement and motivation are low (Holmes & Rasmussen, 2018; Parte & Mellado, 2021). Compared to other business subjects, Cost and Managerial Accounting may create additional levels of anxiety both during the semester and before the exam, and low levels of expectation to pass the exam since the beginning of the course. Hence, accounting undergraduate students still have a traditional view of the accounting profession, excluding a social dimension that is a desirable competence according to the majority of business syllabus (Mellado & Parte, 2020). Consequently, this paper sheds light on students' perception and expectation on accounting discipline in a university with long tradition in online and blended modalities.

Practical Contribution

A key practical takeaway for educators from this paper is the finding that voluntary online quizzes are valuable in distance education. One of the main advantages of online quizzes is that they provide a quick answer to students about the formative assessment and also allows an analysis of student behavior. The study identifies some habits when students complete the quizzes that could be useful for instructors to design learning strategies and activities in the course. In particular, quizzes at the beginning of the course allow an early student diagnosis to take actions and mitigate potential problems related to previous knowledge, skills, progress in the subject, or even prevent early drop-out. Quizzes at midterm allow a revisit of previous diagnosis in order to continue to take actions and mitigate potential problems. Quizzes at the end of the course and prior to the final exam allow the instructor to measure the level of anxiety before the final exam and understand student strategies and student learning during the course that helps in preparing for the syllabus of the next course.

The study also identifies some differences in the linguistic styles between high-performing students and weak-performing students that could be used for an early student diagnosis. The evidence also shows that the students' optimism declines as the

course progresses and the anxiety levels increases during the semester. Consequently, instructors need to design active learning strategies during the semester and increase the intensity in the last weeks of the semester. Moreover, special attention is needed in the group of inactive students or offline students (Parte & Mellado, 2021). Although online courses, in general, have a passive group of students, with low rates of participation during the semester that feel comfortable attending only the final exam, we encourage educators to take action to engage this group of students in learning from the beginning itself and promote their participation. The engagement is crucial in preventing dropouts, which is an important issue in online learning system.

Another practical contribution from this research is that linguistic style allows identification of students' profile and behaviors during the semester, not only from a static point of view but also from a dynamic perspective. Consequently, instructors can benefit from the students' communication and interactions to identify students' profiles in an early phase to help students achieve their objectives. It is also important to examine how student motivation and expectation changes during the semester. The more complete the information about the student is, the easier it is for instructors to identify learning problems and redirect the strategy to help students. Considering the challenges that blended learning and distance learning in higher education create for instructors, researchers, institutions and policymakers in the post-COVID-19 era, the results of this study could be valuable to academia and future research in the field.

Limitations and Future Works

Like any research, the empirical part of this study has its limitations, as the sample used in this study comprised one class during an academic year. Future studies could increase generalizability considering students from more than one class and across more than one academic year. The current study relied on students that voluntarily completed the quizzes and tests. That is, all the students have access to the resources provided in the learning management system due to ethical restrictions instead of being randomly assigned to treatment and control groups. The response rate in e-learning is a critical point because not all the students participate in the activities or used the resources of the virtual platform. Future studies should consider implementing different strategies to motivate inactive students to participate more actively in the course. It would be also interesting to include student grades and cumulative grade point average in the models.

In addition, an interesting avenue is to examine the relationships between the self-determination construct and other dimensions, considering the reciprocal effects in online setting. The evidence could go a step further for a better understanding of students in online distance education. It could also be valuable to explore the students' linguistic styles in an online setting collecting information from different channels as discussion groups, collaborative tasks, individual messages, etc. The results can be complemented with students interviews or focus groups to better understand the usefulness of the quizzes.

Declarations

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

The study was conducted according to the guidelines approved by the UNED (Spain). The study meets the ethical requirements set by the University.

The authors acknowledge the financial contribution from GID_2016_2 ("e-ConTIC") and UNED/Santander, Ref project 2020V/EU-UNED/04.

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Predicting social presence in videoconference-supported LMS courses: Mediation through L2 writing and speaking strategies

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Abstract

The issue addressed here concerns how second language (L2) speaking strategies mediate the relationship between L2 writing strategies and the social presence component of the community of inquiry (CoI) framework within the context of fully online courses that combined learning management system (LMS) for writing tasks and videoconferencing for live classroom discussion. L2 writing strategies related to planning and reviewing contribute to composing texts that students want to upload, present, and discuss, and this sharing is expected to foster classroom social behaviors and consequent language gains. For the current study, a cross-sectional survey of 256 university students was initiated to investigate the mediating effect L2 speaking strategies have on the relationship between L2 writing strategies and social presence. The results indicated positive path coefficients between review strategies and speaking strategies, review strategies and social presence, planning strategies and speaking strategies, and speaking strategies and social presence. Further, speaking strategies explain the relationship between planning strategies and social presence, indicating full mediation. Partial mediation was found for the path between review strategies and social presence. Recognizing how L2 writing and speaking strategies relate to one another and how that relationship influences a CoI illustrates the interconnectivity between language skills. Evidently, increased attention to planning and reviewing strategies results in a final composition worth sharing and discussing, and such sharing and discussion are building blocks to a vibrant social presence.

Keywords: Community of Inquiry, L2 writing strategies, L2 speaking strategies, online learning, social presence, higher education, COVID-19

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.

Transferring courses online during the COVID-19 pandemic meant videosynchronous speaking tasks such as group discussions, presentations, and read-aloud exercises were conducted online alongside writing tasks like journaling, composition, and short answer essay questions. Rarely does so much overlap between writing and speaking occur in online circumstances. Studies of language learning have well-acknowledged the aids of pre-task planning on L2 learning development in speaking and writing tasks (Abrams & Byrd, 2016; Ellis & Yuan, 2004; Seyyedi, Ismail, Orang, & Nejad, 2013). Planning embraces the preparation of task objectives, along with the creation and association of ideas (Chamot & O'Malley, 1994), and finally, reviewing includes the evaluation and altering of ideas, either written or spoken (Beauvais, Olive, & Passerault, 2011). However, despite decades of research investigating issues associated with the community of inquiry (CoI) in online learning environments (e.g., Arbaugh et al., 2008; Kim & Ketenci, 2019), the complexities surrounding students' connectivity emanate from L2 strategy use remains unexplored.

Since the early 1980s, research on writing development has shifted from the overall writing performance to the detailed writing process, focusing primarily on the cognitive processes involved in writing to disentangle complexities facing the writer's cognizance during the composition process (Flower & Hayes, 1981; Limpo & Alves, 2013). Most reviewed cognitive models of writing approve that accomplished writing involves three cognitive processes: planning, monitoring, and reviewing (e.g., Berninger & Winn, 2006; Hayes, 2000).

Conceptual Framing

Writing and Speaking Strategies

Few studies have scrutinized how L2 speaking strategies mediate the relationship between L2 writing strategies and the social presence component of a fully online course's CoI. The bulk of language learning strategy (LLS) research focuses on speaking (Lapkin, Swain, & Smith, 2002; McDonough, 2004; Oxford, 2011; Storch, 2004), with less explicitly focused on writing (Kao & Reynolds, 2017; Maarof & Murat, 2013; Wenden & Rubin, 1987; Zhang & Qin, 2018), and a scarcity of studies collectively investigating the connections between speaking and writing strategies (Veracruzana, 2011). Previous research can be considered the first step towards a more profound understanding of L2 writing and speaking strategies' roles to a CoI and how those roles can guide teaching practices in blended and fully online courses (Zenouzagh, 2020). Therefore, an essential issue in the literature is related to further exploration toward the teaching presence design, which might support and sustain the online virtual community's cognitive and social presence. Through planning strategies, learners develop content worth sharing and discussing, setting into motion the initial triggering stage of a CoI by providing students an object (i.e., written composition) to converse upon in future settings (Anderson, 2016; Garrison, 2017). In other words, the willingness to engage in speaking strategies in online learning is expected to mediate the relationship between L2 planning and reviewing strategies when writing because willingness, ability, and techniques to communicate in the L2 influence how energy exerted on writing strategies manifest in person-to-person communication. For example, students can use speaking strategies to share their writing during class presentations or group conversations, contributing to increased connectivity and social presence. Moreover, the student will be interested in the sharing process when writing results from appropriate levels of planning and reviewing.

CoI and English as a Foreign Language

The CoI framework not only has the potential for developing teacher learning (Zenouzagh, 2020), it guides the development of principles of valuable written feedback through collective efforts (Garrison, 2017). In addition, a CoI can positively aid second language classrooms by reinforcing knowledge construction through socialization (i.e., Fathi, Ahmadnejad, & Yousofi, 2019). In distance learning, asynchronously written communication common in online courses (e.g., discussion forums) can moderately compensate for the forfeiture of body language, live observation, and natural and planned partner and group activities associated with offline learning considered critical in fostering a CoI. Established findings from CoI research clearly illustrates a positive relationship between teacher, social, and cognitive presence and course satisfaction (e.g., Kucuk & Richardson, 2019), as well as an intention for future use (e.g., Traver, Volchok, Bidjerano, & Shea, 2014), and critical thinking (e.g., Yang & Mohd, 2020).

The issue addressed here concerns how planning and review strategies influence the social presence and how speaking strategies help explain the relationship between L2 writing strategies and social presence. In online courses, writing and speaking are two modes of communication that contribute to interactions; therefore, this study addresses how writing and speaking strategies influence the social presence and, consequently, knowledge construction. The following are the proposed hypotheses that guided our study in an attempt to understand better how L2 writing and speaking strategies relate with one another and how that relationship influences the social presence component of a CoI:

- H1: Increasing levels of planning strategies with L2 writing are associated with increasing levels of L2 speaking strategies.
- H2: Increasing levels of review strategies with L2 writing are associated with increasing levels of L2 speaking strategies.
- H3: Increasing levels of L2 speaking strategies are associated with increasing levels of social presence.
- H4: Increasing levels of planning strategies with L2 writing are associated with increasing levels of social presence.
- H5: Increasing levels of review strategies with L2 writing are associated with increasing levels of social presence.
- H6: The relationship between planning strategies with L2 writing and social presence is mediated by increasing levels of L2 speaking strategies.
- H7: The relationship between review strategies with L2 writing and social presence is mediated by increasing levels of L2 speaking strategies.

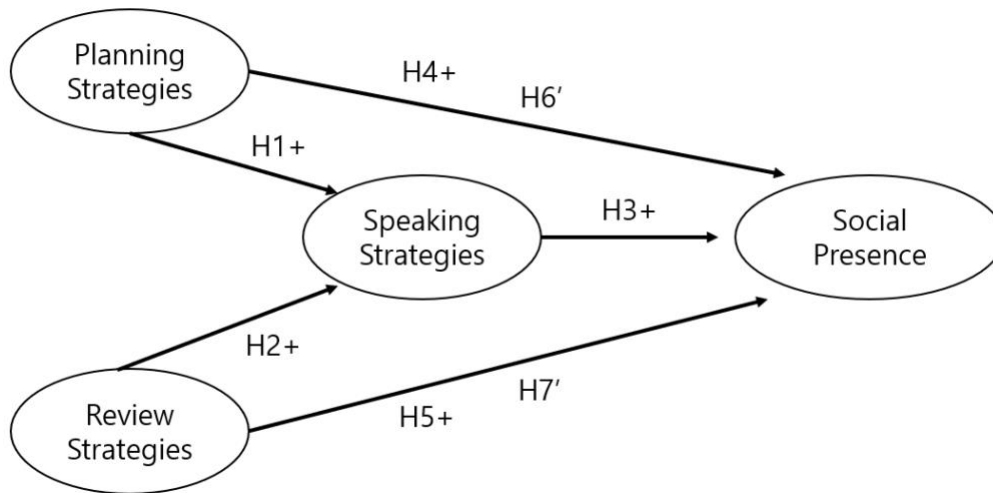


Figure 1. Proposed Model

Literature Review

Research has provided evidence that promulgating learners' collaboration aids in second language acquisition (SLA; Lapkin et al., 2002; McDonough, 2004; Storch, 1998, 2004; Swain & Lapkin, 1998). Online learning collaboration plays a critical role in higher education practice, especially in the context of English as a foreign language (EFL) (Kim & Ketenci, 2019). Studies have conveyed that online collaborative learning enables a sense of community (Chatterjee & Correia, 2020), multimodal approachability (Ching & Hsu, 2013), and social networking connectivity (McDonough, Vleeschauwer, & Crawford, 2019), which influences participants' positive attitudes and performances. EFL online collaborative activities also promote learners' affective and metacognitive skills, such as self-awareness and self-regulation (Chatterjee & Correia, 2020). Moreover, previous findings highlight a central argument that instructors' contribution to planning an effective instructional design is required when supporting learner participation in a collaborative EFL classroom (Aelterman, Vansteenkiste, Haerens, Soenens, Fontaine, & Reeve, 2019).

Theoretical Framework

The theoretical framework for this study is grounded in the early works by Garrison, Anderson, & Archer (2000), who established the connection between the CoI framework to speculate online, blended learning, and distance education (Anderson, 2016). Strategies and techniques in learning engage trigger, representing the actions responsible for shared communication, which is essential to a CoI. The CoI Framework upholds that social knowledge construction is allied when a course meets three unified components: teaching presence, social presence, and cognitive presence. These three CoI subcomponents are considered preconditions for constructing an enduring and meaningful learning community (Garrison, Cleveland-Innes, & Fung, 2010). The success behind integrating the CoI framework is related to a critical component within higher education: social examination (Garrison & Vaughan, 2008). The CoI is concerned with the nature of knowledge formation and the process of scientific inquiry and is broadly defined as any group of individuals working together to attain a shared goal. In the academic context, this applies to a merging social, cognitive, and teaching presence. To this end, educational setting,

learning content, and interlocutor discourse influence the learning experience. Hence, the relationship among the three CoI presences produces a model for and description of collaborative learning—involving knowledge co-construction within a learning environment that intentionally supports interactions that entail collaborative inquiry (Garrison, 2017).

Garrison et al.'s (2000) CoI framework is grounded on learners' capacity to build their social presence (i.e., dynamically participate and trust each other in social activities), cognitive presence (i.e., inquiry, analysis, co-construct meaning collaboratively), and teaching presence (i.e., plan, assist, and direct) within face-to-face or online environments. Cognitive presence refers to knowledge construction through communication with others or learning when communicating with others. However, teaching presence is principally responsible for the functioning quality of both social and cognitive presences related to the instructional strategies and organization of the course and the behaviors in which teachers facilitate discussion and provide feedback that elucidates ideas and stimulates learning (Garrison, 2017). Teaching presence helps set the parameters, affordances, and limitations of a CoI. Cognitive presence is possible through reflection and dialogue and consequently requiring some degree of social presence. The teacher creates the learning environment, and social presence emanates from reflection and dialogue with that environment (Anderson, 2016). However, the literature pertaining to these three components' significance suggests further examination is needed pertaining to the CoI's facilitation of identifying characteristics concerning elements of online learning communities (Kaul, Aksela, & Wu, 2018; Rubin, Fernandes, & Avgerinou, 2013). Further exploration is also required to ensure the framework captures the more nuanced components of specific educational practices, including the effects of course planning and the degree of engagement of course participants (Stewart et al., 2021).

L2 Writing Strategies and Social Presence

Writing strategy research continues to stay relevant because strategy training programs must adapt to evolving L2 writing environments. In line with past research (Kao & Reynolds, 2017; Maarof & Murat, 2013; Wenden & Rubin, 1987; Zhang & Qin, 2018), L2 writing strategies conceptually factor chronologically into planning (e.g., setting aside time to write, organizing thoughts, and outlining), monitoring (e.g., use a dictionary, read aloud, and simplify vocabulary), and review (e.g., ask others for feedback, compare writing with others, and ask the instructor for feedback) strategies. Strategies are useful tools for active, conscious, and purposeful self-regulation, which students rely on to cope with the challenge of writing in a second language (Payne, 2020). Review strategies often entail corrective feedback, asking a peer or instructor for comments to improve second drafts or future writing pieces. These strategies entail communicating with classmates and the instructor to make meaning out of composition emanating from the planning and monitoring writing strategy processes. A CoI is developed and sustained through communication-based on feedback-seeking behavior (Sewart, 2019). Metacognitive and cognitive writing strategies play a part in planning, monitoring, and evaluating and help students complete compositions accordingly (Payne, 2020). In the context of L2 writing, metacognitive strategies help students achieve learning goals. Similarly, cognitive strategies serve the purpose of regulations and goal achievement and are driven by metacognitive planning and organization processes (Aelterman et al., 2019). Examples of cognitive strategies with L2 writing include using a dictionary, translation tools, read-aloud techniques, and other explicit actions focused on completing a writing piece. These monitoring strategies hold an

adjacent position with metacognitive writing strategies that set the foundation for the organization and content to be written first, and possibly, discussed (or presented) second, in what can be described as a strategy-chain (Oxford, 2011). When writing, a strategy-chain encapsulates planning, monitoring, and reflecting on one's writing for the ultimate purpose of sharing ideas through discussion, presentation, posting, or publication with an audience. The reflection stage is a bridge to more social speaking strategies because it entails seeking help from others, including asking peers or teachers to improve future writing based on current writing quality. Writing can then be shared on class forums or presentations; such indirect sharing results in synchronous replies at the end of a class presentation or asynchronous replies to an online class forum. In either case, a classroom CoI emanates from the feedback and sharing stages of writing.

Online writing tasks like forums and blogs support writing strategy use and heighten levels of connectivity. The effect blog-mediated instruction had on learner characteristics was reported in the literature and found students experienced heightened levels of motivation and self-regulated learning and that their positive attitude to the online course had encouraged students to practice other writing in English (Blake, 2016). Mainly, students spent more time planning their writing because they knew it would be read by others publicly on the online class platform. While not directly related to social-seeking behavior, planning and monitoring strategies produced a more delicate writing quality worth discussing with others upon completion (Fathi et al., 2019). To understand how planning and review strategies relate to student characteristics, Bailey (2019) modeled the structural relationship of planning, monitoring, and corrective feedback strategies with English/non-English majors, L2 writing anxiety, and L2 writing skill. In general, students who employed more L2 writing strategies reported higher L2 proficiency and less apprehension to writing (Bailey, 2019).

L2 Speaking Strategies and Social Presence

In the wake of COVID-19, EFL learners across the world adapted quickly by attending the live portion of their courses online through videoconference platforms. Speaking with one another on videoconference platforms has an immediate effect on social presence. In contrast, connectivity among students may be delayed and limited when communicating asynchronously on LMS discussion forums. Speaking a second language involves a certain amount of planning, monitoring, reflection, instantaneous nature, and dependency on turn-taking, making such a chronological ordering impractical (Blake, Wilson, Cetto, & Pardo-Ballester, 2008). With L2 writing, even in public forums where a form of turn-taking occurs, it involves a significant amount of time for brainstorming and other planning strategies before monitoring (Payne, 2020). Likewise, monitoring is a distinctly separate stage from planning and after-writing review strategies.

The overwhelming amount of strategy research in SLA has been focused on speaking and learning based on Oxford's strategy inventory for language learning (SILL) (Oxford, 1990), while L2 writing strategy research has drawn less attention. The popularity of the SILL springs from the psychometric properties dividing strategies into direct and indirect sections. The classroom setting is detrimental in establishing strategies that meet learner needs (Huang, 2016). The progressively extensive use of social and technological tools (e.g., Wikis, Google Docs) in the second language (L2) settings has conveyed transformed responsiveness to collaborative

writing. While the current methodological methods to investigate collaborative writing are appreciated to comprehend L2 students' interactional forms or perceived experiences, they can be inadequate to deliver an authentic result of the learners' quantity and quality of writing within online environments (Yim & Warschauer, 2017).

Recognizing when strategies are used and how they relate to student characteristics (e.g., academic outcome) within a CoI framework provides educators with actionable intelligence of what training is needed, when needed, and why. For instance, heightened brainstorming and planning practices should not be overlooked for more direct social behavior but instead nurtured and brought to fruition as a reference point of social interaction (Payne, 2020). When learners spend time and energy planning strategies, they will produce a better-quality composition, which can be a source of value, praise, and inquiry during classroom discussions.

Methods

A quantitative research design using a cross-sectional survey was initiated to investigate the associations among L2 writing strategies, L2 speaking strategies, and the social presence component of the CoI. A cross-sectional study is an observational study that analyzes data from a representative population segment at a specific point in time. In this case, students were in their second semester of attending fully online EFL courses due to the COVID-19 pandemic. Instructors used their school's LMS to deliver L2 writing activities and Zoom videoconferencing for speaking practice.

Participants

A convenience sampling technique was used to recruit the students of two EFL professors with over 10 years of EFL teaching experience in South Korea. In all, the sample consisted of eight English communication skills classes totaling 256 (117 females and 139 males) freshman ($n = 129$), sophomore ($n = 101$), and junior ($n = 26$) university students with majors including architecture, trade, public administration, engineering, education, and accounting. The survey was administered to students on their sixth week attending their second semester of fully online videoconference courses using Zoom.

Second language proficiency was triangulated through standardized Test of English for International Communication (TOEIC) test scores, self-rated speaking scores, and self-rated writing scores (Cron alpha = .802). English proficiency skewed towards the upper intermediate range. TOEIC levels predominately ranged between 500 and 850. Self-rated speaking and writing skills were within similar ranges, approximately 5.5 out of 10 for males and 5.0 out of 10 for females (1 = low and 10 = high). High standard deviation values indicate mixed levels and, therefore, an accurate representation of L2 proficiency for South Korean university students (see Table 1).

Table 1
L2 Proficiency Ranked by Gender

	TOEIC (n = 254)		SR Writing (n = 256)		SR Speaking (n = 256)	
	M	SD	M	SD	M	SD
Male	2.64	0.93	5.54	1.99	5.43	2.12
Female	2.16	0.84	5.01	1.87	4.93	2.00
All	2.43	0.92	5.31	1.96	5.20	2.02

Note. TOEIC score 1=200-500, 2 = 500-700, 3=700-850, 4=850+; SR, self-reported; TOEIC, n = 254 (2 unreported); Self-reported writing and speaking, n = 256.

Class Environment

The 90-minute classes met once a week on Zoom to practice speaking, writing, listening, and reading. Figure 2 shows a Zoom class and Figure 3 displays students hosting a Zoom presentation. Both the recruited instructors used a variety of activities to help students practice authentic conversational English. Examples of writing and speaking activities are displayed in Table 2 and include composing paragraphs or journaling for writing and participating in partner or group speaking activities for conversational English practice.

Table 2
List of Writing and Speaking Activities

Writing Activities	Speaking Activities
Paragraph and essay structure	Partner or group speaking pairs
Online discussion forums	Webinar class with open discussion
Cooperative writing (e.g., group blog, wiki)	Video or audio recordings
Social media messaging (e.g., Kakao or Facebook groups)	Read aloud or alternate reading
Business writing (e.g., email, cover letter, or resume)	Self-disclosure
Creative writing (e.g., picture prompts or narratives)	Roleplay
Presentation scripts	Presentations

LMS activities were delivered through discussion forums (*see* Figure 4) or assignment submissions. Forums are a typical messaging board that allows file sharing and multimodal communication (i.e., images, links, video, and audio). Other platforms for text-based asynchronous communication included the social media platform Kakao, Zoom messaging, and smartphone text messaging.

Figure 2
Sample of Zoom EFL class (Bailey, Almusharraf, & Hatcher 2020).



Figure 3
Sample of Zoom EFL class (Almusharraf & Bailey, 2021).

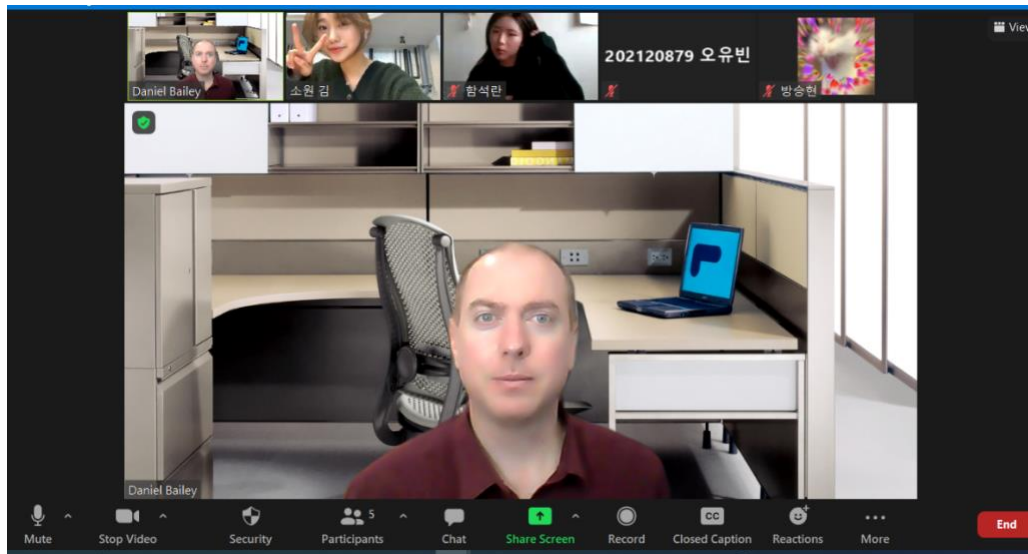
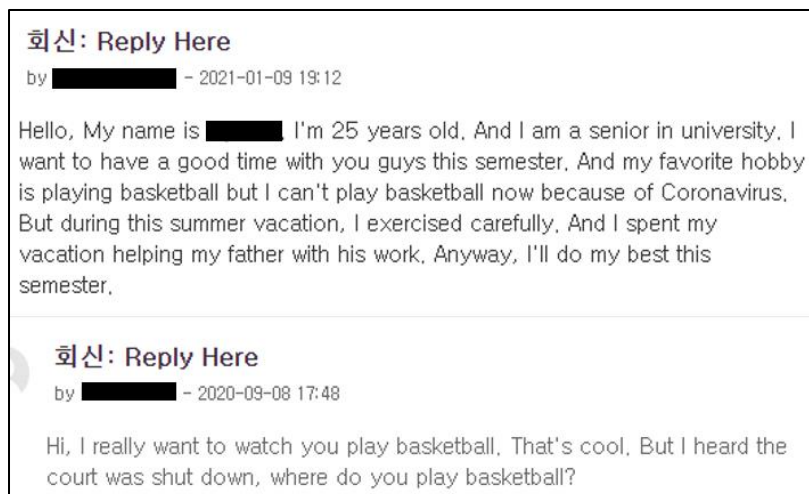


Figure 4

Sample of asynchronous LMS online discussion forum activity.



Approximately 50% of class activities were allocated to writing, 30% to speaking, and 20% to listening. Conversational English and other speaking practice activities occurred during the videoconferencing sessions, while writing practice occurred through the course LMS.

Materials

Instrument

The study administered a four-scale questionnaire, measuring planning strategies, review strategies, speaking strategies, and the social presence component of the CoI. Planning and Review strategy items were taken from Bailey's (2019) and Kao and Reynolds' (2017) writing strategy surveys. Planning items included *I set aside time in advance when writing in English*, *I organize my thoughts (e.g., brainstorm) before I begin writing in English*, *I plan my schedule so I will have enough time to write in English*, and *I look at writing examples (e.g., models) to help my writing*.

Review strategies included *I ask for help with my English writing*, *I compare my English writing to my friends' English writing*, *I ask others for feedback on my English writing*, *I use peer comments to improve my English writing*, and *I make changes to my English writing after receiving feedback*.

Speaking strategy items were taken from Lopez's (2011) speaking strategy survey and included *I ask the other person to repeat a word or phrase if it doesn't sound clear*, *I read aloud to improve my speaking skills*, *If I don't understand something, I ask my speaking partner to paraphrase what they said*, *If I don't understand what something means, I talk to my speaking partner for help*, and *I don't think much about what I'm going to say, I just talk so that my ideas flow naturally in English*.

Finally, the items for the social presence component of CoI were taken from (Rovai, 2002) and included *I feel that it is hard to get help when I have a question*, *I feel connected to*

others in this course, I feel that I am encouraged to ask questions, I feel that students in this course care about each other, I trust others in this course, and I feel that I can rely on others in this course. Cronbach alpha scores for scales ranged between .80 and .85 (see Table 4). All items were rated on a five-point Likert scale from 1 (never true of me) to 5 (always true of me). Items were translated from English to Korean by a professional translator with a degree in translation studies and 10 years of experience. A second translator reviewed translations, and discrepancies in translations were discussed and resolved. Reliability coefficients and factor loading scores are listed in Table 4.

Data Analysis

Quantitative data analysis was carried out using the statistical software packages IBM-SPSS-AMOS 25. Initially, descriptive statistics were performed to examine mean scores and bivariate Pearson correlations among the study variables. Linear regression was used to generate Mahalanobis and Cook's distance values to look for outliers in which nine existed and were consequently removed, leaving 256 total respondents. Normal distributions were observed for the indicators of the latent factors concerning kurtosis and skewness. No kurtosis values ranged outside -1 to +1, indicating acceptable levels of normal univariate distribution (George & Mallery, 2010). Exploratory factor analysis with SPSS followed by confirmatory factor analysis (CFA) with AMOS was used to validate the latent constructs. Once validated, variables were placed into the structural model to execute the structural equation modeling (SEM) procedure.

Results

Table 3 presents the results from the mean score and Pearson correlation analysis. Overall, students reported a strong social presence when fully online LMS courses with a videoconference component. Regarding strategies, students seem to perceive themselves as having a substantial language learning strategy repertoire for speaking and writing. On a 5-point scale, mean scores were in the medium to medium-high range between 3.44 and 3.69, with older students reporting to use review strategies less frequently when writing in a second language. Gender, L2 proficiency level, and age were added to give a broader view of the relationships among the variables of interest. Results show that male students reported higher levels of L2 proficiency; however, this did not equate to a more robust use of speaking or planning strategies. L2 proficiency revealed a statistically significant relationship with all of the observed variables, indicating that self-concept of ability is highly predictive of learner characteristics. Females reported higher use of speaking and review strategies than males; however, this difference was not significant.

Table 3
Correlation and Mean Score Analyses

	1	2	3	4	5	6	7
1 Gender							
2 L2 Prof	-.200**						
3 Age	-.079	-.143*					
4 Social Pres.	.012	.190**	.058				
5 Speaking	.114	.195**	.061	.525**			
6 Planning	.117	.218**	-.081	.475**	.440**		
7 Review	.083	.284**	-.158*	.454**	.432**	.504**	
Mean	1.45	N/A	21.5	3.77	3.44	3.69	3.43
SD	.499	N/A	2.16	.684	.615	.699	.631
Skew.	.188	N/A	1.290	-.118	-.013	-.117	.010
Kurt.	-1.98	N/A	1.128	-.307	.186	-.292	.274

Note. $p < .05^*$, $p < .01^{**}$; Male = 1, Female = 2; L2; see Table 1 for L2 proficiency values.

Study Model

We now explore direct and indirect effects within a structural model containing planning strategies, review strategies, speaking strategies, and the social presence component of the CoI. Exploratory Factor Analysis (EFA) was used to strengthen the internal reliability of the tested structural model. Factors for each of the four variables of interest were extracted through the maximum-likelihood method with Varimax rotation. Several well-recognized criteria for the factor analysis were used. The Kaiser-Meyer-Olkin (KMO) measure of sampling was .866, well above the adequacy level of .60, and Bartlett's Test of Sphericity was significant ($\chi^2 (171) = 1935.87$, $p < .001$). One item showed double loading above the .40 level on the planning and reviewing strategy scales. From a conceptual perspective, this item was deemed appropriate by the acting researchers to be on the planning scale. Table 4 displays the pattern matrix.

Table 4
Pattern Matrix of Study Variable

Cron. Alpha	.841	.850	.802	.828
Planning 1	.801			
Planning 2	.797			
Planning 3	.787			
Planning 4	.740			
Planning 5	.423	.415		
Reviewing 1		.789		
Reviewing 2		.704		
Reviewing 3		.699		
Reviewing 4		.633		
Speaking 1			.711	
Speaking 2			.687	
Speaking 3			.675	
Speaking 4			.605	
Speaking 5			.531	

Social Presence 1	.825
Social Presence 2	.811
Social Presence 3	.638
Social Presence 4	.570
Social Presence 5	.568

The next step entailed using AMOS to carry out the CFA. A four-factor correlated model was used to validate the four variables of interest. The results of the first round of CFA ($\chi^2 = 445.47$, $df = 164$, $p < .001$, $\chi^2 / df = 2.72$, $RMSEA = .081$, $TLI = .829$, $CFI = .852$, $PCLOSE < .001$), indicating poor model fit. Upon checking modification indices, it was suggested to allow items 4 and 5 on the social presence scale to covary (M.I. = 77.2), and items 2 and 3 on the review scale to covary (M.I. = 44.6). Adequate model fit was achieved after running the model again ($\chi^2 = 275.28$, $df = 160$, $p < .001$, $\chi^2 / df = 1.72$, $RMSEA = .053$, $TLI = .928$, $CFI = .940$, $PCLOSE < .329$), indicating planning, reviewing, speaking strategies, and social presence were conceptually unique.

The next step in addressing the proposed hypotheses was to investigate the path coefficients among the study’s variables and the mediating effect of speaking strategies between the writing strategies and social presence. For hypotheses one to five, structural equation modeling was used to measure the direct effects of planning, reviewing, and speaking strategies on reported levels of social presence. For hypotheses six and seven, a 5,000-bootstrap sample was used to test the indirect effect of L2 speaking strategies on the relationship between reported levels of writing strategies and social presence. Figure 5 illustrates the resulting path coefficients for the tested model.

Figure 5
Tested Model

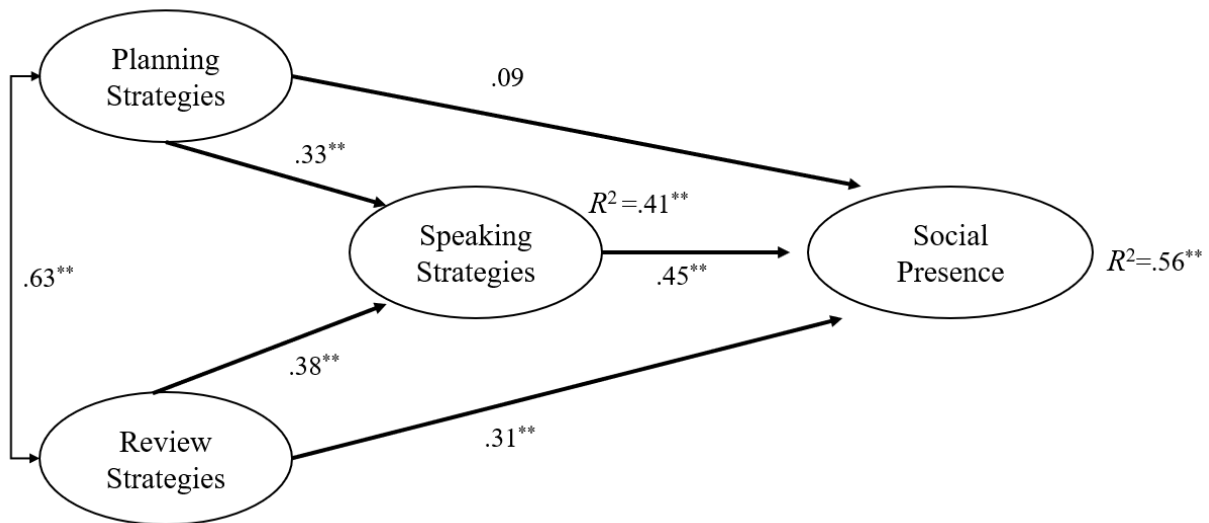


Table 5 displays model information related to path coefficients and regression weights. In all, the structural model with the strategy components explains 56% of the variance for social presence, indicating that L2 writing and speaking strategies highly influence connectivity among students. L2 writing strategies explain 41% of the variance with L2 writing strategy use, confirming the premise that planning and review strategies influence the frequency of speaking strategy use.

Table 5
Path Coefficients and Regression Weights of the Tested Model

		β	Beta	P	R ²
H1	Planning strategies → Speaking strategies	.345	.330	.004**	.41
H2	Review strategies → Speaking strategies	.327	.312	.003**	
H3	Speaking strategies → Social Presence	.449	.448	.001**	.56
H4	Planning strategies → Social Presence	.103	.094	.360	
H5	Review strategies → Social Presence	.268	.483	.004**	
H6	Review Strategies X Speaking Strategies X Social Presence	.147	.171	.003**	
H7	Planning Strategies X Speaking Strategies X Social Presence	.155	.148	.002**	

Note. $p < .01^{**}$

Overall, the tested model confirmed all the proposed hypotheses in the affirmative except for hypothesis four, which pertained to the relationship between planning strategies and social presence. While in the positive direction, the path between planning strategies and social presence was not statistically significant. The positive correlation identified prior with Pierson correlation between planning strategies and social presence was removed when social presence was added to the model, indicating full mediation. In other words, increasing levels of speaking strategies explained the relationship between planning strategies and social presence. It should be noted that levels of mediation for hypotheses six and seven were similar; however, the initial path between review strategies and social presence prior to adding the mediating variable (i.e., speaking strategies) was more significant, so there was more distance to cover before full mediation could occur. A further explanation for these paths and their relevance to extant literature is explained in the following section.

Discussion

The current cross-sectional survey investigated how L2 writing and speaking strategies relate with one another and how that relationship influences the social presence component of a CoI. The researchers specifically examined how writing and speaking strategies influence social presence, and consequently, knowledge construction in fully online EFL courses that combine LMS for writing tasks (e.g., online discussion forums) and videoconferencing for speaking activities (e.g., partner and group discussion). Initially, the results of the study showed that all variables indicated a positive relationship with one another at the bivariate correlation level. In other words, prior to testing the mediation model, all three strategy components contributed to social presence. Once the model was constructed, the study's results confirmed positive path coefficients between review strategies and speaking strategies, planning strategies and speaking strategies, and speaking strategies and social presence. Further, speaking strategies fully mediated the relationship between planning strategies and social presence and partial mediation between review strategies and social presence.

Hypotheses One and Two

By testing our proposed model, L2 planning and reviewing writing strategies showed a positive relationship with L2 speaking strategies. Thus, as illustrated in Table 5, the first and second hypotheses were confirmed, showing that increasing levels of planning strategies and review strategies with writing are associated with increasing levels of L2 speaking strategies. This finding is consistent with research showing a relationship between writing and speaking skills (Brown, 2001; Nation & Newton, 2009; Zhu, 2007). The results here are in line with research showing that although writing and speaking are two different communication modes, they can share similar underlying cognitive processes (Payne, 2020). Both include a process for planning for production, accessing one's lexicon, formulating expressions, and a mechanism for articulation (Payne, 2020). This study confirmed that the willingness to engage in speaking strategies in online learning mediates the relationship between L2 planning and reviewing writing strategies. Similarly, other studies have found evidence that texting in the target language can positively influence oral performance (Blake et al., 2008; Blake, 2016; Payne, 2020).

Hypotheses Three to Five

The third hypothesis was answered in the affirmative and confirmed that increasing levels of L2 speaking strategies are associated with increasing levels of social presence. This means second language speaking strategies help predict the quality of a CoI. At the bivariate level, L2 planning strategies produced a strong positive correlation with social presence, confirming hypothesis four. However, this relationship vanished with the inclusion of speaking strategies as a mediator. Regarding hypothesis five, the positive relationship between review strategies and social presence was evident in both the correlation analysis and the tested structural equation model, indicating review strategies have both direct and indirect influences on social presence. As mentioned earlier, the CoI framework contains the teaching, social, and cognitive presences that overlap and create a meaningful learning experience (Garrison et al., 2010). Each presence has particular functions that enrich the learning experience (Anderson, 2016). Specifically, the social presence opens the door to the cognitive presence and teaching presence, allowing for communication, collaboration, relationship-building, and, eventually, the formation of learning. In other words, research has suggested that social presence, including both written and verbal communication, is an important mediating variable between teaching and cognitive presence and a predictor of course satisfaction (Kucuk & Richardson, 2019). Therefore, findings from answering hypothesis three tie well with research indicating that speaking strategies are a powerful tool that influences social presence, allowing active involvement and interaction that can lead to rich language learning (Lapkin et al., 2002; McDonough, 2004; Storch, 2004).

Hypotheses Six and Seven

This study's results have also confirmed hypothesis six by showing that increasing levels of speaking strategies explain the relationship between planning strategies and social presence. When learners spend time and effort on planning strategies, they will produce better texts that will lead to better oral discussions and, more generally, better involvement and achievement of the learning goals (Abrams & Byrd, 2016; Ellis & Yuan, 2004; Payne, 2020; Seyyedi et al., 2013). More specifically, learners will spend more time planning their writing if they know that others will read their contributions. This result is consistent with Fathi et al. (2019), who argued that while not directly related to social-seeking behavior, planning strategies could produce a more delicate writing quality worth discussing.

In regards to hypothesis seven, the findings revealed that speaking strategies partly explained the relationship between review strategies and social presence. While mediation existed, it was not full mediation, as seen with the planning strategy path. This could be because reviewing strategies often involve feedback-seeking behavior, contributing to the social presence in a classroom. After-writing review strategies often require asking a peer or instructor for comments to improve second drafts or future writing pieces. These strategies entail communicating with classmates and the instructor to make meaning out of a composition. Results for partial mediation between review social strategies and social presence are consistent with research indicating that a CoI is developed and sustained through communication-based or feedback-seeking behavior (Rubin et al., 2013; Sewart, 2019). It is important to note here that reviewing strategies are a link between metacognitive processes and CoI. Learners can become aware of their mental processes by recognizing which kinds of learning tasks cause difficulty, how to recall information, and how to solve learning problems by reviewing strategies. This result is in line with research indicating that it is more likely that learners will develop abilities to evaluate and self-regulate their learning through constructive feedback (Bailey, 2019; Garrison, 2017) and reflection (Anderson, 2016).

A CoI is a powerful pedagogical tool that fosters student engagement and collaboration, and according to these findings, writing and speaking strategies represent the actions partly responsible for the shared communication essential for the CoI's establishment (Garrison, 2017). Therefore, these findings align with research indicating that communicating and collaborating in online communities can develop a productive online learning environment through which knowledge is constructed (Fathi et al., 2019; Garrison et al., 2000; Garrison, 2017). Second language writing and speaking strategies are thus seen as building on each other to create an environment that supports knowledge construction.

Pedagogical Implication

This study illustrated how writing and speaking strategies influence social presence, and consequently, knowledge construction. Recognizing how L2 writing and speaking strategies relate to one another and how that relationship influences the social presence of a CoI enables instructors and educators to understand better the benefits of such strategies on developing and sustaining the community. Educators and instructors may need to rethink their online courses' design to incorporate tasks and activities that encourage cognitive and metacognitive strategies that can raise learners' awareness of the learning process and enhance their control over their own learning. Autonomous planning strategies produce content that can be shared or improved upon through feedback-seeking behavior then used in presentations or as conversation pieces during class discussion.

Findings here propagate the proposition that instructors are responsible for providing their learners with both technical and pedagogic support. As mentioned earlier, direct and indirect feedback from instructors is essential to learners' achievement in developing both speaking skills (i.e., Mehr, Zoghi & Assadi, 2013) and writing skills (i.e., Rashid, Yunus, & Wahi, 2019; Yeh & Chen, 2019). Therefore, it is advised that instructors allow learners to receive meaningful feedback that enables them to reflect on their outcomes and make improvements that can help develop target knowledge. Such meaningful feedback that allowed personal reflection and shared discourse would also improve higher-order thinking skills, potentially resulting in higher achievements (Garrison, 2017) and higher levels of self-awareness and self-regulation (Chatterjee & Correia, 2020). Thus, we must keep our sights set on those strategies to allow opportunities to improve engagement and foster the trust-building necessary

for effective collaboration. The extent to which instructors regulate and structure online discussions, whether written or spoken, can affect student interaction levels, leading to better language learning (Blake, 2016; Huang, 2016; Yim & Warschauer, 2017).

Conclusion

Understanding the interrelations between writing and speaking strategies that influence the social presence and, consequently, contributing positively to a CoI may enrich theoretical insights and online education practice informed by the CoI Framework. To serve this purpose, a quantitative research design using a cross-sectional survey was initiated to investigate the mediating effect L2 speaking strategies have on the relationship between L2 writing strategies and CoI. This study's main result indicated positive path coefficients between review strategies and speaking strategies, review strategies and CoI, planning strategies and speaking strategies, and speaking strategies and CoI. This study's findings will benefit instructors, instructional designers, and administrators interested in enhancing online course engagement.

There are several limitations to this study. First, this sample of university EFL students in South Korea may not be representative enough to generalize the case. Therefore, similar studies are recommended to be replicated with different types of EFL learners from different educational contexts. Additionally, quantitative instruments were only applied in this research; therefore, qualitative research instruments (i.e., interviews, focus groups, and class observation) that examine the nature of writing and reading strategies in online courses can be implemented in future research to enrich and validate the given results.

This study's findings open pathways to future research investigating how feedback-seeking strategies mediate the relationship between language construction strategies and the social presence component in a CoI. There is a particular need for further work on the nature, role, and function of metacognitive processes related to planning and reviewing and their influence on speaking strategies and, consequently, enhancing social presence in online learning environments. Further research is also required in examining larger multicultural samples and different online platforms before any definitive conclusion can be made regarding the relationship between writing strategies, speaking strategies, and a CoI. Lastly, this paper calls for future research to identify different pedagogical approaches that incorporate learning strategies to develop learners' social presence and promote online learning.

Declarations

Data from this study is available upon request.

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

The authors asserted that ethics board approval was obtained from Konkuk University

Funding for this research project was given under the grant Education Research Lab-(ERL-CH-2022/2). This article was supported by Konkuk University in 2022 and Imam Mohammad Ibn Saud Islamic University.

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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

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Abstract

The COVID-19 pandemic caused universities worldwide to close campuses, forcing millions of teachers and students to resort to Emergency Remote Teaching (ERT) and learning. Though necessary, the sudden move to remote delivery marked a significant departure from the standards and norms in distance education. In Korea, the pandemic coincided with the start of the 2020 academic year. Though ERT was new and unplanned during the first semester of the year, it became Sustained Remote Teaching (SRT) in the second. Through the lens of performance improvement theory, we sought to determine if students' experiences and perceptions with learning remotely via SRT would change over time as a result of institutional preparedness and faculty support/experience. In total, 140 (Spring) and 93 (Fall) exchange students rated their perceptions of *Teaching and Learning Processes*, *Student Support*, and *Course Structure* with their ERT/SRT learning experiences via an electronic survey. An independent-samples one-way ANOVA indicated several statistically significant benchmarks, though results are interpreted as minor real world improvement. Implications for ERT/SRT policy and future research in the context of specific student groups are discussed.

Keywords: Emergency Remote Teaching (ERT), exchange students, online learning, distance education, international education, remote learning

Stewart, W. H., Baek, Y., & Lowenthal, P. (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), 170-197.

The COVID-19 pandemic forced educational institutions worldwide to suddenly transition courses to a remote or online learning format (Hodges et al., 2020). The Republic of Korea (hereafter Korea) was no exception; more than 10,000 cases had occurred by March of 2020 (Ministry of Health and Welfare, n.d.). Universities throughout Korea delayed the start of their semesters for two weeks to formulate an emergency plan which resulted in delivering courses online as a health and safety measure. However, unlike conventional online courses, the courses students began taking were improvisational (Hodges et al., 2020). Further, most faculty had no prior training in teaching at a distance, and most universities were unable to support faculty the way universities with traditional online programs often do—with dedicated support staff, proper hardware and software resources, and distance learning expertise (Means et al., 2014). Given this, researchers have come to use several terms to differentiate these courses as a distinct subset of distance education: Emergency Remote Teaching (ERT) (Hodges et al., 2020), Emergency Remote Education (ERE) (Williamson et al., 2020), Emergency Remote Learning (ERL) (Doornbos, 2020), or Emergency Remote Teaching Environment (ERTE) (Whittle et al., 2020). Regardless of the term, courses delivered in this manner are meant to be a temporary solution to an emergency rather than a long-term replacement for face-to-face courses (throughout this paper, the term ERT will be used for consistency).

In Korea, the successful early management of the pandemic by the government led to a dramatic reduction in cases. Moreover, this also allowed national borders to remain open and international students to enter the country, as well as for short-term mobility programs to continue operating. By mid-May, there were only a few new COVID-19 cases reported daily (Yonhap, 2020a). With cases subsiding over summer, schools and students began preparing to return to campus; it seemed that ERT would no longer be necessary. A few weeks prior to the start of the semester in August, however, a COVID-19 outbreak in Seoul led to a second wave of COVID-19 cases which was more severe than the first one in March (Kim, 2020). Rather than return to “normal”, ERT continued to be needed. It also became apparent that ERT would not be short-lived. In fact, ERT was likely to be in place for the entire 2021 academic year due to future and even more severe COVID-19 waves beginning in late fall (see Yonhap, 2020b). Since educational institutions, instructors, and students now possessed experience with remote teaching and learning, we set out to investigate how international exchange students’ experiences and perceptions of ERT changed as the practice became sustained at one university in Korea since mobility programs continued to operate in Korea unlike elsewhere in the world. We present the results of a comparative semester study grounded in performance improvement theory and discuss implications and areas of future research and practice.

Literature Review

Distance education is not new; it dates to postal correspondence courses in the early 1800s in Europe (Bower & Hardy, 2008). Technological developments (i.e., radio, television, satellites, the internet) have since expanded the practice worldwide (Moore & Kearsley, 2012; Saba, 2011). Prior to COVID-19 in the United States alone, over a third of students took at least one internet-based course in a given year (Seamen et al., 2018). In other words, formal internet-based distance education is a common, modern activity (Stewart, 2019). ERT, like distance education, is also not new but it is relatively uncommon, appearing only in response to crises such as natural disasters (e.g., earthquakes) or military conflicts (see Davies & Bentrovato, 2011). Nevertheless, the global scale and health-related circumstances of the COVID-19 pandemic have made the relatively obscure practice a common household experience. Because of the rapid exposure to remote learning, many students and instructors may be tempted to conflate ERT with traditional online courses despite rather significant differences existing between the two (Hodges et al., 2020; Williamson et al., 2020). Yet, for better or worse, these ERT-based experiences are likely to influence current and future perceptions of formal distance education (Stewart & Lowenthal, 2022) despite the two practices being distinct. Moreover, experiences have varied immensely for numerous reasons (Stewart, 2021). Nevertheless, much ERT research to date has primarily sampled regular degree/local students, glossing over vulnerable student populations such as international students (Bond et al., 2021).

Compound ERT and Distancing Learning Issues among International Students

In general, when international students engage in distance learning, many are predisposed to certain hardships related to language proficiency and different socio-cultural norms (Zhang & Kenny, 2010). Moreover, international students often find themselves studying virtually alongside peers from all over the world in heterogeneous learning environments that are likely to affect student experiences in different and unexpected ways (Harrison et al., 2018). While these experiences can be positive (Gemmell et al., 2015), negative ones are also possible (Lee, 2011). For example, international students can have a more difficult time navigating and interacting with virtual learning environments than their non-international peers (Habib et al., 2014). Further, given the asynchronous nature of many online learning environments, international students are also prone to more isolation and loneliness than their non-international and face-to-face counterparts (Erichsen & Bolliger, 2011). In the context of ERT, these known issues have been compounded by pandemic-related stress, social distancing, and the emergence of residential distance education on otherwise closed campuses (Stewart & Lowenthal, 2022). These experiences and perceptions from specific student groups is poorly understood as an emerging research topic in ERT research. Student experiences with ERT, in general, have been reported as heterogeneous due to the many different ways that ERT has manifested (Stewart, 2021).

Characteristics of ERT

The most salient characteristic that distinguishes ERT in key ways from both traditional residential and distance education is that the practice is meant to be temporary. Because ERT courses are unplanned, they are under-developed, under-supported, rapidly delivered, and likely of lower “quality” (Doornbos, 2020; Hodges et al., 2020; Whittle et al., 2020; Williamson et al., 2020). Despite these shortcomings, ERT courses are creative solutions engineered in response to a complex problem in an unstable context. For example, ERT has been used to enable and

maintain girls' access to education in Afghanistan due to Taliban attacks on international and all-girl schools (Davies & Bentrovato, 2011); the remote delivery of materials (including postal, radio broadcasting, and internet delivery) served as a way to maintain educational continuity for certain students and faculty while physically avoiding the danger of Taliban assaults. In the case of COVID-19, ERT has been a form of social distancing, the primary strategy for mitigating the spread of the novel coronavirus.

Experiences with ERT

ERT literature started emerging in 2020 from all over the world with studies spanning numerous fields and virtually all levels of education (Bond et al., 2021; Stewart, 2021). Further, ERT has complicated student mobility and the immigration statuses of millions of international and exchange students (Dietrich, 2020) who have been forced to learn remotely in either their host or home countries. These circumstances have laid a relatively poor foundation for teaching and learning given these additional moderating factors. For example, under ideal conditions, the successful online student is one with strong emotional intelligence, self-awareness, self-regulation abilities, self-discipline, time management knowledge, organizational skills, interpersonal communication adeptness, technology fluency, and an internal locus of control (Colorado & Eberle, 2010; Dabbagh, 2007; Kauffman, 2015). Many real-world factors and conditions limit the applicability of this profile under the best of conditions (Means et al., 2014), yet as a consequence of the pandemic, engaging in remote learning has been involuntary for most. Moreover, experiences and perceptions of learning via ERT have varied significantly from institution to institution and student to student (Williamson et al., 2020). In fact, some students have historically struggled with formal online learning (Means et al., 2014; Xu & Jaggars, 2014), often because of socio-economic status (Stoessel et al., 2015). This challenge can be compounded for international students who often face additional cultural and linguistic obstacles (Erichsen & Bolliger, 2014) in addition to related mental health issues (e.g., loneliness and isolation) in their host country/institution (Forbes-Mewett, 2019). Thus, when viewed collectively, it comes as no surprise that the experiences that students have had with ERT are heterogeneous, which ultimately makes characterizing ERT monolithically impossible (Stewart, 2021).

Positive Experiences

The timing of ERT transitions often have had effects on the nature of the student and instructor experience (Petillion & McNeil, 2020). For example, students might have already been oriented to their courses and their instructors when they transitioned mid-semester in Europe and North America (Van Heuvelenn et al., 2020), whereas students in countries in Asia, due to different academic calendars, likely began the semester in an ERT format. However, many Asian countries have had more prior experience with large-scale health and safety adjustments due to prior experience with other epidemics (e.g., SARS, MERS, H1N1) (Sangster et al., 2020). In Pakistan, for example, Faize and Nawaz (2020) found an increase in student satisfaction as a result of changes to teaching practices during their initial ERT period, but they cautioned that this change could also simply be due to students and instructors having more experience teaching and learning remotely towards the end of the semester. In another study in Saudi Arabia, Abdulrahim and Mabrouk (2020) found that digital learning had actually improved student outcomes, due in part to a robust ICT infrastructure in place. The researchers noted, however,

that participants in their study predominantly came from majors in the humanities, suggesting the possibility that other departments or majors may not have performed as well. In the United Kingdom, students reported being flexible and understanding of curriculum and course changes in light of social distancing (Choi et al., 2020), and students in Indonesia found various digital tools and platforms to have positive effects on their learning (Amin & Sundari, 2020). While technology adoption and integration in education has been a long-known struggle (see Ertmer, 1999), teachers in Chile reported that ERT allowed them to experiment with technology-supported teaching in ways unlike before since there were no “risks” in doing so (Sepulveda-Escobar & Morrison, 2020). Even in Korea, some exchange students’ experiences with ERT have been positive (e.g., flexibility of study schedule and location) (Stewart & Lowenthal, 2022). Nevertheless, the vast majority of ERT experiences around the world have been negative.

Negative Experiences

Regardless of the timing, ERT transitions are typically described as extreme disruptions (Osman, 2020). While the pandemic has made teaching and learning in novel ways unavoidable (Abel, 2020; Alqurshi, 2020), instructors’ prior experiences teaching face-to-face often have not translated well to teaching at a distance (Gyampoh et al., 2020). For example, students have reported not knowing the requirements of assignments (Alqurshi, 2020), indicating how relatively simple course elements could be lost in translation. Instructors’ strategies for conducting classes have also relied largely on mimicking face-to-face instructional practices (Bozkurt et al., 2020; Chatziralli et al., 2020; Van Heuvelen et al., 2020) which has often led to reduced or limited interaction with peers and instructors. This has then led to negative perceptions of online learning, and ultimately lower levels of course satisfaction (Alqurshi, 2020), creating a negative feedback loop. On top of all of this, many students suddenly found themselves sitting for six to eight hours a day at home on their computers whereas for many others, the only way to access their ERT courses was through mobile phones (Sundarasan et al., 2020). Further, makeshift at-home learning spaces have been described as uncomfortable and/or distraction prone (Sepulveda-Escobar & Morrison, 2020). These less-than-ideal learning environments have also coincided with first-time experiences of teaching and learning online (Chatziralli et al., 2020).

First-Time Teaching and Learning Online

Johnson et al. (2020) noted that teachers in their study were not particularly fond of ERT. Other researchers found that the lack of online teaching expertise (Sepulveda-Escobar & Morrison, 2020) and consequent lack of teaching presence in digital environments (Rahiem, 2020) often led to negative perceptions of teaching and learning online (Wilcox & Vignal, 2020). Stress from first-time ERT teaching and learning was coupled with stress intrinsic to the pandemic (MacIntyre et al., 2020). Empirical studies have further revealed mental health issues (Gao, 2020) ranging from decreased motivation (Petillion & McNeil, 2020), confusion and disorientation (Bal et al., 2020), stress (MacIntyre et al., 2020), fear of the unknown (Green et al., 2020), depression and anxiety (Kapasias et al., 2020), unhappiness (Gillis & Krull, 2020), and feelings of remoteness and isolation (Green et al., 2020). Another negative feedback loop was revealed through the use of maladaptive coping strategies (MacIntyre et al., 2020) which made the tasks of remote teaching and learning worse. Among teachers and students, fatigue and burnout were not uncommon (Sangster et al., 2020). Adding to these difficulties have been

technology obstacles and barriers, which do occur with online learning in general, but which have simply been amplified and/or exacerbated by both the pandemic and ERT.

Technology Obstacles and Barriers

While some studies have reported only a few or minor technology-related issues (e.g., Abdulrahim & Mabrouk, 2020; Choi et al., 2020; Crick et al., 2020; Knudson, 2020), comparatively smooth transitions to ERT have been uncommon (Jandrić et al., 2020). One of the biggest technological obstacles and barriers was internet access (i.e., poor bandwidth, limited availability); both instructors and students in interviews, surveys, and open-ended questions in communities all over the world talked about connection difficulties (Abel, 2020; Aboagye et al., 2020; Alqurshi, 2020; Gillis & Krull, 2020; Kapasia et al., 2020). While this is not necessarily surprising as such issues can occur under regular circumstances (Means et al., 2014), internet and computer access could be more problematic than had been initially anticipated (Gillis & Krull, 2020).

Student Engagement

Student engagement was often related (positively and negatively) to adjustments made to course expectations and evaluation policies (Petillion & McNeil, 2020) such as pass/fail grading policies (Perets et al., 2020) or workload reductions (Wilcox & Vignal, 2020). For example, Perets et al. (2020) reported that the implementation of pass/fail grading actually resulted in less student engagement, less attendance at synchronous lectures, and even less viewing of asynchronous lectures. By contrast, Gillis and Krull (2020) reported more favorable student reactions to pass/fail policies though less motivation to engage in remote courses was prevalent nonetheless. When it came to reducing student workloads to accommodate the additional time required for remote instruction, instructors did not necessarily perceive the change being successful, and students still felt ERT had a negative impact on their learning (Wilcox & Vignal, 2020).

Issues in Current Literature

Though ERT is meant to be temporary (Hodges et al., 2020), the pandemic has endured. Schools and universities are continuing to deliver instruction remotely which raises several issues. First, it is not clear how to conceptualize ERT when it is no longer technically an emergency or unplanned. Second, as an emerging research topic, there are no longitudinal studies to date on any number of questions regarding ERT (e.g., improved course engagement or student satisfaction when ERT is sustained). Third, student ERT experiences are heterogeneous with high degrees of contextual variation (Peters et al., 2020) and it is not known how certain student groups (e.g., undergraduates, graduates, international, exchange, etc.) have fared relative to others or what their unique perceptions and experiences are. Even among international students as a category or research analytic, there is a significant amount of typological heterogeneity (Madge et al., 2015) that is often homogenized (Stewart, 2019). Fourth, since now more than a billion students and millions of instructors have experience with remote teaching and learning (UNESCO, n.d.), it is not known if the initial institutional support-interventions to train faculty and assist emergency transitions ultimately improves student experiences and perceptions with remote teaching and learning when a crisis lasts longer than initially expected. Lastly, many students' first experiences with higher education have coincided with the onset of the pandemic

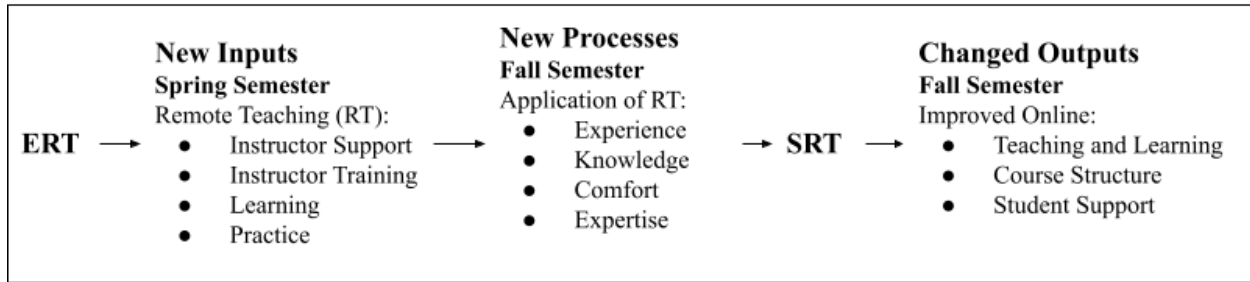
and ERT (i.e., first semester/year students). In other cases, ERT may be the only mode of operation for the entire length of shorter programs (e.g., master's programs, graduate certificates, exchange semesters, etc.) depending on course loads and scheduling. These experiences and perceptions, for better or worse, are likely to influence how students, instructors (and even family members) view learning online and formal distance education in particular. Research to date (e.g., Perets et al., 2020; Petillion & McNeil, 2020; Wilcox & Vignal, 2020) largely only documents changes in student behaviors and perceptions of ERT during the first semester of the pandemic, not when ERT has been sustained consecutive semesters. Moreover, most studies have largely sampled local/degree student populations, creating blind spots in the literature (Bond et al., 2021). In this paper, we investigate the question of changing experiences and perceptions of ERT/SRT among short-term exchange students through the lens of performance improvement theory.

Performance Improvement Theory

Performance very broadly refers to the manner in which something or someone functions, including groups of people as a unit of performance (Elger, 2007). Improved performance refers to this change in activity as a result of knowledge and skill acquisition (Vits & Gelders, 2002) where new knowledge is applied, resulting in measurable outcomes such as faster production of tasks, the use of more refined techniques or tools, the more efficient/effective use of resources, etc. Performance also occurs within a specific environment that is influenced by unique economic, political, and cultural factors, in addition to the particular affordances and constraints of a given setting (Swanson, 1999). Further, this dynamic interaction occurs across multiple knowledge/skill domains (e.g., psychomotor, cognitive, affective) (Elger, 2007) and what may successfully work in one setting may not in another. Under normal circumstances, interventions to improve performance are generally aligned with specific objectives (Burrow & Berardinelli, 2003), such as changing an instructional method, and related structural changes (e.g., new evaluation criteria) to modify behavior long-term (Morrison et al., 2011).

In the context of ERT, a performance paradox exists where long-term changes to instruction (i.e., remote delivery) are not the intended goal (Hodges et al., 2020). Performance improvement theory suggests that the interventions used to help faculty transition to ERT, in addition to ongoing training and support, should produce a change in teaching behavior that is measurable. Such performance measures already occur in the form of end-of-course and/or faculty evaluations by students. We recognize, however, that pandemic teaching performance is difficult to measure meaningfully given the conditions and impossible demands placed on many instructors. Nevertheless, as the COVID-19 pandemic endures around the world, sustained ERT continues to be relied upon as the primary method of educational continuity, and students are still being required to learn online involuntarily. Thus, we sought to investigate how new inputs (i.e., instructor ERT support, new experience/knowledge) and the resulting processes (i.e., sustained ERT training) would change outputs (i.e., instructor performance), resulting in measurable outcomes (i.e., changed experiences and perceptions of ERT) as reported by students (Swanson, 1999). This model of performance is illustrated in Figure 1.

Figure 1
Model of ERT Performance Improvement



The Current Study

This study was undertaken at a large, private research institute in northern Seoul during the 2020 academic year (early March to late December) in Korea. The university has a student population of approximately 20,000 students, 3,300 of whom are international. Among the international student body, around 300-400 are exchange students per semester (i.e., around 800-1000 annually). The university, like all universities in Korea, conducted both its entire Spring and Fall semesters online as a health and safety measure against COVID-19. While ERT was new for everyone in the Spring, it became sustained through the Fall due to large COVID-19 cluster infections (see Kim, 2020).

Key Research Objectives

While virtually all students have been affected by campus closures and ERT (Stewart, 2021; UNESCO, n.d.), international (degree-seeking and exchange) students have also experienced additional hardships due to mobility issues and complicated immigration statuses, potentially increased isolation in their host country, as well as social, cultural, and linguistic barriers (Erichsen & Bolliger, 2014; Forbes-Mewett, 2019). Prior distance education research often homogenizes distinctly different student groups by using international as a generic research analytic (Madge et al., 2015; Rensimer, 2016; Stewart, 2019). Further, as a subpopulation of the general international student body, most current ERT research has not specifically looked at this particular student subtype (Bond et al., 2021). Exchange students' experiences can be further complicated due to their comparatively short educational sojourns (Stewart, 2020), providing students less time to learn and adjust to digital learning environments than their local degree-seeking counterparts. Moreover, exchange students at the university can enroll in courses across almost all colleges with only a few practical exceptions, exposing them to a much wider variety of instructional practices and ERT course formats. It was also expected that their views would be diverse due to their heterogeneous socio-cultural backgrounds. Additionally, such students have been some of the few students living on campus despite being required to take all of their courses online (Peters et al., 2020). While exchange students are primarily motivated by the desire to have new cross-cultural experiences and to interact with locals in a residential manner (Stewart, 2020), this experience has largely been absent as a consequence of the pandemic and ERT (Stewart & Lowenthal, 2022). Exchange students, who are engaged in short-term student mobility, are also likely less

familiar with their institution, classmates, instructors, departments, policies, etc. given the short lengths of their sojourns (typically 4-6 months) (Stewart, 2020). Since instructors at the university now possessed experience with ERT, this study, was guided by the following research questions:

1. Do exchange students’ perceptions of, and experiences with, *Teaching and Learning Processes*, *Student Support*, and *Course Structure* change when ERT is sustained over consecutive semesters?
2. Does ERT improve when it becomes Sustained Remote Teaching (SRT)?

Methodology

Data was collected via an electronic survey around the middle to the end of both the first and second semesters of the academic year. After completing an informed consent form, students were asked basic demographic information, characteristics of their courses, as well as to rate their perceptions, using a five-point scale (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree) of learning online on three dimensions from the Institute for Higher Education Policy (iHEP) benchmarks for success in internet-based distance education: *Teaching and Learning Processes*, *Student Support*, and *Course Structure* (Phipps & Merisotis, 2000). At the end of the survey, an optional open-ended question invited students to share their experiences with learning remotely in their own words. The survey remained open for five weeks and students were sent occasional reminders to participate. No incentives were offered for participation.

Participants

Participants came from the 2020 Spring (263) and Fall (167) exchange student body. In the Spring (Semester 1 of the academic calendar), there were 140 responses yielding a 53.23% response rate, while in the Fall there were 93 responses yielding a 56.02% response rate. Respondent demographics are presented in Table 1. Student’s nationalities are representative of the population as a whole and are presented in Figure A in Appendix A for reference. Variations between population totals and survey respondents by nationality varied from 0-5% each semester.

Table 1
Respondent Demographics and Exchange Characteristics

Survey Item	Characteristic	Spring 2020 % (n=140)	Fall 2020 % (n=93)
Age (M=22.2/21.9%)	18-22	62.83%	65.6%
	23-30	37.17%	34.4%
Gender	Male	13.6%	16.1%
	Female	86.4%	83.9%

Primary Study Level	Undergraduate	72.2%	81.1%
	Graduate	16.4%	13.5%
	Certificate*	11.4%	5.4%
Exchange Length	4 months	47.1%	41.4%
	6 months	11.4%	7.2%
	10 months	32.1%	40.5%
	12 months	9.4%	10.8%
Campus	Seoul	90%	95.5%
	Satellite	10%	4.5%
Prior Online Course Experience	Yes	17%	82%
	No	83%	18%

Note: Total exchange student enrollment for was Spring 2020 = 263, Fall 2020 = 167.

*Certificate refers to an intensive Korean language program.

While participant characteristics across both semesters are relatively similar and consistent with the exchange program overall, we saw a slight increase in longer exchange periods to both 10 and 12 months. Many incoming students from Europe wanted to prolong returning to comparatively worse COVID-19 conditions in their home countries. Unsurprisingly in Semester 2, 82% of students now reported having prior online learning experience compared to just 17% the semester before.

Results

Course Characteristics

ERT course characteristics did not change dramatically from semester to semester (see Table 2). One item of note, however, is the lighter course load. We speculate that students seemed to be adjusting their course loads based on experience from Semester 1 since we saw an increase in lighter course loads (1-2) from 26.42% to 35.48% with a simultaneous decrease in medium course loads (3-5) from 60.71% to 49.46%.

Table 2

Emergency Online Course Characteristics

Survey Item	Course Characteristics	Spring 2020 % (n=140)	Fall 2020 % (n=93)
Course Load (M=3.68/3.52)	1-2	26.42%	35.48%
	3-5	60.71%	49.46%
	6-9	12.84%	15.05%
Course Size	1-20	39.5%	36.6%
	21-40	44.3%	41.9%
	41-60	15.7%	17.2%
	61+	0.5%	4.3%

Course Type	Asynchronous	8.6%	9.7%
	Synchronous	28.6%	31.2%
	Both Types	62.9%	59.1%
Course Activities	Discussion Forums	10.7%	7.2%
	Small Group Projects	12.9%	16.6%
	Self-study Assignments	19.7%	18.9%
	Live Group (text) Chats	9.2%	7.2%
	Video Conferencing (Live Lectures)	27.9%	29.1%
	Pre-recorded Lectures	19.7%	21.1%
Location of Course Engagement	Dormitory	65.7%	62.5%
	Apartment	14.3%	26.9%
	Cafe	12.9%	7.6%
	Goshiwon*	4.3%	3.3%
	Study Room	2.1%	0%

Note: *Goshiwon is a common housing option available to students unique to Korea

iHEP Dimensions

The overall scores for the survey's three dimensions and scale reliability are presented in Table 3. Each dimension's Cronbach's alpha score is greater than 0.7 with the exception of *Course Structure* for Fall 2020, representing internal data consistency overall (we analyze *Course Structure*'s Fall reliability score in the discussion). All three dimensions can be characterized as neutral with the mean ratings falling between 3 (Neutral) and 4 (Agree). For *Teaching and Learning Processes* as well as *Course Structure*, there was an increase in the mean scores (+.166 and +.212 respectively) in the Fall. By contrast, there was a slight decrease in the mean score (-.03) for *Student Support*. The standard deviations for ratings in *Student Support* and *Course Structure* decreased (-.02 and -.131) while the deviation among ratings for *Teaching and Learning Processes* increased (+.20) slightly.

Table 3

iHEP Dimensions Scores by Semester

iHEP Dimensions	α		M		SD	
	<i>Spring</i>	<i>Fall</i>	<i>Spring</i>	<i>Fall</i>	<i>Spring</i>	<i>Fall</i>
<i>Teaching and Learning Processes</i>	.839	.877	3.294	3.46	.624	.644
<i>Student Support</i>	.728	.814	3.270	3.24	.841	.706
<i>Course Structure</i>	.746	.678	3.508	3.72	.656	.525

When it comes to perceptions of *Teaching and Learning Processes*, the difference between semester mean scores increased for all items, ranging from .01 to .79 (0.2%-15.8%). The average increase was .198 (3.96%) which was attributable to four items with relatively large

mean score increases (1. Courses are well organized into units and allow students to master objectives before moving on to the next unit [+ .23]; 2. Class voice-mail, video conferencing, and/or e-mail systems are provided to encourage students to work with each other and their instructor[s] [+ .15]; 3. Student interaction with other students is facilitated through a variety [e.g., 1:1, group activities, projects, discussions, etc.] of ways [+ .79]; 4. Course materials [i.e., books, PowerPoints, videos, software, etc.] promote collaboration among students [+ .48]). The difference between standard deviation scores each semester ranged from .02 to .173 (.4%-3.46%) with deviations decreasing across seven of the 10 benchmarks. For “Courses are well organized into units and allows students to master objectives before moving on to the next unit” and “The course units are of varying lengths determined by the complexity of the learning objectives,” the decrease in deviation semester over semester was comparatively large at .112 and .173. The other three benchmarks had relatively minor increases in the standard deviations. The results are presented in Table 4.

Table 4
Perceptions of Teaching and Learning Processes

Benchmarks	Semester	1	2	3	4	5	M	SD
Faculty provide feedback on student assignments and answer questions in a timely manner.	Spring	3 (2.1%)	19 (13.6%)	27 (19.3%)	68 (48.6%)	23 (16.4%)	3.64	.983
	Fall	5 (5.4%)	5 (5.45)	27 (29.0%)	37 (39.8%)	19 (20.4%)	3.65	1.04
Feedback to students is provided in a manner that is constructive and helpful.	Spring	4 (2.9%)	13 (9.3%)	34 (24.3%)	68 (48.6%)	21 (15.0%)	3.64	.946
	Fall	3 (3.25)	6 (6.5%)	21 (22.6%)	50 (53.8%)	13 (14.0%)	3.69	.909
Courses are well organized into units and allows students to master objectives before moving on to the next unit.	Spring	4 (2.9%)	11 (7.9%)	39 (27.9%)	72 (51.4%)	14 (10.0%)	3.58	.882
	Fall	1 (1.1%)	4 (4.3%)	30 (32.3%)	45 (48.4%)	13 (14.0%)	3.81	.770
Student interaction with faculty is facilitated through a variety (e.g., chat, email, office hours, class postings, etc.) of ways.	Spring	2 (1.4%)	11 (7.9%)	45 (32.1%)	70 (50%)	12 (8.6%)	3.56	.815
	Fall	1 (1.1%)	3 (3.2%)	23 (24.7%)	52 (55.9%)	14 (15.1%)	3.61	.860
The course units are of varying lengths determined by the complexity of the learning objectives.	Spring	5 (3.6%)	13 (9.3%)	46 (32.9%)	63 (45%)	13 (9.3%)	3.47	.917
	Fall	1 (1.1%)	4 (4.3%)	37 (39.8%)	44 (47.3%)	7 (7.5%)	3.56	.744
Each unit requires students to	Spring	6	11	48	62	13		

engage themselves in analysis, synthesis, and evaluation as part of their course assignments.		(4.3%)	(7.9%)	(34.3%)	(44.3%)	(9.3%)	3.46	.924
	Fall	1 (1.1%)	8 (8.6%)	29 (31.2%)	43 (46.2%)	12 (12.9%)	3.61	.860
Class voice-mail, video conferencing, and/or e-mail systems are provided to encourage students to work with each other and their instructor(s).	Spring	7 (5.0%)	32 (22.9%)	41 (29.3%)	53 (37.9%)	7 (5.0%)	3.15	.996
	Fall	5 (5.4%)	12 (12.9%)	33 (35.5%)	36 (38.7%)	7 (7.5%)	3.30	.976
Courses are designed to require students to work in groups utilizing problem-solving activities in order to develop an understanding of the topic.	Spring	11 (7.9%)	41 (29.3%)	34 (24.3%)	50 (35.7%)	4 (2.9%)	2.96	1.04
	Fall	6 (6.5%)	20 (21.5%)	38 (40.9%)	22 (23.7%)	7 (7.5%)	3.04	1.01
Student interaction with other students is facilitated through a variety (e.g., 1:1, group activities, projects, discussions, etc.) of ways.	Spring	21 (15.0%)	37 (26.4%)	37 (26.4%)	36 (25.7%)	9 (6.4%)	2.82	1.05
	Fall	7 (7.5%)	21 (22.6%)	26 (28.0%)	28 (30.1%)	11 (11.8%)	3.61	1.14
Course materials (i.e., books, PowerPoints, videos, software, etc.) promote collaboration among students.	Spring	20 (14.3%)	46 (32.9%)	39 (27.9%)	32 (22.9%)	3 (2.1%)	2.66	1.05
	Fall	5 (5.4%)	18 (19.4%)	35 (37.6%)	29 (31.2%)	6 (6.5%)	3.14	.985

Note: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree, M=Mean, SD=Standard Deviation

When examining perceptions of *Student Support*, mean scores decreased on four out of five items from Semester 1 to Semester 2, ranging between .01 to .08 (0.2% - 1.6%). “Easily accessible technical support is available to students throughout the course” was the only benchmark with an increase in the mean score by .03. When considering the differences between standard deviation scores, three benchmarks had decreasing variances. The results are presented in Table 5.

Table 5
Student Perceptions of Student Support

Benchmark	Semester	1	2	3	4	5	M	SD
Information (e.g., syllabus, software guides, tutorials, etc.) is supplied to students about their courses.	Spring	2 (1.4%)	12 (8.6%)	29 (20.7%)	79 (56.4%)	18 (12.9%)	3.71	.852
	Fall	1 (1.1%)	4 (4.3%)	30 (32.3%)	45 (48.4%)	13 (14.0%)	3.70	.805

Students can obtain assistance to help them use the course software (e.g., E-Class, WebEx, Zoom, etc.).	Spring	4 (2.9%)	18 (12.9%)	42 (30.0%)	69 (49.3%)	7 (5.0%)	3.41	.881
	Fall	2 (2.2%)	14 (15.1%)	33 (35.5%)	37 (39.8%)	7 (7.5%)	3.35	.905
A system is in place to address student complaints or difficulties with the course.	Spring	5 (3.6%)	29 (20.7%)	48 (34.3%)	53 (37.9%)	5 (3.6%)	3.17	.921
	Fall	7 (7.5%)	14 (15.1%)	38 (40.9%)	28 (30.1%)	6 (6.5%)	3.13	1.00
Easily accessible technical support is available to students throughout the course.	Spring	6 (4.3%)	29 (20.7%)	59 (42.1%)	39 (27.9%)	7 (5.0%)	3.09	.925
	Fall	7 (7.5%)	10 (10.8%)	44 (47.3%)	29 (31.2%)	3 (3.2%)	3.12	.919
Students are provided with training or information to help them use course software, digital tools, apply, electronic databases, websites, etc.	Spring	14 (10.0%)	33 (23.6%)	40 (28.6%)	48 (34.3%)	5 (3.6%)	2.98	1.06
	Fall	9 (9.7%)	24 (25.8%)	28 (30.1%)	31 (33.3%)	1 (1.1%)	2.90	1.01

Note: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree, M=Mean, SD=Standard Deviation

When examining perceptions of *Course Structure*, the difference between semester mean scores increased for all five benchmarks ranging from .13 to .38 (2.6%-7.6%). The difference between the standard deviation scores also decreased for all benchmarks from -.037 to -.295. When compared with *Teaching and Learning Processes* and *Student Support*, this was the only dimension where all benchmarks saw an increase in mean scores while simultaneously having less deviation among responses (see Table 6).

Table 6
Student Perceptions of Course Structure

Benchmark	Semester	1	2	3	4	5	M	SD
Students are provided with basic course information that outlines course objectives, concepts, and ideas.	Spring	1 (0.7%)	3 (2.1%)	32 (22.9%)	82 (58.6%)	22 (15.7%)	3.86	.721
	Fall	0 (0%)	2 (2.2%)	16 (17.2%)	56 (60.2%)	19 (20.4%)	3.99	.684
Sufficient resources are made available to the students to complete class assignments, tasks, projects, etc.	Spring	5 (3.6%)	13 (9.3%)	37 (26.4%)	71 (50.7%)	14 (10.0%)	3.54	.924
	Fall	0 (0%)	10 (10.8%)	23 (24.7%)	48 (51.6%)	12 (12.9%)	3.67	.838
Specific expectations are set for students with	Spring	2 (1.4%)	25 (17.9%)	31 (22.1%)	70 (50%)	12 (8.6%)	3.46	.932

respect to a minimum amount of time per week for study and homework assignments.	Fall	1 (1.1%)	7 (7.5%)	27 (29.0%)	44 (47.3%)	14 (15.1%)	3.68	.862
Learning outcomes for each course are summarized in clearly written, straightforward statements.	Spring	5 (3.6%)	20 (14.3%)	46 (32.9%)	59 (42.1%)	10 (7.1%)	3.35	.936
	Fall	0 (0%)	10 (10.8%)	27 (29.0%)	50 (53.8%)	6 (6.5%)	3.56	.773
Faculty are required to grade and return all assignments within a certain time period.	Spring	9 (6.4%)	25 (17.9%)	35 (25.0%)	54 (38.6%)	17 (12.1%)	3.32	1.10
	Fall	0 (0%)	7 (7.5%)	27 (29.0%)	46 (49.5%)	13 (14.0%)	3.70	.805

Note: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree, M=Mean, SD=Standard Deviation

Inferential Analysis

Since the vast majority of exchange students only stay for a single semester (4-6 months) in addition to shortening or extending exchange periods for numerous reasons (Stewart, 2020), paired tests are not feasible. However, since we used Survey Monkey to survey the population both semesters, we were able to cross reference complete responses between the two groups and check for independence of observations; this check revealed seven students common to both groups. These responses were removed from the data set prior to inferential analysis, resulting in 133 (Spring) and 86 (Fall) students per group. Since the four assumptions of a Kruskal-Wallis independent samples one-way ANOVA were met, we conducted the non-parametric test for each iHEP benchmark and overall dimension score using the statistics software Jamovi and recalculated the alpha, mean, and standard deviation values. Six statistically significant differences (two dimensions, four benchmarks) between the Spring and Fall semesters were revealed and are presented in Table 7. Since the mean ranks for each tested item in the Fall were larger than the Spring semester, the null hypothesis (no improvement) can be rejected, though in some instances the apparent improvement is less certain. The Cronbach's alpha was re-calculated based on the adjusted response totals and still indicate internal data consistency with values of .7 or greater. The one exception to this is *Course Structure* for the Fall semester.

Table 7

Independent-Samples Analysis of Differences Between Spring and Fall Semesters

iHEP Dimensions/ Benchmarks	Semester	α	M	SD	Mean Rank	χ^2	df	p
<i>Teaching and Learning Processes</i>	Spring	.847	3.27	.646	102.69	4.51900	1	0.034
	Fall	.884	3.47	.662	121.30			

Student interaction with other students is facilitated through a variety (e.g., 1:1, group activities, projects, discussions, etc.) of ways.	Spring		2.81	1.156	102.84	4.58646	1	0.032
	Fall		3.16	1.146	121.07			
Course materials (i.e., books, PowerPoints, videos, software, etc.) promote collaboration among students.	Spring		2.63	1.062	98.38	12.2323	1	<.001
	Fall		3.15	1.00	127.97			
<i>Course Structure</i>	Spring	.754	3.49	.754	102.48	4.82568	1	0.028
	Fall	.690	3.73	.534	121.62			
Faculty are required to grade and return all assignments within a certain time period.	Spring		3.34	1.10	102.98	4.61844	1	0.032
	Fall		3.69	.815	120.85			
Learning outcomes for each course are summarized in clearly written, straightforward statements.	Spring		3.30	.977	103.38	4.21368	1	0.040
	Fall		3.58	.789	120.24			

Note: The adjusted semester response count for independent samples analysis are 133 (Spring) and 86 (Fall). CI = 95%.

Discussion

On the surface, the experiences and perceptions of exchange students learning online via ERT do generally show “improvement” in that the mean scores are often higher in the Fall than the Spring semester on individual benchmarks (see Tables, 3, 4, 6). In terms of performance improvement theory, it would seem that instructors acquired new knowledge and skills which were then applied in more effective ways (Vits & Gelders, 2002) as evidenced in students’ perceptions. Nevertheless, the changes are particularly inconsequential in most cases. The independent samples analysis also supports this conclusion but limits the scope of positive change to only four individual benchmarks, presenting even more modest results. Only 20% of benchmarks in *Teaching and Learning Processes* showed statistically significant improvement which were related to the facilitation of student-student interaction directly and indirectly. The mean score for “Student interaction with other students is facilitated through a variety (e.g., 1:1, group activities, projects, discussions, etc.) of ways” increased by 4% ($p = .034$) whereas the mean score for “Course materials (i.e., books, PowerPoints, videos, software, etc.) promote collaboration among students” increased by 10.4% ($p < .001$) and was the strongest result among all the iHEP benchmarks.

Potential reasons for this change include the support and training that the university provided during the Spring semester, as well as student comments on faculty evaluations which may have informed instructors where and/or how they might adjust their teaching. Where more notable “improvement” seems to have occurred was in *Course Structure*, though this is ultimately less certain.

Course Structure saw improvement in the mean scores as well as smaller deviations across all of the dimension’s benchmarks. While this might suggest that instructors were able to improve moving their face-to-face course structure into a more effective remote format, inferential analysis revealed limited gains. As noted in both Table 2 and Table 7, the Fall Semester alpha value for *Course Structure* can be considered unreliable as the values (.678 and .690) are less than 0.7. Further, if the benchmark “Faculty are required to grade and return all assignments within a certain time period”, which had the mean score increase by 7% and which has a significant p value (.032) were dropped, the scale reliability would improve to an acceptable value (.737) but would lose a “significant” result. Thus, we must recognize that improvement on this item is questionable. In the Spring, a student shared that:

Most of my teachers haven’t been able to communicate to me about my grade while the online courses I take in my home university update the grade book every other week so I know and understand what I am doing right or wrong. Right now in most of my classes I feel like I am going in blind, not too sure if what I am doing is right or wrong.

Similar sentiments were shared in the Fall:

I’m quite disappointed in the way that they make us submit a lot of assignments but never correct them or stop half way through correcting them. Especially now that mid-term exams are coming up it’s quite annoying to not be able to study one’s errors/mistakes in assignments.

By contrast, “Learning outcomes for each course are summarized in clearly written, straightforward statements” had a mean score increase of 5.6% and was statistically significant ($p=.040$). In the Spring, students were frustrated by not necessarily knowing what was expected of them as one respondent described: “Sometimes the syllabus is not updated, and some important information are [sic] not given clearly, which makes it hard to organize study times.” For some iHEP quality indicators, performance improvement theory does seem to describe the results, at least partially. Admittedly, however, the improvements are relatively small and may have numerous other causes instead of being the result of skill acquisition and subsequent performance improvement. Further, given that exchange students and the instructors often come from different socio-cultural backgrounds (Lee, 2011), it is possible that any new skill acquisition and improved remote teaching performance may not have come across so clearly (Swanson, 1999) to the students in this study. Nevertheless, there are no longitudinal studies on ERT to date for greater comparison and/or contextualization.

In pragmatic terms, what kind of improvement (i.e., how many benchmarks) and to what degree (i.e., the amount of percentage change) can realistically be expected is not known and is an open area of research. At least one possible explanation for the “improvement” across *Teaching and Learning Processes* as well as *Course Structure* is that students, in general, now have more experience and familiarity learning online (see Table 1). Faize and Nawaz (2020) posited an analogous explanation for increased student satisfaction results in their study in Pakistan. Nevertheless, where we saw no real change was in *Student Support*.

In fact, 80% of the iHEP benchmarks in *Student Support* (Table 5) actually saw decreases in their mean scores in the Fall with the exception of one item (i.e., Easily accessible technical support is available to students throughout the course). We speculate that the apparent decrease in the dimension score (about 0.6%) is a function of student familiarity with the host institution and its practices/protocols, rather than an actual performance decrease from the Spring semester, which is supported by the lack of any statistically significant differences. Thus, while a simple view of performance improvement theory relies on instructors as the sole agents of change, it is important to recognize that students’ perceptions of and experiences with instructors are, at least in part, limited by their familiarity as a function of their shorter educational sojourns (Stewart, 2020, 2021). Further, it is possible that students’ expectations have increased alongside ERT improvements, evening out any positive change. We suggest, however, that in terms of performance improvement theory, there is a contextual variable that may explain the ambivalent/negative results in *Student Support*: new enrollment.

In the case of exchange students, the vast majority are newly enrolled each semester given the tendency to only conduct single semester sojourns of four to six months (Stewart, 2020). Moreover, new enrollment also coincides with the first semester at the institution (which can also be the case for degree-seeking students). Petillion and McNeil (2020) described how timing could affect perceptions of ERT positively or negatively, where students already oriented to their courses would have more favorable experiences. Similarly, Van Heuvelenn et al. (2020) documented how orientation to courses prior to ERT delivery had better outcomes through less disruption; students were already familiar with course activities, assignments, expectations, etc. However, since exchange students are often always new and have no prior orientation to how ERT courses had been conducted at the university in the Spring, increased *Student Support* scores for continually new students may be paradoxical. Traditionally this type of difficulty has been present when students start learning online (Hachey et al., 2012) and is potentially an analogous challenge in the life cycle of academic exchanges (see Abdullah et al., 2017; Perez-Encinas & Ammigan, 2016) which may complicate perceptions of ERT. Further, the university does not have a standard ERT course format (see Table 2), generally leaving format and method decisions up to individual instructors. The result is that students encounter multiple course formats, different CMS platforms, tools, etc. The lack of standardization in ERT practices also makes it much more difficult for faculty and administrators to provide support for other courses since each one is delivered and operated differently. And unlike local Korean degree students, there are additional sociocultural and linguistic obstacles that can impede how exchange students interact and engage with their courses (Erichsen & Bolliger, 2014; Forbes-Mewett, 2019; Lee, 2011).

Ultimately in this study, the results can be interpreted as insignificant in the real world given that only 20% of the benchmarks saw statistically significant improvement with mean score increases ranging from roughly 4-10%, and even less with actual statistical significance. While the first-semester results are understandable as a consequence of not knowing how ERT courses would manifest and the impossible demands placed on educators and institutions, we must be cognizant of whether similar results remain acceptable when spanning consecutive semesters. While the end goal of ERT/SRT is not to replace face-to-face courses with ones that are delivered remotely ad infinitum, the lack of improvement should give us pause due to the vast amounts of financial and human resources that have been invested in educational continuity from the onset of the pandemic. Moreover, pandemic-related learning losses as a result of ERT and the potential lack of improvement deserve attention, especially since ERT/SRT is involuntary for students and instructors. As ERT transitions into SRT, instructors would likely benefit from upgrading to specific distance education training versus emergency continuity. If this is not possible or feasible, we suggest that students' experiences and perceptions of remote teaching can be improved, at the very least, by implementing more standardized course practices. Standardization under emergency/crisis circumstances can ultimately act as a potential strategy to improve *Teaching and Learning Processes*, *Student Support*, and *Course Structure* for first-semester/short-term students. To prepare for future remote teaching scenarios, universities (and by extension, faculty) could benefit from ERT/SRT plans that include short-, mid-, and long-term contingencies so that balanced standards of remote learning can be achieved, as well as to provide support for the student groups most in need.

Conclusion

In the case of a prolonged global pandemic or crisis, the emergence of remote teaching will need to evolve beyond just ERT into what we suggest can be more accurately characterized as Sustained Remote Teaching (SRT). Over the span of several consecutive semesters, these remote courses likely need to share more characteristics with traditional online courses since planning and development are feasible. Given the sustained nature of remote teaching and performance improvement theory, it is not unreasonable to assume that "quality" should improve as a result of new skill acquisition through training, support, and experience. However, based on our data, this assumption is tenuous; performance may not improve across enough indicators to be considered "successful" and/or to all student groups equitably. This is important since pandemic-related learning losses will no doubt present numerous challenges for educators and institutions in both short-and long-term post-pandemic academic affairs. Nevertheless, the findings, implications, and conclusions in this paper are not without limitations. First, the sampling was limited to one specific type of student at one university and it is likely that other types of students (i.e., degree students, local Korean students, graduate students, etc.) would rate these aspects of ERT/SRT courses differently. Further the ERT/SRT experience at other institutions may also be different due to different institutional capacity and faculty know-how. In that same vein, the dynamics and context of the study are set in Korea with international exchange students during the pandemic; other locations and other host university-student dynamics may present different results.

Nevertheless, there are numerous avenues for future research. Different student groups can be compared over time not only in terms of their perceptions of ERT/SRT, but also in their academic performance throughout. Similarly, longer studies with repeated measures (i.e., two, three, four semesters) can be conducted for the duration of ERT/SRT course delivery where possible to better understand how course characteristics evolve or change over time. Further, ERT literature is emergent with a discussion yet to occur on how to conceptualize ERT when the remote delivery of courses is no longer unplanned yet not a replacement for face-to-face delivery. The development of a more refined ERT definition, taxonomy, or model of ERT/SRT characteristics that account for the duration of the practice would no doubt benefit the educational community at large. Such a blueprint could help address improvement in learning remotely when crisis conditions once again demand ERT in the short-term, and SRT in the long.

Declarations

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

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

The author declared that no financial support for the research, authorship, and/or publication of this article was received.

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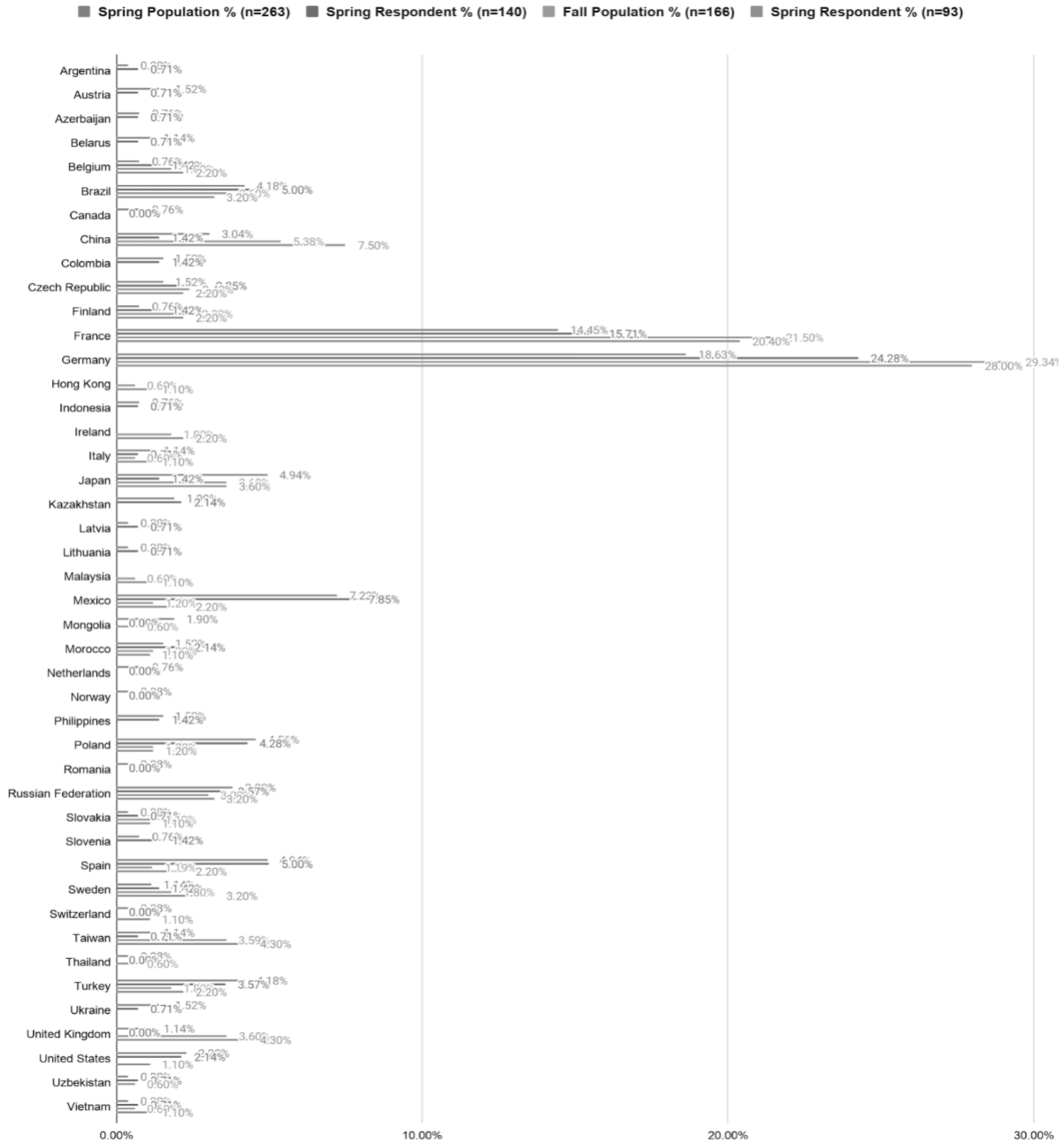
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Appendix A

Figure A
Comparison of Exchange Student Semester Populations vs Survey Response Percentages



Relationships Between Online Student Engagement Practices and GPA Among RN-to-BSN Students

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Abstract

The purpose of this quantitative, correlational study was to investigate the relationships between perceived online student engagement and self-reported grade point average (GPA) among post-licensure, undergraduate nursing students. Participants for this study were RN-to-BSN students at a mid-sized university in the Midwest. Approximately 110 students were contacted for participation, with 27 complete student responses ($N=27$). Study participants were predominately 36 years or older (63%), full-time students (55.6%), and female (77.8%). The Community of Inquiry survey instrument by authors Arbaugh et al. (2008) measured perceived student engagement. Significant, positive correlations among the variables of cognitive presence ($r_s=.467$, $p=.014$), teaching presence ($r_s=.448$, $p=.019$), and self-reported GPA were determined among RN-to-BSN students. Significant effect differences were found between student engagement groups and self-reported GPA ($p<.05$); thus, within this study, student engagement significantly related to academic outcomes. Subsequently, the utilization of institution standards that heighten online student engagement could relate to improved student academic outcomes for RN-to-BSN students.

Keywords: Online student engagement, Community of Inquiry, nursing students

Rioch, K. E., & Tharp, J. L. (2022). Student engagement practices and GPA among RN-BSN students. *Online Learning*, 26(1), 198-217.

More than 600 Registered Nurse to Baccalaureate (RN-to-BSN) programs are offered exclusively or partially online in the United States (American Association of Colleges of Nursing [ACCN], 2019). RN-to-BSN programs allow an academic pathway for associate degree nurses with professional licensure to complete their baccalaureate in nursing within one to two years (ACCN, 2019). The Institute of Medicine (IOM) aims to increase the percentage of registered nurses in the US with a baccalaureate nursing degree to meet growing demand, and progress is underway (Hampton & Pierce, 2016; Perfetto & Orsolini, 2019). Since the IOM recommendation commenced within the last decade, enrollment in post-licensure baccalaureate programs has increased by 69% (Altman, 2016). Merrell et al. (2020) concluded the demand for RN-to-BSN programs continues to grow as health care employers express a preference for BSN-prepared nurses, and as states legislatures indicate they may require nurses to obtain their BSN degree within ten years of licensure. The IOM posits that this expanded education of the nursing workforce creates the potential to reduce health disparities and improve patient outcomes within an increasingly complex health care environment (Altman, 2016).

Growth in online RN-to-BSN programs has contributed to the IOM's nursing education advancement (Perfetto & Orsolini, 2019). However, despite online education growth, student persistence in online courses varies (Deschaine & Whale, 2018; Su & Waugh, 2018; Knestrick et al., 2016). Knestrick et al. (2016) reported that nearly 50% of online nursing students who dropped a course or took a leave of absence also withdrew from their university. Cipher et al. (2017) similarly determined that online RN-to-BSN students who withdrew from a course were 22.8% less likely to graduate. Barriers to graduation among RN-to-BSN students may include disruptions with family balance, lack of connection to the program and/or institution, and financial cost (De Leon, 2018; Kennel & Ward-Smith, 2017).

Perceived connections to institution, faculty, and student peers define elements of student engagement (Kuh, 2016; Astin, 1999). Within a qualitative case study utilizing exit survey data, Delaney (2018) concluded that online RN-to-BSN students who completed their degree were more likely to report high perceptions of institutional fit between student and program, continuous connection and access to faculty, and a fostered sense of community among program peers. Moreover, from a meta-analysis of 19 RN-to-BSN studies, significant positive relationships were found between online student engagement and course performance (Perfetto, 2019). Within these 19 reviewed studies, RN-to-BSN students who spent more time interacting with their online courses were more likely to achieve higher grades (Perfetto, 2019). Despite this connection, little information exists on relationships between RN-to-BSN online student engagement and GPA.

Purpose of Study

The purpose of this quantitative, correlational study was to explore the relationships between student engagement and GPAs to learn more about RN-to-BSN students' online engagement practices. The Community of Inquiry (CoI) survey instrument was used to measure perceived students' engagement for each CoI model scale, subscale, and survey item. The research questions that guided this study were:

To what extent do relationships exist between perceived online student engagement practices and self-reported GPA among RN-to-BSN students?

- a. To what extent do relationships exist between perceived teaching presence and its subscales and self-reported GPA among RN-to-BSN students?
- b. To what extent do relationships exist between perceived social presence and its subscales and self-reported GPA among RN-to-BSN students?
- c. To what extent do relationships exist between perceived cognitive presence and its subscales and self-reported GPA among RN-to-BSN students?
- d. To what extent do relationships exist between singular CoI survey items and self-reported GPA among RN-to-BSN students?

Review of Literature

This literature review examines the Community of Inquiry (CoI) by Garrison et al. (1999) as the conceptual framework of the study along with the main variables of online student engagement and self-reported GPA. Additionally, this section provides an overview of student engagement practices relevant to the RN-to-BSN population.

Student Engagement and the Community of Inquiry

Measures of student engagement involve conceptual frameworks that encompass physical and psychological opportunities to connect with academic coursework (Astin, 1999; Kuh, 2016). Larreamendy-Joerns and Leinhardt (2006) defined online engagement as practices that include meaningful interactions and connections between the student and course material, peers, and the instructor to include cognitive and social elements. Garrison et al. (1999) developed the CoI model as a conceptual framework for collaborative learning and effective online classroom experiences, and therefore a conceptual framework for this study as well.

The CoI model is exclusive to online pedagogy and relies on the interactive communication of instructors, students, and the learning management system to create three scales that impact the learning process: cognitive presence, social presence, and teaching presence (Garrison et al., 1999; Garrison & Arbaugh, 2007; Garrison et al., 2010). Teaching presence represents the relationship between instructor and student, course guidance, and structured feedback (Garrison et al., 1999; Garrison & Arbaugh, 2007). Teaching presence includes three subscale measures: instructional design and organization, discourse facilitation, and direct instruction (Garrison & Arbaugh, 2007; Garrison et al., 2010). Social presence represents meaningful interactions among participants and the development of a relevant learning community (Garrison et al., 1999; Garrison & Arbaugh, 2007). Subscale measures of social presence involve emotional expression, open communication, and group cohesion (Garrison & Arbaugh, 2007; Garrison et al., 2010). Cognitive presence represents critical thinking and application of learned material (Garrison et al., 1999; Garrison & Arbaugh, 2007). Cognitive presence includes subscale measures to represent various stages of the critical thinking process, including triggering event, exploration, integration, and resolution (Garrison et al., 1999; Garrison & Arbaugh, 2007; Garrison et al., 2010). When all three elements and their respective subscales are combined, they are likely to cultivate student engagement through critical thinking and dynamic learning (Garrison et al., 1999; Garrison & Arbaugh, 2007). Reviewing the scales of cognitive, social, and teaching presences provides a foundation to

improve pedagogy and enhance online student engagement (Redstone et al., 2018). Figure 1 illustrates the three scales of the CoI model.

Figure 1

Community of Inquiry Model

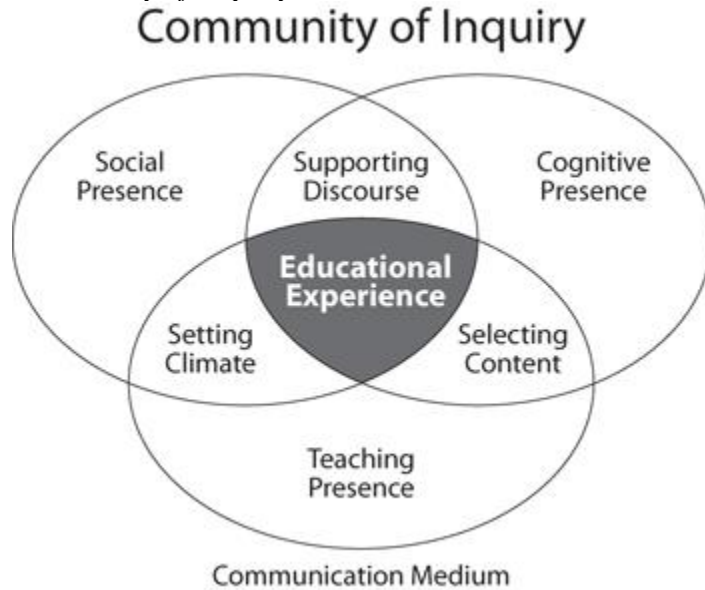


Figure 1. Community of Inquiry Model. Adapted from Garrison et al., 1999, p. 88.

Student Engagement and GPA Athens (2018) demonstrated significant positive relationships between student perceptions of engagement, learning communities, and self-reported student grades, with statistically significant differences between self-reported undergraduate student grades and student perceptions of engagement ($p < .001$). Cumulative GPA among undergraduate students also correlates with online course success (Huntington-Klein et al., 2016; Jaggars & Xu, 2016), as well as course persistence and the likelihood to enroll in another online course (Huntington-Klein et al., 2016). In agreement, Bloemer et al. (2018) concluded that undergraduate cumulative GPA predicted success in online coursework.

Jaggars and Xu (2016) determined that increased levels of online student interaction impacted student course performance. Athens (2018) concurred with these findings; significant positive relationships existed between perceptions of engagement, learning community, and self-reported student grades ($p < .001$). Specific to the RN-to-BSN population, positive correlations were found between the time spent with online course material and student grades (Perfetto, 2019). A comparative, quantitative study involving 944 nursing students showed that nursing students' higher levels of course performance correlated with their reports of higher engagement levels (Hampton & Pearce, 2016).

Student Engagement and Online Nursing Students

Hampton et al. (2017) determined patterns in preferred teaching style within a mixed-methods study of 217 nursing students. Of the online nursing students, 76% preferred instruction methods of instructor videos, narrated presentations, or live stream sessions versus synchronous

instruction or non-narrated presentations. Moreover, the strength of perceived teaching presence correlated to higher levels of student engagement and course motivation (Hampton et al., 2017).

In a quasi-experimental comparison study, London (2018) concluded that RN-to-BSN students were more likely to report course, instructor, and program satisfaction with routine, text-based feedback from course instructors. Significant differences, however, existed between teaching style preferences of older and younger nursing students. Hampton et al. (2017) noted differences between age and preferred collaborative modalities; older students preferred the discussion forums and asynchronous learning whereas younger students preferred interactive games and live stream collaboration. In a quantitative, correlation study utilizing the CoI survey instrument among 239 RN-to-BSN students, Olson and Benham-Hutchins (2019) determined that higher levels of cognitive presence were found with the greater degree of group projects whereas lower levels of cognitive presence were associated with greater online presentations and papers. Despite preferential differences in teaching style and class activities, online nursing students with higher reports of connection to the instructor are more likely to report higher levels of student engagement (Hampton & Pearce, 2016; London, 2018).

Methods

Study Sample

After approval by the university institutional review board and nursing program, a convenience sample of current RN-to-BSN students at a singular, mid-sized institution in the Midwest was recruited for participation during the summer and fall semesters of 2020. Convenience sampling is common among professional nursing program literature to assess perceptions, attitudes, and behaviors of student engagement and preferred learning practices (London, 2018, Hampton et al., 2017; Merrell et al., 2020; Carlon et al., 2012). Approximately 90 RN-to-BSN students were recruited in the summer semester and an additional 20 students were recruited in the fall; summer recruitment involved contacting all program cohorts whereas the fall recruitment targeted only new program enrollees to increase participation and avoid repeat participation. In total, approximately 110 students were contacted for participation with 29 initial responses and a total response rate of 26.3%. Two student responses were incomplete and subsequently discarded from the study results; thus, this study's sample included 27 complete student responses ($N= 27$).

Student demographic and characteristic data are reported in Table 1. Most study participants were 36 years or older (63%), full-time students (55.6%), and female (77.8%). No data on ethnicity or race was collected to avoid potential program or student identifying data. Two students reported no prior experience with online coursework; however, 92.6% of student participants had previously taken at least one online course. Most participants were currently enrolled in either one (51.9%) or two (40.7%) online courses at the time of the survey.

Table 1
Student Demographic Characteristics (N= 27)

Variables	Subcategories	Frequency and (Percentage)
Age	18-36 yrs.	10 (37%)
	>36 yrs.	17 (63%)
Gender	Female	21 (77.8%)
	Male	6 (22.2%)
Enrollment Status	Full Time	15 (55.6%)
	Part Time	12 (44.4%)
Number of Online Courses Currently Enrolled	1 online class	14 (51.9%)
	2 online classes	11 (40.7%)
	3 or more online classes	2 (7.4%)
Number of Online Courses Previously Taken	0, first online class	2 (7.4%)
	1-2 online classes	4 (14.8%)
	3 or more online classes	21 (77.8%)
GPA	Mostly A's	12 (44.4%)
	A's and B's	13 (48.2%)
	Mostly B's or below	2 (7.4%)

Note: Mostly A's = GPA 3.75 or higher, A's and B's = GPA 3.25-3.74, Mostly B's and below = 3.24 or lower (U.S. Department of Education, 2019).

Instrument

The Community of Inquiry model by Garrison et al. (1999) served as a framework to measure student engagement within this study, so the corresponding study instrument was utilized. Developed and validated by authors Arbaugh et al. (2008), the CoI survey instrument consists of 34 items divided into three scales: cognitive, social, and teaching presence. Subscales within teaching presence included design and organization, facilitation, and direct instruction (Arbaugh et al., 2008). Subscales within social presence included affective expression, open communication, and group cohesion (Arbaugh et al., 2008). Lastly, subscales within cognitive presence included triggering event, exploration, integration, and resolution (Arbaugh et al., 2008). A five-point Likert scale measured the degree of student engagement: 1= strongly disagree, 2= disagree, 3= neutral, 4= agree, and 5= strongly agree.

The CoI survey instrument consistently yields reliable and valid results over a decade of research (Stenbom, 2018; Redstone et al., 2018; Kozan, 2016). Between 2007 and 2018, over 200 articles published by 224 different authors utilized the CoI survey as an instrumentation method (Stenbom, 2018). Within the articles, published in 47 different journals, sample populations ranged from 5 to 64,781 students (Stenbom, 2018). Specifically related to the

interest of this study, GPA predicted differences in student engagement within previous CoI research (Stenbom, 2018; Shea & Bidjerano, 2009).

Shea and Bidjerano (2009, 2010) argued that the CoI framework reflects collaborative learning and supports epistemic engagement as defined by Larreamendy-Joerns and Leinhardt. Since the CoI defines both cognitive and social elements of collaborative learning, Shea and Bidjerano (2009) argued the CoI model is “specifically devoted to the goal of supporting epistemic engagement” (p. 1722) and remains the “most concise descriptive model for understanding higher education online learning with an epistemic engagement pedagogical approach” (p. 1723). Notably, similarities of collaborative knowledge gains, instructor and student commitments to practical inquiry can be demonstrated between the epistemic engagement viewpoint of Larreamendy-Joerns and Leinhardt with the Community of Inquiry model (Shea & Bidjerano, 2009, 2010).

RN-to-BSN students were contacted by campus email for study participation via an anonymous Qualtrics survey link. Informed consent, provided within the survey link, was required prior to survey completion. After acknowledgement of informed consent, the Qualtrics survey consisted of six descriptive data questions including characteristics variables of age, full- or part-time enrollment, gender, number of online classes currently enrolled, number of online classes previously completed, and self-reported GPA. The complete 34-item CoI survey instrument followed: questions 1-13 encompassed teaching presence, 14-22 encompassed social presence, and 23-34 encompassed cognitive presence (Arbaugh et al., 2008). Subscales within teaching presence included the following question items: 1-4, design and organization; 5-10, facilitation; 11-13, direct instruction; 14-16, affective expression; 17-19, open communication; 20-22, group cohesion; 23-25, triggering event; 26-28, exploration; 29-31, integration; and 32-34, resolution (Arbaugh et al., 2008).

Cronbach’s alpha for each scale of the survey indicated high internal consistency levels with .937 for teaching presence, .897 for social presence, and .935 for cognitive presence (Arbaugh et al., 2008). Some sub-scale survey sections also indicated high levels of internal consistency, including teaching presence design and organization ($\alpha = .906$), teaching presence facilitation ($\alpha = .902$), social presence effective expression ($\alpha = .838$), cognitive presence triggering event ($\alpha = .823$), cognitive presence exploration ($\alpha = .852$), and cognitive presence resolution ($\alpha = .857$).

Data Analysis

The data collected in this study from the Qualtrics survey results were analyzed through the Statistical Package for Social Sciences software (SPSS) version 22.0. Cronbach's alpha measured the average inter-item correlation. Non-parametric statistics were used due to the small study population of 27 students (Leech & Onwuegbuzie, 2019; MacFarland & Yates, 2016; Şenel Tekin et al., 2020). Spearman rank correlation coefficient [r_s] determined relationships between the CoI engagement scales and self-reported cumulative GPA values (De Winter et al., 2016). Spearman rank correlation coefficient [r_s] demonstrates lower variability with skewed datasets and provides efficiency gains for small study populations (De Winter et al., 2016). Kruskal-Wallis tests determined effect differences between student engagement practices and cumulative GPA (MacFarland & Yates, 2016). Kruskal-Wallis analysis is the non-parametric

version of the one-way ANOVA and appropriate to assess differences in multiple independent groups within a non-normal distribution (MacFarland & Yates, 2016).

Results

A correlation analysis was conducted using the Spearman rank correlation coefficient to examine relationships between self-reported GPA and perceived online student engagement practices. The Kruskal Wallis H-test analyzed the relationship between self-reported GPA, CoI scale, and subscale composite scores. Mean scale and select subscale composite scores are found in Table 2.

Table 2

Descriptive Statistics of Community of Inquiry Scales and Subscales (N=27)

	Minimum	Maximum	Mean	SD
Teaching presence (13 items)	3.08	5.00	4.28	.570
Social presence (9 items)	2.56	5.00	4.00	.670
Cognitive presence (12 items)	2.92	5.00	4.21	.522
Teaching presence: Design & organization	2.25	5.00	4.35	.684
Teaching presence: Facilitation	3.00	5.00	4.22	.620
Social presence: Affective expression	1.33	5.00	3.80	.926
Cognitive presence: Triggering event	2.67	5.00	4.10	.583
Cognitive presence: Exploration	3.33	5.00	4.32	.595
Cognitive presence: Resolution	2.00	5.00	4.21	.655

Note: SD= standard deviation; Likert scale of 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

Teaching Presence

Table 3 indicates the results of the CoI scale and GPA relationships. A positive, statistically significant relationship was found between self-reported cumulative GPA and perception of teaching presence ($r_s = .467, p = .014$). Study participants who reported higher engagement levels within the scales of teaching presence were also more likely to self-report higher GPAs.

Positive, significant relationships were also found between self-reported GPA and the perceived engagement subscales of design and organization ($r_s = .460, p = .016$), facilitation ($r_s = .439, p = .022$), triggering event ($r_s = .538, p = .004$), exploration ($r_s = .393, p = .042$), and resolution ($r_s = .432, p = .024$). Thus, study participants with higher levels of perceived student engagement within the subscales of design and organization, facilitation, triggering event, exploration, and resolution were also more likely to self-report higher GPAs.

Cognitive Presence

A positive, statistically significant relationship was also found between self-reported cumulative GPA and perception of cognitive presence ($r_s = .448, p = .019$). Study participants who reported higher engagement levels within the scales of cognitive presence were also more likely to self-report higher GPAs.

Social Presence

No significant relationship was found between GPA and social presence.

Table 3

Results of Significant Correlation between Community of Inquiry Scales and GPA

Variables	N	Rs	P
Teaching Presence	27	.467	.014*
Social Presence	27	.392	.081
Cognitive Presence	27	.448	.019*
Teaching presence: Design & organization	27	.460	.016*
Teaching presence: Facilitation	27	.439	.022*
Social presence: Affective expression	27	.256	.198
Cognitive presence: Triggering event	27	.538	.004*
Cognitive presence: Exploration	27	.393	.042*
Cognitive presence: Resolution	27	.432	.024*

Note: * $p < .05$, two-tailed

CoI Survey Items

Further exploring the relationship between perceived online student engagement measurements and self-reported cumulative GPA, specific item questions yielded significant results. Table 4 demonstrates the positive, significant relationships between singular item questions within various subscales and self-reported GPA. Again, student participants with higher perceived engagement levels reflected in survey Items 1, 2, 6, 9, 10, 11, 13, 23, 24, 25, 26, 27, and 29 were more likely to self-report higher GPA values.

Table 4
Significant Relationships Between COI Survey Items and GPA

Scale/Subscale	Item No.	Item	N	Rs	P
Teaching presence: Design & organization	1	The instructor clearly communicated important course topics.	27	.486	.010*
Teaching presence: Design & organization	2	The instructor clearly communicated important course goals.	27	.423	.028*
Teaching presence: Facilitation	6	The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me learn.	27	.483	.011*
Teaching presence: Facilitation	9	The instructor encouraged course participants to explore new concepts in this course.	27	.415	.031*
Teaching presence: Facilitation	10	Instructor actions reinforced the development of a sense of community among course participants.	27	.392	.043*
Teaching presence: Direct instruction	11	The instructor helped to focus discussion on relevant issues in a way that helped me learn.	27	.407	.035*
Teaching presence: Direct instruction	13	The instructor provided feedback in a timely fashion.	27	.413	.032*
Cognitive presence: Triggering event	23	Problems posed increased my interest in course issues.	27	.461	.016*
Cognitive presence: Triggering event	24	Course activities piqued my curiosity.	27	.487	.010*
Cognitive presence: Triggering event	25	I felt motivated to explore content related questions.	27	.487	.010*
Cognitive presence: Exploration	26	I utilized a variety of information sources to explore problems posed in this course.	27	.432	.024*
Cognitive presence: Exploration	27	Brainstorming and finding relevant information helped me resolve content related questions.	27	.437	.023*
Cognitive presence: Integration	29	Combining new information helped me answer questions raised in course activities.	27	.420	.029*

Note: * $p < .05$, two-tailed. Adapted from Arbaugh et al., 2008.

The Kruskal-Wallis H-test evaluated whether differences exist between perceived student engagement groups and self-reported GPA. Significant differences between self-reported mean GPA scores among perceived student engagement groups were found within the following

survey Items at $p < .05$: 1 (the instructor clearly communicated important course topics), 6 (the instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me learn), 24 (course activities piqued my curiosity), and 27 (brainstorming and finding relevant information helped me resolve content-related questions).

For Item 1, the Kruskal-Wallis test revealed a significant difference of means ($H = 9.218$, $p = .010$). A post hoc pairwise comparison found that mean self-reported GPA was significantly different between perceived student engagement group 4 “agree” and group 5 “strongly agree” ($p = .002$). For Item 6, the Kruskal-Wallis test indicated a significant difference of means ($H = 8.073$, $p = .045$). A post hoc pairwise comparison found that mean self-reported GPA was significantly different between perceived student engagement group 4 “agree” and group 5 “strongly agree” ($p = .025$). Significant differences were also found between Groups 2 “do not agree” and 5 ($p = .030$).

For Item 24, the Kruskal-Wallis test revealed a significant difference of means ($H = 6.271$, $p = .043$). A post hoc pairwise comparison found that mean self-reported GPA was significantly different between perceived student engagement group 4 “agree” and group 5 “strongly agree” ($p = .023$). For Item 27, the Kruskal-Wallis test showed that there was a significant difference of means ($H = 9.158$, $p = .010$). A post hoc pairwise comparison found that mean self-reported GPA was significantly different between perceived student engagement group 4 “agree” and group 5 “strongly agree” ($p = .005$). Relevant results from the Kruskal-Wallis analyses are found in Table 5 and Figure 2.

Table 5

Kruskal-Wallis H-test Among Student Engagement Groups

Item No.	Student Engagement Scale	Student Engagement Subscale	Student Engagement Group (n)	H	P
1	Teaching Presence	Design & Organization	2 (2)	9.218	.010*
			3 (0)		
			4 (13)		
			5 (12)		
			5 (12)		
6	Teaching Presence	Facilitation	2 (1)	8.073	.045*
			3 (3)		
			4 (12)		
			5 (11)		
			5 (11)		
24	Cognitive Presence	Triggering Event	3 (2)	6.271	.043*
			4 (16)		
			5 (9)		
			5 (9)		
			5 (9)		
27	Cognitive Presence	Exploration	3 (1)	9.158	.010*
			4 (13)		
			5 (13)		
			5 (13)		
			5 (13)		

Note: * $p < .05$, Student Engagement Groups 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

Figure 2
Box Plot of Items 1, 6, and Cumulative GPA

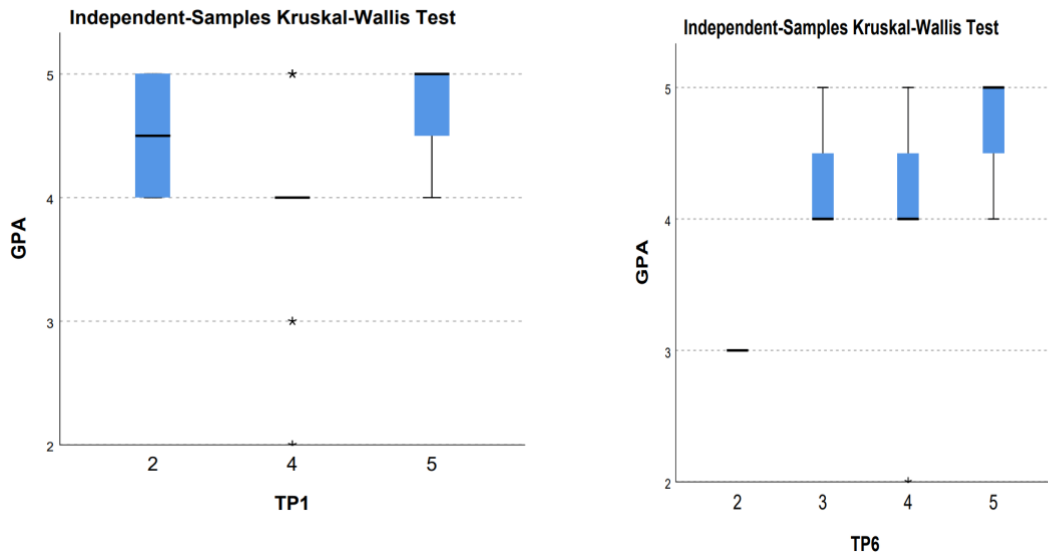


Figure 2. Results Kruskal-Wallis H test. For item 1, there was a statistically significant difference in GPA between the different student engagement groups of $X^2(2)= 9.218, p= .010^*$. For item 6, there was a statistically significant difference in GPA between the different student engagement groups of $X^2(3)= 8.073, p= .045^*$. TP1= Teaching presence item 1. TP6 = Teaching presence 6. Student engagement groups 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree. GPA= grade point average. 2= mostly B/C's, 3= mostly B's, 4= mostly A/B's, 5= mostly A's.

Discussion

This study explored relationships between perceived student engagement and self-reported GPA among a convenience sample of online RN-to-BSN students. The data imply that some of the variances in reported cumulative GPA can be accounted for by perceptions of online student engagement within this study population. Subsequently, the utilization of institution standards that heighten online student engagement could relate to improved student academic outcomes for RN-to-BSN students.

Students with higher GPAs are described as focused, attentive, and actively engaged in learning; subsequently, students with higher GPAs are more likely to graduate and achieve degree completion (Schreiner et al., 2012; Chatterjee et al., 2018). Knestrick et al. (2016) found that undergraduate GPA was a strong predictor of online nursing student persistence and concluded that for every unit increase of 0.1 in GPA, student attrition rates decrease by a unit value of 2.5%. In this study, self-reported GPA significantly correlated with item questions related to student connection and interest in the course material.

No significant relationships were determined with perceived social presence and self-reported GPA. This finding is consistent with its theoretical framework. Social presence developed to include meaningful interactions and establish a relevant learning community (Garrison & Arbaugh, 2007; Garrison et al., 2010). Despite its relevance to generative knowledge, Garrison and Arbaugh (2007) caution that social presence cannot stand alone to

facilitate learning. This discrepancy is unlike the other constructs of cognitive and teaching presence; cognitive and teaching presence have the potential to facilitate learning independently (Garrison & Arbaugh, 2007).

Recommendations

This study suggests the importance of maintaining higher levels of student engagement within online RN-to-BSN programs. This finding aligns with other research suggesting significant relationships between the utilization of best-practice frameworks, student perceptions of engagement, and course content quality (Anderson et al., 2015; Bigatel & Edel-Malizia, 2017). Based on this discovery, online instructors, administrators, and instructional designers might consider the following actions to strengthen student engagement practices with online RN-to-BSN programs: 1) create clear alignment of course learning outcomes with professional goals, 2) maintain strong instructor facilitation, visibility, and access with a priority focus on timely and relevant feedback, 3) increase instructor knowledge of best-practice standards and provide support to implement these strategies within course design, and 4) provide partnership opportunities between instructors and instructional designers to promote alignment with instructional practice and course learning goals.

Clear Course Alignment

The relationship between course learning outcomes and professional goals aligns with several findings in this study, including positive, significant relationships found between self-reported GPA, perceived teaching presence, and its subscales of design and organization. Moreover, some variance for GPA could be accounted for by the survey Item 1, with significant effect difference between student engagement groups. Yang et al. (2017) reported that students were more likely to complete an online course if it aligns with their individual and professional needs. The more students can connect with the course information, the more likely they are to stay enrolled (Yang et al., 2017). Thus, students' perceptions influence engagement and engagement influenced the likelihood of course completion (Su & Waugh, 2018; Bloemer et al., 2017; Bloemer et al., 2018).

Instructor Visibility and Feedback

The variables of perceived teaching presence, its subscale facilitation, and self-reported GPA demonstrated positive, significant relationships. Some variances in self-reported GPA could be accounted for by Item 6, with significant effect differences between student engagement groups. Again, this finding concurs with other literature on the significance of the relationship between student engagement, access to the instructor, and quality of instructor-student interactions (Watson et al., 2017; Athens, 2018). Watson et al. (2017) suggested that students' perceived educational quality included access to the instructor and the establishment of multiple virtual office hours to promote engagement and interaction. Within the authors' quantitative study of 624 students, results suggested diverse modes of communication and timeliness of feedback significantly correlated to the perceived quality of interaction between instructor and student (Watson et al., 2017).

Instructor feedback is a predictor of student engagement (Athens, 2018; Bigatel & Edel-Malizia, 2018). Athens (2018) concluded that meaningful and timely instructor feedback was also a predictor for higher student engagement levels. From their mixed methodology study of

485 undergraduate students, Bigatel and Edel-Malizia (2018) concluded that higher engagement levels were present when the instructor provided prompt feedback within 72 hours of completed activities, provided students with reflective learning opportunities, and assessed student learning by diverse methods.

Best Practice Standards

Implementing standard practice guidelines for online courses could improve dynamic learning practices, educational quality, and student engagement (Anderson et al., 2015; Watson et al., 2017). This study determined significant, positive correlations between the variables of perceived cognitive presence, its subscale triggering event, and self-reported GPA. Significant effect differences with item 24 among student engagement groups, which again accounts for some of the variances with self-reported GPA.

A longitudinal, quantitative study of 339 undergraduate nursing students by Anderson et al. (2015) suggested a significant relationship exists between the utilization of *First Principles on Instruction* and student perceptions of online course quality. Similarly, a quantitative study of 624 students by Watson et al. (2017) concluded that online students prefer instructional strategies suggested by the *Seven Good Principles for Good Practice in Undergraduate Education* and the *Quality Matters Rubric*. In both studies, students' perceptions of quality education align to best-practice standards; thus, the use of standards could improve the pedagogical approaches that lead to student engagement in online courses (Watson et al., 2017; Anderson et al., 2015).

Partnership Between Instructional Designers and Instructors

Finally, RN-to-BSN programs might consider purposeful partnership opportunities between instructors and instructional designers to promote alignment with instructional practice and course learning goals. Within this study, significant, positive correlations between the variables of perceived cognitive presence, its subscale exploration, and self-reported GPA. Moreover, significant effect differences were found among student engagement groups with item 27. Anderson et al. (2015) emphasized the importance of collaboration between instructional designers and instructors to pair expert content with course development models to heighten student engagement practices among online nursing students. Overall, some literature suggests that clear course directions and goals, connections between course material, and perceived course relevancy correlated with higher student engagement (Athens, 2018; Chen et al., 2017; Alvarez-Bell et al., 2017).

Limitations and Considerations

This study's limitations include the use of a convenience sample, small sample size, and use of self-reported instrumentation. The use of self-reported survey instrumentation and self-reported GPA among a convenience sample could result in non-response and self-reporting bias (Privitera & Ahlgrim-Delzell, 2019; Caskie et al., 2014). A quantitative study of 194 undergraduate students by Caskie et al. (2014) determined that students' self-reported GPAs significantly correlated with university records. However, Caskie et al. (2014) noted that reporting differences could exist in the lower GPA and lower self-efficacy groups; within the authors' sample, males underreported GPA whereas females overreported GPA. Subsequently, Caskie et al. (2014) concluded that potential bias might exist when utilizing students' self-reported GPA. Marley and Platau (2017) disagreed with potential bias determinations and

determined within their quantitative study of undergraduate students; self-reported GPA significantly correlated with actual university records.

Significant findings in this study warrant further investigation with larger student populations. However, this study's results add to the literature in demonstrating a connection between online student engagement and academic outcomes despite limitations.

Declarations

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

The author(s) assert that approval from an ethics review board (IRB) at Maryville University.

The authors declared that they received no financial support for the research, authorship, and/or publication of this article.

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The Effects of Nudges on Students' Use of the Diagnostic Assessment and Achievement of College Skills

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Abstract

The purpose of this study is to examine the effects of nudges on online college students' use of the Diagnostic Assessment and Achievement of College Skills (DAACS), a suite of free, online assessments, feedback, and resources designed to optimize student success in college. The results indicate that the nudges had an effect on students' completion of the DAACS and on accessing the feedback. The effectiveness varied by type of nudge and the order in which a series of nudges was sent. Simply sending the nudges did not have a direct effect on academic outcomes, but students who responded to one series of nudges were more successful than those who did not.

Keywords: nudges, college readiness, assessment, academic success

Franklin, Jr., D. W., Bryer, J., Lui, A. M., Andrade, H. L., Akhmedjanova, D. (2022). The effects of nudges on students' use of the diagnostic assessment and achievement of college skills. *Online Learning*, 26(2), 218-240.

Identifying and addressing the preparedness of newly enrolled college students is one of the most pressing issues in higher education today (Fay et al., 2017; Mokher et al., 2019; National Center for Public Policy and Higher Education & Southern Regional Education Board, 2010). Seventy-five percent of all high school seniors are unprepared for post-secondary coursework in mathematics, and 63% are unprepared for coursework in reading (National Assessment of Educational Progress, 2019). Over half of all 2019 high school graduates nationwide took the ACT. Of these, almost 40% failed to meet any of the four ACT College Readiness Benchmarks (ACT, 2019).

Unfortunately, traditional methods of bolstering college readiness skills have been shown to be ineffective, unnecessary for the majority of students, and associated with negative outcomes (Jaggars & Stacey, 2014). A different approach to enhancing college readiness is to offer newly enrolled college students the opportunity to assess their levels of readiness and apply feedback to become better prepared on their own. The Diagnostic Assessment and Achievement of College Skills (DAACS) system was developed with this purpose in mind (Vanderslice-Barr, 2020).

The Diagnostic Assessment and Achievement of College Skills, or DAACS, is a suite of open source, online assessments and supports (both technological and social) designed to help students prepare for the rigors of college (<https://daacs.net/>). Students use the DAACS website by taking four assessments, including mathematics, reading, writing, and self-regulated learning. They receive instant results on the assessments, along with individualized feedback and links to free online resources designed to help them fill in gaps in their knowledge and skills. Students who use the DAACS tend to have better academic outcomes than those who do not (Bryer et al., 2019), but not all students fully use it by reviewing their feedback and accessing related resources. In this paper, we report on the effectiveness of various behavioral nudges that encourage students to take the assessments and read the feedback.

What is the DAACS?

DAACS has four major components: (1) diagnostic assessments of students' readiness for college in terms of self-regulated learning (SRL), reading, writing, and mathematics; (2) instant, automated, customized feedback with recommendations and links to open educational resources (OERs) that help students address deficiencies; (3) information that enables academic advisors to help students address deficiencies identified by the assessments; and (4) predictive models that identify students at risk as well as the specific risk factors. The first three components are designed to directly influence student functioning, while the fourth is intended for institutional use. Taken together, the components align with the strategies recommended by the What Works Clearinghouse (WWC; Bailey et al., 2016) for supporting postsecondary students, with the exception of providing monetary incentives (Table 1).

Table 1*WWC Strategies for Postsecondary Students in Developmental Education, and DAACS Features*

	WWC Strategy	Instantiation in DAACS
1	Use multiple measures to assess postsecondary readiness	Diagnostic assessments of students' SRL, reading, writing, and mathematics, followed by feedback, recommended strategies, and links to OERs
2	Require regular participation in enhanced advising activities	Access to DAACS dashboards and results by trained academic advisors
3	Offer students performance-based monetary incentives	Not applicable
4	Compress developmental education	Access to feedback, recommended strategies, and links to OERs enables students to engage in self-directed learning to prepare for college-level work
5	Teach students how to become self-regulated learners	SRL and writing assessments assess SRL, support students in making concrete improvement plans, and link to the online SRL Lab (https://srl.daacs.net)
6	Implement comprehensive, integrated, and long-lasting support programs.	Assessments of key soft skills such as SRL; integration into new student orientation and advising; freely available to students

The immediate feedback students receive upon completing the assessments and the related links to OERs are designed to promote self-directed learning. Consistent with the design intentions, findings from a randomized control trial at two institutions of higher education ($n = 21,381$) indicated that the DAACS is helpful to students who used the feedback and resources. Students who not only took the assessments but also clicked on the feedback (presumably to read it) were significantly more likely to complete their first six months of coursework on-time and were significantly more successful in earning credits than were the students who only took the assessments (Bryer et al., 2019). These results suggest that DAACS could be beneficial to those students who might not already be inclined to use it. In response, we developed nudges in the form of emailed encouragement for students to take advantage of the DAACS assessments, feedback, and resources.

DAACS Nudges

Nudge theory gained prominence after the publication of Thaler and Sunstein's book entitled *Nudge: Improving Decisions about Health, Wealth, and Happiness* (2008). According to their theory, which is grounded in behavioral economics, people make decisions based on trade-offs between costs and benefits. In the context of education, for example, making the decision to pursue a college degree involves a trade-off between costs (effort, time, and money) and benefits (future earnings). Nudges to take action can "alter people's behaviors in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008, p. 6), and break down barriers to success (Damgaard & Nielsen, 2018). Given the pressing need to help a large number of students navigate online learning without a commensurate increase in institutional resources, nudges provide an inexpensive way to encourage students to use tools that could be beneficial to them, such as the DAACS.

Taking the DAACS assessments and using the feedback and resources is a relatively small investment of effort and time that can result in substantial profit in terms of academic success (Bryer et al., 2019). If students are not aware of the benefits, however, they are unlikely

to invest the time. A nudge could encourage them to spend time on improving their academic skills and solidify their investment in their education. The goal of this study was to prompt (or nudge) students to complete the DAACS assessments and read their feedback. We did so by sending emails with personalized encouragements to students who either had not yet completed the DAACS assessments or had taken the assessments but not reviewed the feedback.

Theoretical Framework

Since the popularization of the concept, researchers have examined the effects of nudges on outcomes and behaviors in different domains, including education. The studies have a variety of foci, including setting default options, framing interventions, peer group manipulations, deadlines, goal-setting, reminders, social comparison, informational nudges, basic assistance, skill boosting, extrinsic motivation, social belonging, identity activation, and mindset (Damgaard & Nielsen, 2018). The nudges used in this study are most closely related to reminder, social comparison, and informational nudges, each of which are briefly reviewed next.

Reminder Nudges

Reminders are a type of nudge that prompts students to turn their attention to a particular problem or task, gives them easy access to information, and/or reminds them of the benefits of completing a task (Damgaard & Nielsen, 2018). Research has demonstrated the efficacy of reminder nudges for a variety of academic outcomes. In two separate experimental studies, Castleman and Page (2015, 2017) designed interventions to increase college enrollment for high school students by sending them text message reminders of the tasks they needed to complete before starting college. Both of these studies found a positive effect on college enrollment (3% and 7% increases, respectively), but for one of the studies (2015), this effect was limited to students who did not have as much access to support for college planning in high school and who were less prepared for college matriculation upon high school graduation than other students.

The effects of reminder nudges have also been demonstrated in the completion of financial aid applications, conference presentations, and course assignments. Castleman and Page (2016) found significant experimental effects of reminders sent to community college students to refile their financial aid applications (a 12% increase compared to control group students), especially for low-achieving students. Page et al. (2020) also found quasi-experimental evidence that personalized text messages sent to 7,500 high school students about their financial aid filing status was associated with increases in filing and college enrollment. Another experimental study using reminder nudges found that they increased the number of graduate students who submitted presentations to an academic conference (Unkovic et al., 2016). Across two experimental studies, Motz et al. (2021) found that sending reminders about upcoming assignment deadlines to students in online courses increased their on-time assignment submissions and grades.

The research on reminder nudges suggests that they can encourage students to take the steps necessary for enrolling in college. However, some studies on reminder nudges have produced null results (e.g., Bird et al., 2019; Dobronya et al., 2019), and there is a lack of research on whether reminder nudges can increase students' engagement in behaviors that could help them improve their success while in college (see Motz et al., 2021, for an exception). To

test their effectiveness in the college context, all of the nudges designed for this project include a reminder component. For one set of nudges, the reminder is for students who have not yet completed the DAACS. For the other set of nudges, the reminder is for those who have completed the DAACS to return to the website to review their results and feedback.

Social Comparison Nudges

Social comparison nudges provide information about others' behavior or performance to change the nudged person's behavior or performance in the desirable direction. For example, Thaler and Sunstein (2008) described a study in which tax delinquent individuals in the United Kingdom were told that nine out of ten people pay their taxes on time, and the recipients of the nudge were among the few who had not yet done so. This resulted in a 15% increase in payment within 23 days. There has also been research on the effectiveness of social norms nudges in education. For example, applicants for Teach for America (TFA) who were admitted into the program were given information in their admissions letter about the high percentage of applicants who joined TFA, and were significantly more likely to join than a control group of students who were not given this information (Coffman et al., 2017). Another study by Eyinck et al. (2019) found that sending students in an Introductory Psychology class a message with a descriptive norm that provided information about what other students did was more effective for improving students' learning outcomes than sending them a message with an injunctive norm that provided information about what students should do.

Other studies test the effect of nudges that provide information about the performance of other students. These studies provide mixed evidence of effectiveness. For example, when nudges are provided in a way that compares students' performance to other students, some studies find a positive effect (e.g., Tran & Zeckhauser, 2012), while other studies find a negative effect (e.g., Azmat et al., 2019). Similarly, when students' performance as compared to other students is made public (e.g., posted online for other students to see, or being given an award for their grades), there is sometimes a positive effect (e.g., Tran & Zeckhauser, 2012) and sometimes a negative effect (e.g., Wagner & Riener, 2015). Damgaard and Nielsen (2018) suggest that relative performance feedback, rather than just social norm information, can have a demotivating effect by subtly conveying to high-performing students that they do not have to try as hard and discouraging lower performing students from trying at all. They suggest that providing students with enough time to change their behavior in a productive way can make performance nudges work more effectively.

One study navigated the potential negative impact of relative performance feedback by providing information about the performance of students who exhibit certain behaviors to nudge those students toward more beneficial behaviors. In an experiment with over 24,000 students in a Massive Open Online Course (MOOC), Martinez (2013) sent an e-mail nudge about how students who procrastinate tend to perform worse than students who do not. This nudge was sent before the last quiz was due, rather than earlier in the course, which would have given students more time to change their behavior, as suggested by Damgaard and Nielsen (2018). Still, the nudged students were 17% more likely to complete the course than a control group.

We decided to test the effectiveness of two different types of social comparison nudges on students' completion of the DAACS (hereafter referred to as Completion Nudges). For both of these nudges, we used descriptive norms (i.e., describing what other students actually do), which Eynck et al. (2019) found are more effective for improving students' learning outcomes than injunctive norms (i.e., describing what should be done). With one of the nudges, we used a simple social norms nudge similar to Coffman et al. (2017), in which we inform students that the majority of students have completed the DAACS, and that they are in the small minority of students who have not. The other nudge was designed to test the effect of providing information about performance in a manner similar to Martinez (2013), by informing students how much more successful are students who have completed the DAACS, and informing them that they are in the small minority of students who have not. As per Damgaard and Nielsen's (2018) suggestion, these nudges were sent soon after students enrolled in college, in order to provide enough time for them to take the DAACS and become better learners. This nudge has elements of a social comparison nudge, since it provides information about the benefits of DAACS on other students' performance, and also elements of an informational nudge, which is described next.

Informational Nudges

Informational nudges aim to improve outcomes by providing information about people's behavior and ability, or by encouraging them to overcome behavioral barriers that might impede their success (Damgaard & Nielsen, 2018). Studies have found positive effects of these types of nudges on a variety of academic outcomes. Some of these studies provide generic, non-personalized information to students. For example, providing information to students about plagiarism (Dee & Jacob, 2012), procrastination (Martinez, 2013), grit (Alan et al., 2019), and strategies for persisting in college (Bettinger & Baker, 2014) has been linked to improvements in those areas and relevant outcomes such as math performance (Alan et al., 2019) and college graduation (Bettinger & Baker, 2014). However, some studies have found very small or null effects of informational nudges on outcomes such as students' use of a website to find out more about a college in Michigan and their financial aid process (Hyman, 2019), and college enrollment by high school students (Gurantz et al., 2020).

Another study using a personalized informational nudge asked students in MOOCs to write about how they plan to complete the course and finish their assignments on time (Yeomans & Reich, 2017). This resulted in a 29% increase in course completion compared to control students. However, students who were immediately nudged to review what they wrote and adhere to their plan were not any more successful than students who simply responded to the prompt. DAACS uses a similar, personalized prompt for its diagnostic writing assessment, in which students are prompted to reflect on their self-regulated learning survey results and commit to using the strategies included in the feedback. For this study, we used nudges that encouraged them to review the feedback on their strengths and weaknesses in terms of self-regulated learning, as well as a nudge that encouraged them to review what they wrote about SRL for the writing assessment. We expected this nudge to be more effective than the one used by Yeomans and Reich (2017) for three reasons: (1) our writing assessment prompt had students write about their SRL survey results and feedback for improving their learning; (2) students were nudged

months after they wrote their essay for the writing assessment, as opposed to immediately after writing; (3) the nudge was included in a series of three nudges.

Design Principles and Research Questions

Yi (2019) recommended three design principles for nudges, each of which were considered in the creation of the DAACS nudges: Nudges should (1) serve as a connection between students and services that are available to them that they are not yet using; (2) address students' specific challenges and cognitive barriers; and (3) be brief and carefully timed, since the efficacy of nudges diminishes with exposure. In light of these design recommendations and the research on various types of nudges, as well as the purposes and features of DAACS, we created two types of nudges—Completion Nudges and informational Review-the-Feedback Nudges—with two or three variants each. The purpose of this study is to determine the effect of these nudges on students' use of DAACS and its feedback. Our investigation is guided by the following research questions:

1. Do Completion Nudges increase rates of completion of the DAACS assessments? If so, which type of nudge (social norms or performance) has the largest effect on completion?
2. Do students who had already completed the assessments login to the DAACS website when they receive a series of three informational Review-the-Feedback Nudges (strength, weakness, writing)? If so, which sequence of nudges has the greatest effect on the number of logins?
3. Do nudges have an effect on students' first-term course completion? If so, which nudges have the largest effect?
4. Of the students who received a nudge, is responding to it associated with an increase in first-term course completion? If so, which nudges have the strongest association?

Method

Participants

The study sample included incoming undergraduate students at Excelsior College, a private, nonprofit, online liberal arts college comprised of three schools (Undergraduate Studies, Graduate Studies, and Nursing) that offers over 40 programs in business health sciences, liberal arts, nursing, public service, and technology. Excelsior College serves predominately non-traditional, first-generation college students with an average age of 34. All newly enrolled students are given access to the DAACS as part of the college's online, asynchronous orientation. Although students are encouraged to complete the orientation, there are no consequences for not completing it. As a result, many students take the DAACS assessments, but many others do not.

Between April and December of 2019, 9,959 students enrolled at the institution. Two samples were selected from this pool of students for this study: Students who did not complete DAACS within three weeks of enrolling ($n = 5,130$) were selected to receive a Completion Nudge to complete the assessments. The second sample included students who completed DAACS ($n = 1,302$) and were to receive a series of Review-the-Feedback Nudges.

To comply with ethical standards, students who were less than 18 years of age were omitted from our sample, as were students who opted out of the study. Our final sample sizes for the Completion Nudges and Review-the-Feedback Nudges groups were $n = 5,057$ and $n = 1,255$, respectively. Demographics of the two samples are provided in Tables 2 and 3. Tests of equality between the treatment and control groups for both the Completion Nudges and Review-the-Feedback groups revealed trivial or no differences in demographic variables.

Table 2
Sample Demographics for Completion Nudges Group

		Control		Performance Nudge		Social Norms Nudge	
		(n)	(%)	(n)	(%)	(n)	(%)
Gender	Male	880	51%	934	55%	916	55%
	Female	845	49%	767	45%	753	45%
	NA	1	0%	0	0%	0	0%
Ethnicity	White	1094	63%	1073	63%	1032	62%
	Black or African American	277	16%	270	16%	267	16%
	Hispanic	220	13%	218	13%	219	13%
	Asian	54	3%	57	3%	50	3%
	Two or more races	57	3%	62	4%	67	4%
	American Indian or Alaska Native	11	1%	7	0%	7	0%
	Native Hawaiian or Other Pacific Islander	9	1%	10	1%	10	1%
	Unknown	4	0%	4	0%	17	1%
First Generation	No	922	53%	899	53%	880	53%
	Yes	390	23%	372	22%	375	22%
	NA	414	24%	430	25%	414	25%
Active Military	No	1112	64%	1066	63%	1062	64%
	Yes	614	36%	635	37%	607	36%

The Effects of Nudges on Students' Achievement

		Control		Performance Nudge		Social Norms Nudge	
		(n)	(%)	(n)	(%)	(n)	(%)
Income	≥ 120,000	152	9%	135	8%	139	8%
	< 100,000	100	6%	85	5%	106	6%
	< 120,000	96	6%	103	6%	78	5%
	< 25,000	154	9%	158	9%	155	9%
	< 35,000	149	9%	152	9%	150	9%
	< 45,000	165	10%	156	9%	152	9%
	< 55,000	184	11%	173	10%	154	9%
	< 70,000	180	10%	194	11%	174	10%
	< 85,000	148	9%	137	8%	172	10%
	NA	398	23%	408	24%	389	23%

Table 3
Sample Demographics for Review-the-Feedback Group

		Control		St.We.Wr.		We.Wr.St.		Wr.St.We.	
		(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Gender	Female	110	38%	128	41%	135	40%	128	38%
	Male	182	62%	186	59%	201	60%	210	62%
Ethnicity	White	188	64%	198	63%	213	63%	220	65%
	Black or African American	49	17%	33	11%	43	13%	36	11%
	Hispanic	33	11%	50	16%	51	15%	54	16%
	Two or more races	9	3%	13	4%	19	6%	11	3%
	Asian	6	2%	12	4%	5	1%	12	4%
	American Indian or Alaska Native	2	1%	5	2%	1	0%	1	0%
	Native Hawaiian or Other Pacific Islander	2	1%	1	0%	2	1%	3	1%
	Unknown	3	1%	2	1%	2	1%	1	0%
First Generation	No	113	39%	112	36%	137	41%	134	40%
	Yes	45	15%	59	19%	46	14%	67	20%
	NA	134	46%	143	46%	153	46%	137	41%
Active Military	No	161	55%	172	55%	188	56%	199	59%
	Yes	131	45%	142	45%	148	44%	139	41%
Income	≥120,000	12	4%	22	7%	15	4%	23	7%
	< 100,000	12	4%	14	4%	14	4%	20	6%
	< 120,000	18	6%	13	4%	14	4%	19	6%
	< 25,000	19	7%	11	4%	14	4%	16	5%
	< 35,000	19	7%	18	6%	15	4%	16	5%
	< 45,000	13	4%	24	8%	23	7%	20	6%

	Control		St.We.Wr.		We.Wr.St.		Wr.St.We.	
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
< 55,000	24	8%	20	6%	28	8%	25	7%
< 70,000	30	10%	32	10%	39	12%	32	9%
< 85,000	19	7%	22	7%	25	7%	32	9%
NA	126	43%	138	44%	149	44%	135	40%

Note. St = Strength Nudge; We = Weakness Nudge; Wr = Writing Nudge.

Design and Procedures

Two randomized controlled trials were conducted concurrently to examine the effects of two Completion Nudges and three Review-the-Feedback Nudges, sent to students via e-mail. As described above and in Table 4, Completion Nudges were designed to deliver a social norm or a performance nudge to students who had not completed any of the DAACS assessments within three weeks of initially being enrolled in the orientation course. As an open enrollment institution, new students were added to this study on a weekly basis. Each week, new students were randomly assigned with equal probability to one of three conditions: (1) a control group that did not receive any email nudges ($n = 1,725$), (2) a treatment group that received a Performance Nudge ($n = 1,686$), or (3) a treatment group that received a Social Norms Nudge ($n = 1,646$). There is no attrition from the study because once students were assigned to a group, their outcomes were observed.

Table 4

Description and Content of DAACS Nudges

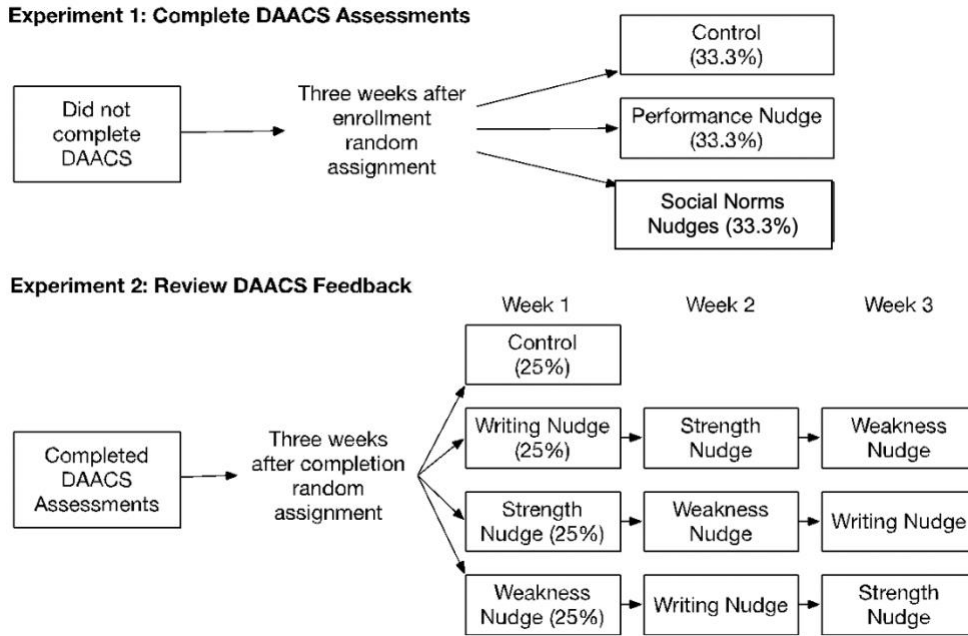
Nudge Type	Description	Full Text of Nudge
Completion Nudges for Students to Complete the DAACS Assessments		
Social Norms Nudge	Uses social norms to encourage students to complete the DAACS assessments.	<i>“Over 80% of college students at participating universities have completed the DAACS. You are currently in the small minority of people who have not yet completed it. Please consider completing the DAACS, after which you will be given results and helpful feedback on how to become an efficient, successful learner.”</i>
Performance Nudge	Uses the likelihood of improved performance to encourage students to complete the DAACS assessments.	<i>“College students who use the DAACS are 1.5 times more successful than those who have not. You are currently in the small minority of people who have not yet completed it. Complete the DAACS now to learn about your strengths and weaknesses</i>

Nudge Type	Description	Full Text of Nudge
Informational Review-the-Feedback Nudges for Students Who Already Completed DAACS		
Writing Nudge	Asks students about how well they are following through on what they committed to regarding improving their SRL in their essays for the DAACS writing assessment. Includes a link to their essay so they can remind themselves of what they said they would do.	<i>and discover ways to become a better learner.”</i>
Strength Nudge	Encourages students to keep up the good work on a sub-domain they scored high on, and directs them toward strategies to continue to improve or in case they find themselves slipping in regards to that sub-domain.	<i>“You recently completed the DAACS self-regulated learning survey, and were given results and feedback on your individual strengths and weaknesses. Your results indicated that you scored high on [a scale, e.g., motivation, strategies, metacognition]. Congratulations—this is an important asset that will help you as you continue your studies. If you’d like to read more about [the scale], or if your skills in this area have slipped since you first took the survey, click here.”</i>
Weakness Nudge	Encourages students to review feedback on a subscale on which they scored poorly, and directs them toward strategies to continue to improve in regards to that scale.	<i>“You recently completed the DAACS self-regulated learning survey and were given feedback about areas in which you could improve. Your results for planning indicate that you will perform better in college if you try new strategies. Click here to learn about strategies for [a subscale].”</i>

Review-the-Feedback Nudges were designed for students who had already completed the DAACS SRL and writing assessments to encourage them to review their feedback.

These students were randomly assigned to either the control group ($n = 292$) or one of three treatment groups that received a different sequence of three nudge messages: (1) Strength.Weakness.Writing Nudge ($n = 307$), Weakness.Writing.Strength Nudge ($n = 329$), and Writing.Strength.Weakness Nudge ($n = 327$). These three nudges were sent to students over the span of three consecutive weeks. Figure 1 provides an illustration of the design and Table 4 contains the full text of the nudges.

Figure 1
DAACS-nudges Research Design



Data Sources

Behavioral and academic outcomes were collected to address our research questions.

Behavioral Outcomes

Students' completion of the DAACS assessments and their opening of the feedback and OERs were used as behavioral indicators before and after they received nudges. For the Completion Nudges group, students who completed the DAACS self-regulated learning and writing assessments within 14 days of when they received the nudge were considered to have responded to the nudge; those who completed the DAACS assessments after 14 days, or never completed the assessments, were considered to have been nonresponsive.

Students in the Review-the-Feedback Nudges group received a series of three nudges. Students who logged in to view the DAACS results and resources within four weeks of receiving the first nudge (one week after the third nudge was sent) were considered to have responded to the nudge; those who logged in later or did not log in at all were considered to have been nonresponsive.

Academic Outcomes

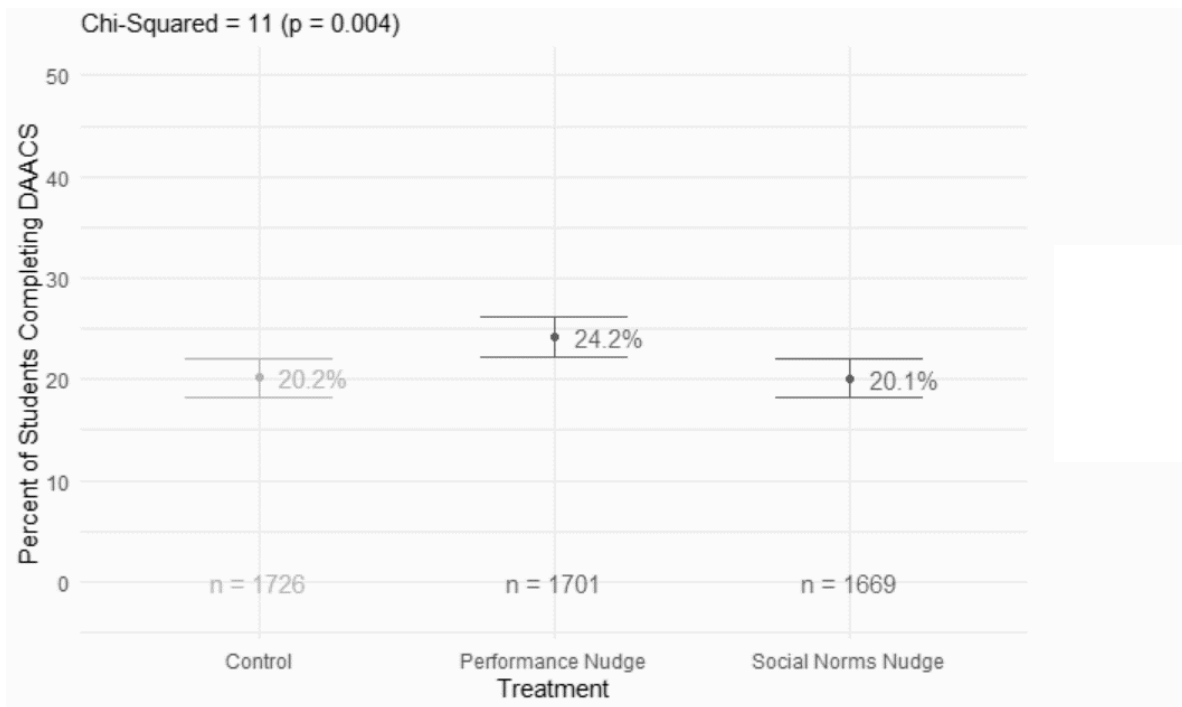
First semester course completion was the dichotomous indicator of the academic outcome. That is, students who successfully completed at least three credits by the end of their first semester were deemed successful; students who did not were deemed unsuccessful.

Results

Research Question 1: Do Completion Nudges increase rates of completion of the DAACS assessments? If so, which type of nudge (social norms or performance) has the largest effect on completion?

A chi-square goodness-of-fit was performed on the Completion Nudges group to determine whether the two treatment and control groups resulted in equal completion of DAACS. Completion of DAACS among the three conditions was not equally distributed, $\chi^2(2, N = 5,096) = 10.999, p < .01$. Post-hoc analysis of between group differences revealed that the Performance Completion Nudge resulted in a significantly higher completion rate than the Social Norms Completion Nudge and the control group. There were no significant differences between the Social Norms Completion Nudge and the control group (Figure 2).

Figure 2
DAACS Completion for Completion Nudges Groups

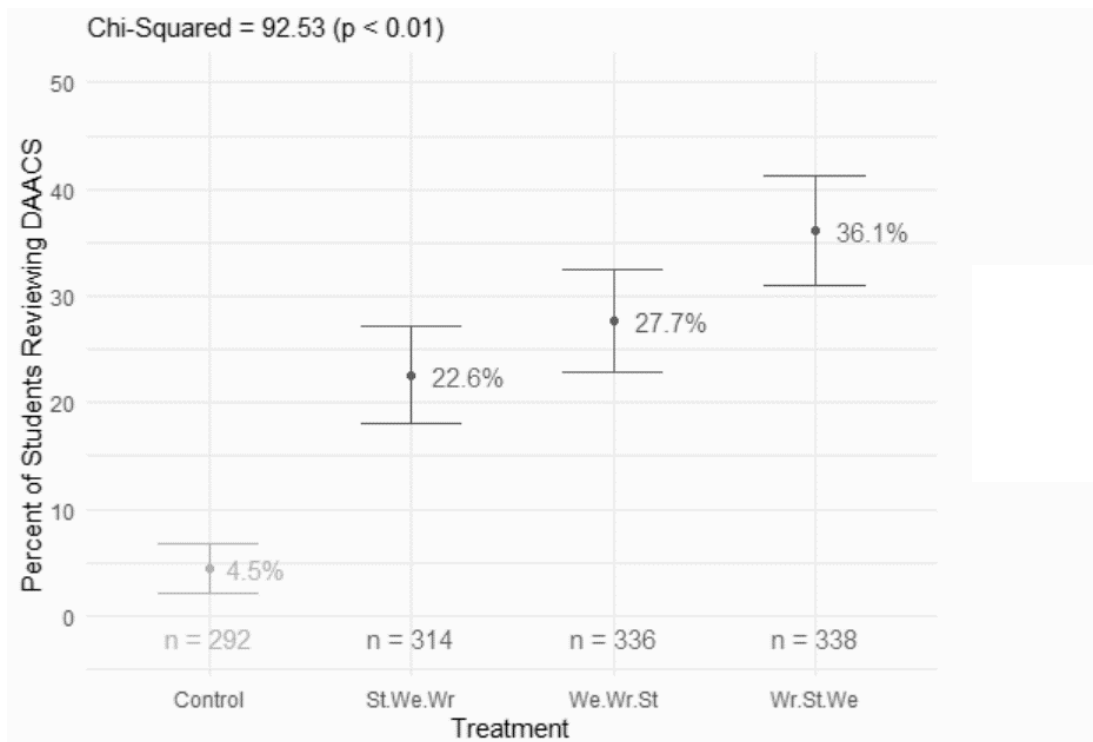


Research Question 2: Do students who had already completed the assessments login to the DAACS website when they receive a series of three informational Review-the-Feedback Nudges (strength, weakness, writing)? If so, which sequence of nudges has the greatest effect on the number of logins?

A chi-square goodness-of-fit was performed to determine whether the three treatment and control groups resulted in equal percentage of students reviewing their DAACS feedback. The

percentage was not equally distributed across the four groups, $\chi^2(3, N = 1,280) = 92.53, p < .001$. Post-hoc analysis indicated that the Writing.Strength.Weakness series of nudges (36.1% reviewed the feedback) and Weakness.Writing.Strength series of nudges (27.7% reviewed) outperformed Strength.Weakness.Writing. (22.6% reviewed) series, as well as the control group (4.5% reviewed; Figure 3).

Figure 3
DAACS Feedback Reviewed for Review-the-Feedback Nudge Groups



Note. St.We.Wr. = Strength.Weakness.Writing; We.Wr.St = Weakness.Writing.Strength; Wr.St.We. = Writing.Strength.Weakness

Research Question 3: Do nudges have an effect on students' first-term course completion? If so, which nudges have the largest effect?

DAACS Completion Nudge Group. A chi-square goodness-of-fit was performed to determine whether students' behavioral response to a Completion Nudge increases their first term course completion. The percentage was equally distributed across the three groups, with 51.4% of the Control group ($n = 888$), 54.0% of the Performance Nudge group ($n = 919$), and

52.9% of the Social Norms Nudge group ($n = 883$) completing their first term course, $X^2(2, N = 5096) = 2.29, p = .32$. Although there are slight differences in the percentages of students who successfully completed three credits during their first semester, students who received a Completion Nudges are statistically comparable to the students who did not.

Review-the-Feedback Nudge Group. A chi-square goodness-of-fit was performed to determine whether students' behavioral response to the Review-the-Feedback Nudges increases their first term course completion. The percentage was equally distributed across the four groups, with 53.8% of the Control group ($n = 157$), 49.0% of the Strength.Weakness.Writing Nudges group ($n = 154$), 49.4% of the Weakness.Writing.Strength Nudges group ($n = 166$), and 53.6% of the Writing.Strength.Weakness Nudges group ($n = 181$) successfully completing three credits during their first semester, $X^2(2, N = 1,280) = 2.51, p = .47$. That is, the course completion of students who received the Review-the-Feedback Nudges is comparable to students who did not.

Research Question 4: Of the students who received a nudge, is responding to it associated with an increase in first term course completion? If so, which nudges have the strongest association?

Completion Nudge Group. A chi-square goodness-of-fit was performed to determine whether students' behavioral response to the Completion Nudge was associated with an increase in their first term course completion. The percentage was not equally distributed across the two groups, with 69.3% of the Responded-to-Nudge group, and 49.0% of the Did-Not-Respond-to-Nudge group completing their first term course completion, $X^2(1, N = 3,370) = 95.70, p < .001$. That is, students who completed the DAACS assessments in response to the nudge were more likely to earn three credits during their first semester than students who did not. Furthermore, the group of students who responded to the performance nudge had slightly more success with first term course completion (72.2%) as compared to the group of students who responded to the social norms nudge (65.7%), and this difference approached statistical significance $X^2(1, N = 746) = 3.466, p = 0.06$.

Review-the-Feedback Nudge Group. A chi-square goodness-of-fit was performed to determine whether students' behavioral response to the Review-the-Feedback Nudge was associated with an increase in their first term course completion. The percentage was equally distributed across the two groups, with 53.1% of the Responded-to-Nudge group, and 49.7% of the Did-Not-Respond-to-Nudge group completing a first term course, $X^2(1, N = 988) = .83, p = .364$. This means that the course completion rates of students who responded to the Review-the-Feedback Nudge by accessing their DAACS feedback is comparable to the students who did not.

Discussion

The purpose of this study was to examine the effects of nudges on a sample of largely non-traditional, online students' use of the DAACS assessments and feedback, and on their first semester course completion. The results indicate that some nudges had an effect on students' completion of the DAACS assessments and accessing the feedback. We sent two different nudges to students who had not yet completed the DAACS. The Social Norms nudge informed

students of the high percentage of students who have completed the DAACS, and the Performance nudge informed students of the success previous students have had after using DAACS. Both nudges included a statement that the student was “in the small minority” of students who had not yet completed the DAACS. The Performance nudge had a positive effect on students' completion of the DAACS compared to a control group, while the Social Norms nudge did not.

This finding is consistent with the literature on reminder nudges, which suggests that reminding students to complete a task can have a positive effect on a variety of outcomes (Castleman & Page, 2015, 2016, 2017; Unkovic et al., 2016). The finding that the Performance Nudge outperformed the Social Norms Nudge is not surprising, given the mixed evidence in the literature of effectiveness of social comparison nudges. While both nudges pointed out that a student was “in the small minority,” the Performance Nudge also provided motivational information (“students who use the DAACS are 1.5 times more successful than those who have not”). As a result, it might have behaved more like an informational nudge than a social comparison nudge.

The results of this study also suggest that nudges that encourage students to review the DAACS feedback increase the rate of logging in to view the feedback. We tested three nudges that served as reminder and informational nudges, randomizing the order in which these nudges were sent. Although the Review-the-Feedback nudges increased students' viewing of feedback in any order, the most effective order was the one that began with the writing nudge, which encouraged students to review the brief essay they wrote for the writing assessment about their SRL survey results and plans for becoming more self-regulated. This finding is consistent with the literature on informational nudges, which demonstrates that giving students information about their behavior and ability or how to overcome behavioral barriers has a positive effect on academic outcomes (Damgaard & Nielsen, 2018). We speculate that the series of nudges that began by encouraging students to review their own essays was most effective because it was inherently personal: the vast majority of students wrote earnest essays about their plans to become better self-regulated learners (Akhmedjanova et al., 2019), which suggests that they might have found a reminder to reread what they wrote particularly motivating.

Finally, we tested whether any of the nudges influenced an academic outcome, namely first-term course completion. We found that none of the nudges resulted in significantly different outcomes than the control groups. Thus, although the nudges had an effect on immediate behaviors (completing the DAACS, clicking on the feedback), they did not have an effect on a complex, relatively long-term academic outcome. Although feedback has a well-established influence on learning (Lipnevich & Smith, 2018), it is clear from these findings and the nudges literature that people can be compelled to engage in a discrete behavior through nudges but changing a chain of behaviors over long periods of time to increase performance is difficult.

However, there were significant differences in first-term course completion between students who were sent a Completion Nudge and responded to that nudge and students who did not respond. While we cannot determine causality from this finding, since we had no control

over who responded to the nudge, this finding implies that the DAACS can be beneficial to those who use it. It might seem obvious that students who seek out resources to improve their college success will be more successful, whether the intervention is effective or not. However, in this study students who were sent Completion Nudges were those who had not completed the DAACS when first asked to do so, so this finding cannot be explained simply in terms of compliance or motivation. We speculate that the Completion Nudges did what nudges do best: remind people to do something beneficial that they have put off.

Interestingly, students who received and responded to the performance nudge were more likely to be successful than students who received and responded to the social norms nudge. Although this difference was only marginally significant, it is consistent with our other finding that the performance nudge was more effective at getting students to complete the DAACS than the social norms nudge. Again, the promise of improved performance provoked more of the desired response than did social comparison.

There are a few limitations to this study. First, our sample consisted only of students from one online college, most of whom were nontraditional in terms of age and number of transfer credits. Thus, the findings from this study are not generalizable to traditional students in traditional educational institutions. Second, although we found significant effects of a series of nudges that encourage students to review their feedback, we cannot determine which of the three individual nudges (writing, strengths, weaknesses) was most effective, since they were all sent to all treatment students at some point. The reasoning behind sending all three nudges was that we were primarily concerned with increasing students' use of the DAACS in a way that would maximize its effectiveness. This reasoning worked, as the nudges did have an effect on how frequently students accessed the DAACS feedback, and we were able to determine which ordering of the nudges was most effective. However, future research should isolate these three nudges to determine their relative effectiveness.

Another limitation of this study is the outcome used to measure academic performance. Since Excelsior College utilizes a pass/fail system, we were only able to operationalize academic performance as whether or not students successfully completed at least three credits by the end of their first semester. Thus, the outcome measure we used might have operated as a measure of persistence rather than of performance. Since the nudges were aimed at increasing students' performance, rather than their persistence, future research should investigate the effects of nudges on more traditional measures of academic performance, such as grades or GPA.

We also acknowledge the criticism made by Hertwig and Grüne-Yanoff (2017) that nudges are paternalistic. While we acknowledge that nudges can be perceived as coercive and undermining autonomy, we argue that the nudges employed for the DAACS encourage students to make choices for themselves that can increase their chances of success without restricting their autonomy. All of the nudges, and the DAACS itself, encourage students to regulate their own learning, and thus are more aligned with what Hertwig and Grüne-Yanoff (2017) call educative nudges or "boosts", which "seek to foster people's cognitive and motivational competences" (p.

981), rather than non-educative nudges, which simply aim to change people's behavior without a corresponding improvement in skills or competencies.

The use of nudges has increased in popularity over the last several years because they offer a cost-effective way of encouraging individuals to engage in specific behaviors. Results from this study contribute to this body of research by investigating the efficacy of a variety of new nudges created specifically for online learning and DAACS, and which aim to use aspects of nudges that have worked in previous research while avoiding or improving on aspects which have not worked. That is, we found that nudges are effective in prompting students to engage in specific academic activities, while also revealing that not all nudges perform equally. Nudges that combined features of reminder, social comparison, and informational nudges were more effective than nudges that only provided information about social norms. In addition, students who were nudged to review their academic strengths, weaknesses, and the SRL strategies they planned to use were more likely to do so than students who did not receive these nudges. These effects varied based on the order in which the nudges were sent, with the suggestion to review a self-authored essay about self-regulated learning being the most effective lead nudge.

When designing an educational tool for online students, having faith that “if you build it, they will come” might not result in students using the tool to its full advantage. Although previous research has demonstrated the benefits of using the DAACS on students' college success (Bryer et al., 2019), many students choose not to use it, perhaps because they do not see it as worthy of their time. Some students likely made a rational decision not to use it, as their DAACS results indicated that they were well prepared for college. For the majority of students, however, the DAACS identified gaps in their knowledge and skills that needed to be addressed. This study shows that students can be prompted to take the DAACS assessments and access the related feedback by sending low-cost, automated, and personalized nudges via email. To abuse an old adage, our next step is to determine how to not only get the horse to water and make it drink, but also to make it absorb that water in a way that makes it useful. That is the work of instructional design, and perhaps beyond the scope of a nudge.

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 Excelsior College, 7 Columbia Circle, Albany, NY 12203, USA.

This work was supported by the U.S. Department of Education under grant #P116F150077. However, the contents do not necessarily represent the policy of the U.S. Department of Education, and endorsement by the Federal Government should not be assumed.

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Face-to-Face vs. Online Asynchronous Teaching in a Conservation Biology Course

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Abstract

Effective, e-learning environments include a diverse range of pedagogical practices and should focus on active-learning and student-centered pedagogy. Therefore, it should not be the delivery medium, but rather the instructional methods that facilitate proper learning. Courses that incorporate effective instructional methods will support better learning than courses that do not use effective methods, regardless of the mode of delivery. We compared a traditionally taught face-to-face conservation biology course, Biol 4244/5244, for Biology majors to a fully online asynchronous e-learning course designed using essentially the same materials but varying course delivery. The Biol 4244/5244 course is designated by the University of North Carolina at Charlotte as a “writing-intensive course,” where communication is a significant part of the course learning experience. We found no significant differences in learning outcomes, regardless of the method of course delivery. Overall, we feel that this study indicates that online instruction in this type of writing-intensive and evolution-based course is a viable alternative to face-to-face instruction.

Keywords: face-to-face, online, conservation biology, writing-intensive course, evolution-based course

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.

Science education has rapidly transformed in the digital age, and a large shift in pedagogical approach has occurred over the last 10–20 years. The traditional model, where the lecturer acts as the “sage on the stage,” has become outdated, and is conflict with much of what we know about effective science teaching. Still, many classrooms in higher education rely on a transformative approach to teaching where students attend lectures and earn course grades through in-class participation and examination. An asynchronous online course structure, however, allows students coming from varying backgrounds to review and explore material on their own time, and at their own pace. While deadlines in these courses do exist, the students are largely allowed to complete these assignments as they proceed through the course material on their own. This structure helps place the learning directly in the hands of the student, while shifting the instructor’s role toward being a facilitator. Asynchronous e-learning courses have the potential to capture the benefits of web-based instruction while retaining benefits of traditional classroom instruction, such as direct interactions (Navarro & Shoemaker, 2000; Martin & Bolliger, 2018).

Review of Relevant Literature

In a study of undergraduate students at an American university enrolled in both traditional face-to-face and online courses, students indicated that they preferred online courses to the traditional classroom, indicating that they learned more in these classes, spent more time on these classes, and found these classes to be more difficult yet of higher quality than traditional classes (Hannay & Newvine, 2006). In a comparative study, Paul and Jefferson (2019) examined the differences between traditional and online learning environments and argued that traditional learning environments are (a) bound by location and presence of instructor and student, (b) presented in real time, (c) controlled by an instructor, and (d) are linear in teaching methods. Alternatively, asynchronous online courses are unbound and can be more flexible and dynamic (Paul and Jefferson, 2019).

An asynchronous online course design offers several methods that motivate, challenge and assess students without an instructor having to lead every step of the learning process (Sunal et al., 2003). A well-designed e-learning course has the potential for achieving high levels of learning and understanding, comparable to levels from traditional in-class environments (Byrd-Bredbenner and Bauer, 1991; Zubas et al., 2006; Bernstein, 2013; Nassoura, 2020). Hundreds of comparison studies have shown no differences in learning between e-learning and traditional classrooms (Clark, 1994; Dillon and Gabbard, 1998; Palocsay and Stevens, 2008; Magalhães et al., 2020; Hilton et al., 2021). Bernard et al. (2004) performed a meta-analysis integrating research studies that compared e-learning to learning from traditional classrooms and found no practical differences between e-learning and face-to-face learning. A review of online learning by Tallent-Runnels et al. (2006) found overwhelming evidence that learning in an online environment can be as effective as that in traditional classrooms. However, they found that student learning in an online environment was affected strongly by the quality of the online instruction.

To be effective, e-learning environments should include a diverse range of pedagogical practices and should focus on active learning student-centered pedagogical techniques (Baker, 2003; Browne, 2005; Harris et al., 2020). Therefore, it should not be the delivery medium, but rather the instructional methods that facilitate proper learning. Courses that incorporate effective

instructional methods will support better learning than courses that do not use effective methods, regardless of the mode of delivery (Keengwe and Kidd, 2010; Clark and Mayer, 2016).

Research Questions

We compared a traditionally taught face-to-face conservation biology course, Biol 4244/5244, for Biology majors to a fully online asynchronous e-learning course designed using essentially the same materials but varying course delivery. The Biol 4244/5244 course is designated by the University of North Carolina at Charlotte as a “W” or “writing-intensive course” where communication is a significant part of the course learning experience. In writing intensive courses, students are given frequent opportunities to engage in a variety of informal, low stakes communication assignments and learning activities. Informal writing and speaking opportunities have the explicit purposes of exploring and deepening content area knowledge and developing writing abilities. Students are further required to complete at least one formal communication assignment where students are given formative feedback and an opportunity to revise a significant part of at least one formal communication assignment. For formal writing in W courses, there is a minimum requirement by the university of 2,500 words (approximately 9–10 pages). In Biol 4244/5244, the formal writing assignment is a group-written grant proposal on a chosen conservation related theme. Some of these themes included effects of climate change on species distribution, effects of habitat loss and fragmentation, conservation genetics, endangered species, and the illegal wildlife trade.

To facilitate communication in this course, a peer communication consultant was embedded in the course by the Communication Across the Curriculum (CxC) program. This faculty development program exists to help faculty and departments design curricula that can improve students’ writing and speaking skills. The peer communication consultant is a fellow biology major that has received extensive training in communication methods and meets with students, or in our case student groups, to work on communication and writing-based skills weekly throughout the semester. We compared a variety of learning outcomes, including those related to written communication skills, between students taught using a traditional face-to-face lecture, and students from a newly developed e-learning course in an asynchronous online environment in order to assess which mode of delivery was most effective in promoting learning and written communication in this STEM course.

Methods

Students enrolled in the conservation biology course during spring 2019 (n = 22) were taught using traditional face-to-face lectures, combined with in-class writing activities and in-class work with a peer consultant once per week to help with writing assignments. Students taking the course in fall 2020 (n = 18) participated in a fully asynchronous online course format and were taught using pre-recorded lectures, combined with online discussion boards, online writing activities, and online work with a peer consultant once per week.

Evaluation

Pre- and post-course surveys consisted of 25 questions based on demographics, course learning objectives, and student perceptions about written communication development. Students were first asked a series of questions related to writing-intensive coursework. Questions were related to the following course objectives and measured students’ self-perception of mastery of the objectives:

- (1) Students will locate and access the Atkins library biology research guide where all the online databases for searching literature are located.
- (2) Students will differentiate between an empirical study and a literature review article.
- (3) Students will be able to formulate a scientific hypothesis.
- (4) Students will cite scientific literature using MLA, CSE, or APA formats.
- (5) Students will synthesize data to think creatively about scientific problems.
- (6) Students will locate and access appropriate scientific literature specific to subdisciplines of interest.
- (7) Students will provide and receive useful constructive feedback as part of the peer review process.
- (8) Students will work as a team to solve scientific problems.
- (9) Students will read and interpret scientific literature specific to subdisciplines of interest.
- (10) Students will communicate scientific ideas to non-experts through writing.
- (11) Students will collaborate with a peer communication consultant to improve their writing skills throughout the course.

Students were next asked a series of questions related to conservation biology content. These questions were related to the following course objectives and measured students' self-perception of mastery of the objectives:

- (1) Students will describe the development of the field of conservation biology based on three predominant conservation land ethics.
- (2) Students will explain the significance of conserving ecosystem, species, and genetic diversity.
- (3) Students will differentiate between preservation and conservation.
- (4) Students will describe the main threats to biodiversity.
- (5) Students will describe the significance of the current extinction crisis.
- (6) Students will describe the process of de-extinction.
- (7) Students will describe the effects of global climate change on alterations to water and nutrient cycling.
- (8) Students will describe predicted effects of global climate change on species distributions and phenologies.
- (9) Students will discuss the ethical responsibility of humans in maintaining biodiversity in a sustainable manner.

Statistical Analysis

All test scores were analyzed with inferential statistics using quantitative software, JMP Pro 15. Fisher's exact test was used to accommodate a small sample size. For spring 2019 (face-to-face) and fall 2020 (online) semesters, a statistical analysis was performed to compare the pre- and post-test responses for each question. This analysis was conducted to determine the impact of each teaching delivery method on student understanding for the assessment criteria. To check for the possibility of sample bias, another analysis was conducted to compare responses on the pre-test scores for each delivery method. This step was taken to determine if there was any statistical difference between the groups prior to instruction. Finally, another analysis was performed on each question to compare responses on the post-test scores for each teaching delivery method. This final analysis establishes whether there was a statistically significant

difference between the post-test scores for both groups, which would be an indicator of the relative effectiveness of the two delivery methods.

Additionally, we compared students' overall performance in the course. This comparison included analyzing the average exam scores, final course grade, and performance on a course-long, collaborative writing project. Again, we utilized JMP Pro 15 software to complete the inferential statistical analysis. For each performance area, the numerical score for face-to-face students was compared to that of the online students. A box plot was used to check for the normality of the data. This check indicated that the data are not normally distributed for the three criteria. Therefore, the Wilcoxon Rank Sum, nonparametric test was used to look for a significant difference in the three data sets.

Results

Demographics

UNC Charlotte (UNCC) is an urban research university with over 30,000 students. The undergraduate student population is 57% White, 16% African American, 10% Hispanic, 7% Asian, 5% two or more races, 3% non-resident alien, and the remainder unknown (UNC Charlotte, n.d.). Ninety percent of students enrolled in Biol 4244/5244 were seniors in their last year of undergraduate schooling (n = 20 spring 2019 face-to-face, n = 16 fall 2020 online), while there was only 1 junior in spring and 1 graduate student enrolled in both semesters (Table 1). Twenty-three percent (n = 5) of students enrolled in the course transferred from a junior or community college in spring 2019, while 77% (n = 17) did not (Table 2).

Twenty-eight percent (n = 5) of students in fall 2020 transferred to UNCC from a junior or community college, while 72% (n = 13) did not. Similarly, 23% (n = 5) of students enrolled in Biol 4244/5244 transferred to UNCC from a 4-year college in the spring 2019 course, while 77% (n = 17) did not. Only 11% of students in the course transferred from another 4-year college in the fall 2020 course, while 89% did not (Table 2). Students who transfer from a community college can have different experiences and motivations that might impact their performance (List & Nadasen, 2017). Accordingly, we collected data on possible differences in the students' academic backgrounds in the demographics of our questionnaire to include transfer student information. Assessing the impact of academic background was beyond the scope of our study; however, the data is included in the event it is helpful to other researchers.

Table 1
Summary Data for Students Participating in this Study

Semester taught	Class ranking	n
Spring 2019 (face-to-face)	Junior	1
	Senior	20
	Graduate	1
Fall 2020 (online)	Junior	1
	Senior	16
	Graduate	1

Table 2*Where Students from This Study Came From Prior to UNCC*

Semester taught	Transferred from junior/community college	n
Spring 2019 (face-to-face)	Yes	5
	No	17
Fall 2020 (online)	Yes	5
	No	13
Semester taught	Transferred from 4-year college	n
Spring 2019 (face-to-face)	Yes	5
	No	17
Fall 2020 (online)	Yes	2
	No	16

Qualitative Course Performance—Writing Intensive Survey Questions

There were no significant differences between the modes of course delivery from spring 2019 (face-to-face) and fall 2020 (online asynchronous) for any of the survey questions related to the writing intensive course objectives (Table 3). There was a significant difference between pre-course and post-course answers for both modes of delivery for the following questions, indicating that students increased their confidence throughout the semester (Table 3):

- (1) I know how to access the biology research guide.
- (2) I can differentiate between an empirical and review article.
- (3) How confident are you in your ability to think creatively about scientific problems?
- (4) How confident are you in your ability to choose an appropriate database to search for scientific literature across subdisciplines?

There was a significant difference between pre-course and post-course answers for spring 2019 (face-to-face) for the following questions:

- (1) I am able to write a proper scientific hypothesis.
- (2) How confident are you in your ability to read and interpret scientific literature?
- (3) How confident are you in your ability to communicate scientific ideas through writing?

There was no difference found between pre- and post-course answers in either semester for the following questions, meaning that students did not increase their confidence in these questions throughout the semesters for either mode of course delivery (Table 3):

- (1) Is this a properly written hypothesis: “Does applying fertilizer to plants help them grow?”
- (2) I am able to cite scientific literature within the text of a paper using MLA, CSE, or APA format.
- (3) How confident are you in your ability to give and receive useful constructive feedback as part of the peer review process?

- (4) How confident are you in your ability to work on solving a scientific problem as part of a team?
- (5) How confident are you in your ability to communicate scientific information to a non-expert?
- (6) How likely do you think you are to benefit from working with a peer communication consultant in this course?

Qualitative Course Performance—Conservation Biology Content

There were no significant differences between the modes of course delivery from spring 2019 (face-to-face) and fall 2020 (online asynchronous) for any of the survey questions related to the conservation biology content course objectives (Table 3). We did find a significant difference between pre-course and post-course answers for both semesters for the following questions, indicating that students increased their confidence in the questions throughout the semester (Table 3):

- (1) I am able to describe the development of the field of conservation biology based on the three predominant conservation land ethics.
- (2) I am able to tell the difference between conservation and preservation.
- (3) I am able to describe the main threats to biodiversity.
- (4) I am able to describe the significance of the current extinction crisis.
- (5) I am able to describe the process of de-extinction.
- (6) How confident are you in your ability to accurately describe predicted effects of global climate change on alterations of water and nutrient cycles?
- (7) How confident are you in your ability to accurately describe the predicted effects of global climate change on species distributions and phenologies?
- (8) How confident are you in discussing the ethical responsibility of humans in maintaining biodiversity in a sustainable manner?

There was a significant difference between pre-course and post-course answers for spring 2019 (face-to-face) only for the following question:

- (1) I am able to explain the significance of conserving ecosystem, species, and genetic diversity.

Quantitative Course Performance

A look at the exam average of the face-to-face students and that of the online students indicated no significant difference in their performances. The normal and chi-square approximations for the Wilcoxon test statistic indicated p-values of 0.7642 and 0.7538, respectively. There was also no significant difference in the mean final course grades. The p-value for the normal approximation was 0.3005, and the chi-square was 0.2941. Finally, the analysis of the collaborative project scores indicated no significant difference between the course formats. In this case, the p-values for the normal and chi-square approximations under the Wilcoxon test were 0.0918 and 0.0752, respectively. These scores were further analyzed using the Wilcoxon Exact Test. The two-tailed p-value here was 0.0844, supporting no significant difference in the students' performance on this project.

Table 3

Questions Where Both Groups Showed Improvement from Pre-course to Post-course and There Was No Significant Difference on the Post-course Assessment

Question	Face-to-face Pre vs Post Test	Online Pre vs Post Test	Face-to-face vs. Online Pre tests	Face-to-face vs. Online Post tests
<i>I know how to access the biology research guide.</i>	< 0.0001*	< 0.0114*	0.1468	0.2198
<i>I can differentiate between an empirical and review article.</i>	<0.0001*	<0.0001*	0.9265	1.0000
<i>How confident are you in your ability to think creatively about scientific problems?</i>	0.0079*	0.0433*	0.9542	0.4310
<i>How confident are you in your ability to choose an appropriate database to search for scientific literature across sub-disciplines?</i>	0.0004*	0.0054*	0.7175	0.4977
<i>I am able to describe the development of the field of conservation biology based on three predominant conservation land ethics.</i>	<0.0001*	<0.0001*	1.0000	0.4761
<i>I am able to explain the difference between conservation and preservation.</i>	<0.0001*	<0.0029*	0.2000	1.0000
<i>I am able to describe the main threats to biodiversity.</i>	0.0014*	0.0191*	0.7470	1.0000
<i>I am able to describe the significance of the current extinction crisis.</i>	<0.0001*	0.0076*	0.1098	1.0000
<i>I am able to describe the process of de-extinction.</i>	<0.0001*	<0.0001*	0.1962	1.0000
<i>How confident are you about your ability to accurately describe predicted effects of global climate change on alterations to water and nutrient cycling?</i>	<0.0001*	<0.0001*	0.1224	0.9066
<i>How confident are you about your ability to accurately describe predicted effects of global climate change on species distributions and phenologies?</i>	<0.0001*	0.0012*	0.6191	0.8926
<i>How confident are you in discussing the ethical responsibility of humans in maintaining biodiversity in a sustainable manner?</i>	<0.0001*	0.0112*	0.6248	1.0000

Discussion

University courses may or may not be suitable for online delivery. For writing intensive courses, online delivery often suits the content of the course well, as this type of delivery is primarily text-based (Savenye, 2001). Despite the format of a course as online writing intensive, providing opportunities for student-student interactions and student-faculty interactions through

online discussions and interactive assignments are essential for maintaining learning engagement in the course (Buelow et al., 2018). Martin et al. (2020) noted that participation in online discussion boards and other methods of computer-mediated communication are critical to student's success in online courses. Studies by Kucuk and Richardson (2019) indicated that cognitive presence is significant in maintaining online learning engagement. The structure of our course, including the student-student collaboration on the grant writing project, and student-peer interaction with a peer communication consultant helped maintain students' cognitive presence in online and face-to-face classes. Text-based writing projects, and even peer reviews, can easily be turned in and shared online and students can easily participate in asynchronous discussion posts related to course content.

Our study comparing a face-to-face version of conservation biology, Biol 4244/5244, to an asynchronous online version showed no significant differences between these two modes of course delivery when comparing learning outcomes related to course material and written communication. Both modes of course delivery required the students to work in small groups of 4 to 5 to write a comprehensive grant proposal as their writing intensive assignment for this course. The student performance for both groups indicates that students can work collaboratively to produce an effectively written scientific document, independent of the mode of course delivery. Questions where both groups showed improvement from pre-course to post-course and where there was no significant difference on the post-course assessment indicated that there were no significant differences between face-to-face and online methods of instruction. This was the case for 12 out of the 24 questions, not considering the demographic questions. Interestingly, no communication-related questions fell into this category.

There were several face-to-face survey questions that showed a significant difference from pre-course to post-course and showed no significant difference on the post-course assessment for the two groups. These questions included student confidence in ability to write a proper scientific hypothesis, read and interpret scientific literature, written communication of scientific ideas, and explaining the significance of conserving ecosystem, species, and genetic diversity. This indicates that there are several areas where teaching face-to-face might be more effective than teaching online, especially for communication-based objectives. In a face-to-face environment, we took time to practice a number of these communication-based skills that were possibly not adequately replicated in the online version of the course. It should be noted that although online students did not show improvement in their confidence in these abilities, their performance on the comprehensive grant proposal indicates otherwise. Online and face-to-face students showed increased confidence in their ability to access the biology research guide, to differentiate between an empirical and review article, to think creatively about scientific problems, and to choose an appropriate database to search for scientific literature across subdisciplines.

Research has shown that students who report higher self-efficacy in their ability to use online platforms and self-regulate will perceive greater course effectiveness and are more satisfied with their learning experience (Landrum, 2020). Only one section of our course was offered each of the semesters studied. So, students wanting to take the course were required to enroll in the only format offered. This limited offering meant that students might not have been comfortable with taking an online class. Teaching presence can increase students' emotional

engagement in a course as well as increase students' constructive involvement (Kucuk & Richardson, 2019). Therefore, in future online course offerings, promoting confidence as well as improvement in capability should be a focus.

No conservation biology-related questions resulted in similar responses for both groups on pre-course and post-course assessment, which means that students learned this material by taking the course through both methods of instruction. However, there were several questions related to accessing resources and literature that showed no significant difference before and after taking the course, as well as a number of communication-based questions. Student answers on the pre- and post-test surveys indicate that students entered the class both semesters already having these skills. For example, there was no difference in the pre- and post-test answers for identifying a properly formatted hypothesis or being able to cite literature properly using a common scientific format. The student answers indicated that all 18 of the students surveyed were confident in these skills prior to taking the course in a face-to-face format. Only three students indicated that they may not recognize a properly formatted hypothesis, while only four indicated that they may not be able to properly cite literature prior to taking the online course.

Using quantitative analysis methods, we found no statistically significant difference in students' academic achievement in online and traditional exams. Nor was there a difference in the collaborative grant proposal assignment. This information is a strong indicator of the students' skills. Instead, the questionnaire is an indicator of student confidence in their ability.

There were some methodological weaknesses and limitations to our study. One is the limited comparison of only two classes to each other. We do feel that our study provides an interesting and relevant comparison of a conservation-based face to face and online course. In the future, studies over longer periods of time could add more information to the results we obtained in the present study. Additionally, we recognize that replication of our study could be challenging given the incorporation of a peer communication consultant into the course. While this could be a challenge, it could still be accomplished if others were truly interested in conducting a similar study over a longer period.

Overall, we feel that this study indicates that online instruction in this type of course is a viable alternative to face-to-face instruction. Student performance and confidence are comparable in many (most) of the assessed areas. Improving student confidence is one area that can use some improvement. Martin et al. (2020) suggests the use of a Student Readiness for Online Learning (SROL) survey to determine students' confidence in their ability for online learning. SROL data reflects students' attributes, time management, communication, and technical competencies, all of which have been shown to increase student confidence in online learning. Survey results can be used by students and faculty to assess readiness for online learning and to improve student confidence in online learning. We feel other educators can use information gained in our research to plan and design similar online courses.

Declarations

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

The authors asserted that ethics board approval was obtained from UNCC in 2021 for this study.

Funding for this research project was given under a SoTL Grant from UNCC.

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The Impact of Attitudes, Beliefs, and Cognitive Reflection on the Development of Critical Thinking Skills in Online Students

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Abstract

Learning and development of critical thinking (CT) skills in higher education is essential for academic achievement. The following experiment is the first to examine the effect of online student's perceptions and attitudes towards CT across dimensions of confidence, valuing, misconceptions, cognitive reflection, and authors writing. Furthermore, a CT intervention was developed, and the effects of the intervention examined with an aim to help students improve their grade point average. The analyses demonstrated that student's confidence and cognitive reflection predict academic achievement. Moreover, the online CT intervention was associated with improved students' CT attitudes, skills, and academic performance. Significant interactions were observed between time (pre- and post-intervention) and intervention in cognitive reflection, confidence, beliefs, and attitudes related to CT, and student grade point average (GPA, as a measure of student's performance on online modules). It was concluded that the CT can be taught and that an intervention based on "how to think" rather than a "what to think" mixed approach can help online students develop CT, strengthen their confidence in CT and help students improve their academic performance in an online setting.

Keywords: critical thinking, cognitive reflection, critical thinking confidence, teaching, learning

Simonovic, B., Vione, K.C., Fido, D., Stupple, E. J. N., Martin, J. & Clarke, R. (2022). The impact of attitudes, beliefs, and cognitive reflection on the development of critical thinking skills in online students. *Online Learning*, 26(2), 254-274.

Critical thinking (CT) is a core skill in higher education and most educators emphasize the importance of fostering students' CT skills to prepare them for "real-world" challenges (Facione, 1990; Halpern, 2014; Puig et al., 2019). CT skills are considered essential to learning in higher education (Thompson, 2011) not only because they facilitate high academic performance, but because they are associated with higher rates of employability, stronger public engagement, and firm financial position (Facione & Facione, 2001; Osborne et al., 2013). However, although learning and developing CT skills represent an important area of pedagogy, there remains a need for further research in online environment (Hussin et al., 2019; MacKnight, 2000).

Online programs in higher education are no different from on-campus programs in terms of promoting CT, and yet unfamiliar teaching techniques in online environment can cause difficulties regarding the best methods for fostering CT (Hussin et al., 2019). Attempts have been made to promote CT using online discussion boards and text-based communication (e.g., Belcher et al., 2015) and course curriculum changes (e.g., Nold, 2017). Although positive evidence towards promoting critical thinking in online learning has been found (e.g., Arend, 2009; Lunney et al., 2008; Swart, 2017), most studies present significant limitations, such as not measuring critical thinking at pre- and post-intervention, not outlining clear and replicable procedures, or focusing strictly on discussion boards. There is also a tendency to focus on specific assessment-focused aspects of learning rather than promoting CT skills more generally, which may be transferable to real-life (Maurino, 2007). Furthermore, only limited research exists in online environments, which tests the effectiveness of teaching approaches such as discussion boards, focus group, problem-based and task-based strategies in promoting CT (Guiller et al., 2008; Parker et al., 2015; Richardson & Ice, 2010). As such, a consensus on how to define, measure, and nurture CT skills through educational effort in online environments is yet to be achieved.

Review of Literature

Facione (1990, p. 2) defined CT as "a purposeful, self-regulatory judgment that results in interpretation, analysis, evaluation, and inference as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based". This definition captures the multifaced nature of CT and may explain the difficulties that educators face when teaching and promoting CT interventions (Tsui, 2002). Systematic reviews consistently indicate that teaching CT should adopt "how to think" instead of "what to think" approaches to advance teaching strategies that may influence the development of CT skills (Cloete, 2019; Puig et al., 2019). This is particularly important because the teaching of CT skills in higher education has been identified—globally—as an area requiring improvement with students reporting difficulty in understanding and demonstrating CT in their assessments (Abrami et al., 2008; 2015) and many teachers often lack understanding of what CT encompasses and how to teach it (Janssen et al., 2019). For example, Duro et al., (2013) explored students' and lecturers' understanding of critical thinking and found a mismatch between students' understanding of CT and lecturers' expectations. They recommended structured interactive CT exercises to enhance students' critical metacognitive processes for the development of strong arguments.

Previously, CT has been described as a metacognitive process, believed to be pivotal in logical thinking, decision-making, and problem-solving (Halpern, 2003). This metacognitive process is associated with the analytic system posited by dual process theorists in cognitive psychology (Bonnefon, 2016; Kahneman, 2011). Dual process theories of thinking and reasoning propose a qualitative contrast between “Type 1” automatic, fast, and implicit processes (e.g., intuitions or gut-feelings) and “Type 2” analytic processes that are conscious, effortful, and self-regulatory. Type 2 processing is associated with executive function and working memory capacity but also other factors that are important in CT such as aptitude for reflective judgments, beliefs and confidence, and propensity to avoid miserly processing of information by relying on Type 1 processes (Toplak, West, & Stanovich, 2014). Thus, it is expected that CT entails cognitive and metacognitive components to enable learning and application of CT skills.

Recent systematic reviews (Abrami et al., 2015; Dwyer et al., 2014; Puig et al., 2019; Ross et al., 2013) have identified a range of measures related to aspects of CT such as dispositions (e.g., the California Critical Thinking Disposition Inventory [CCTDI], Facione et al., 2001), problem solving (e.g., the California Critical Thinking Skills Test [CCTST], Facione et al., 1992) and CT-related abilities to process information in a logical manner (e.g., Watson-Glaser Critical Thinking Appraisal [WGCTA], Watson & Glaser, 1964). These measures were widely used to assess students’ CT; however, there were concerns raised about their psychometric properties as the validity and reliability of these measures is difficult to establish (Abrami et al., 2008; Bernard et al., 2008). Furthermore, these measures do not cover some of the very important elements of CT such as metacognitive thinking and cognitive aptitudes (Liu et al., 2014).

The importance of metacognitive thinking was highlighted as an important factor of CT (Dwyer et al., 2014), whereby metacognitive thinking entails self-regulation of thoughts by using executive function, such as attention, memory, and higher-order cognitive skills for application of the CT skills. As such, application of CT skills depends on cognitive reasoning processes and metacognitive monitoring where confidence and beliefs in CT knowledge, and cognitive reflection may help students to engage in effortful thinking and to prevent errors in reasoning. For example, students’ positive attitudes and beliefs about CT significantly correlates with their ability to override false beliefs, the ability to assess arguments strengths and are highly significant predictors of students’ grade point average (GPA) (Stuppel et al., 2017). Furthermore, an ability to override incorrect responses, by engaging in more effortful and actively open-minded thinking strongly correlates with beliefs and attitudes in CT and academic performance (Frederick, 2005; Heijltjes et al., 2015; Klaczynski, 2014; Stanovich, 2011; Stanovich et al., 2016; Stuppel et al., 2017). Thus, the measures related to attitudes and beliefs in CT and cognitive reflections could be used to teach students about common misconceptions about CT and how to challenge those misconceptions by facilitating reflection on their CT and by engaging them in analytic thinking. Moreover, these can help students to engage deeply with the learning and teaching material presented to them and help identify themselves as the authors of their assessments—rather than superficially seeking course credit and passively regurgitating material for grades rather than knowledge.

Indeed, attitudes and beliefs in CT are important for creation of authorial identity that is in turn important in assessment writing. Authorial identity epitomizes the attitudes and beliefs that a writer has of themselves as an author and the way they express themselves in terms of the construct and critical analysis in their writing (Elander et al., 2010). Authorial identity is moreover related to the development of CT, particularly in terms of developing writing skills (Cheung et al., 2015; Elander et al., 2010). Cheung et al., (2015) demonstrated correlations between beliefs and attitudes about CT and authorial identity suggesting an important link between the development of CT skills and the development of writing skills through education. Indeed, the application of their learned academic literacy is not only essential to the construction of a good argument (Elander et al., 2010) but also may lead to prevention of unintentional errors such as plagiarism (Abasi et al., 2006). Thus, examination of students' sense of ownership of written work and authorial ways of thinking may help the development of pedagogic interventions. Furthermore, teaching students about authorial identity may help strengthen their confidence, attitudes, and beliefs about their CT skills related to the critical evaluation of the written argument.

Considering the multifaceted nature of CT, it is understandable why educators face difficulties when teaching and promoting CT interventions. A CT intervention was developed (consisted of four parts) with an aim to include several important aspects of CT (Ennis, 2016). The first part of the intervention provided material and guidance for students to gain some basic understanding of general CT skills (e.g., Facione, 2000) and instructions on how to recognize and apply them in real life situations. The second part focused on the importance of metacognition (e.g., Stanovich, 2018) and highlighted the importance of "sharpening" metacognitive skills by thinking of common errors in reasoning and avoiding biases. The third part focused on the real-life examples from Twitter, fake news and biases, fallacies, and heuristics based on the dual-processes theories (Evans & Stanovich, 2013). The last part covered general instructions on how to approach assessments and develop basic strategies when preparing assessment. Thus, the overall goal was to help students become critical thinkers by using "how to think" rather than "what to think" approach based on the evidence that teaching strategies that encourage, stimulate, and facilitate students' acquisition and transfer of thinking skills are essential for CT development (Beyer, 2008; Halpern, 1993).

The primary goal was to assess students' critical thinking ability, attitudes, and beliefs on critical thinking. The Cognitive Reflection Test CRT (CRT; Toplak et al., 2014) was chosen because it measures analytic thinking which theoretically underpins CT (Halpern, 2014). The Critical Thinking Toolkit (CriTT; Stupple et al., 2017) and the Student Attitudes and Beliefs about Authorship Scale (SABAS; Cheung et al., 2015) were chosen because they measure attitudes (e.g., aptitudes, beliefs, and confidence related to CT and academic writing) that are important in higher education and the development of the CT skills (e.g., Dwyer et al., 2014). Secondly, it was assessed whether the intervention improved CT in students. GPA was used to examine whether the intervention improved GPA and as a direct measure of the correlation between CT and student academic achievement (Facione et al., 2000). The intervention design was based on mixed approaches (for a review, see Tiruneh, Verburgh, & Elen, 2014) whereby the importance of metacognition, real-life examples related to cognitive errors and biases, fake news, and general assessments preparation were covered. This was to address the complexity and breadth of CT development and help students to effectively communicate their critical thinking.

It was predicted that students' attitudes, beliefs, and confidence would predict willingness to engage with the workshops. Second, it was also predicted that positive attitudes, beliefs, confidence, and higher cognitive reflection would positively predict variance in students' GPA. Lastly, it was predicted that the students who engaged with the workshops would score higher on CRT, CriTT, SABAS, and GPA after the workshops than students that did not engage.

Methods

Participants

To determine target sample size, an a priori power analyses using G*Power (version 3.1.9.2) was conducted. Based on the suggestion related to the common effect size in educational research (Hattie, 2008), for a small effect size and a standard alpha level of .05, a minimum of 187 participants would be required to have 80% power in correlational analyses. The second a priori power analysis was conducted for the group comparisons analysis for a small effect size of 0.3, alpha adjusted level of .001¹ for multiple comparisons, a minimum of 54 participants would be required to have 80% power in the mixed ANOVA analyses. We aimed to recruit upwards of 200 participants to account for incidents of missing data and participant withdrawals. A total of 191 university students (Mage = 28.01 years, SD = 8.62; 62.23 % female) responded to an online advertisement distributed via email lists and module announcements, these participants were entered in the correlational analysis. For the intervention, participants who responded the advertisement expressing their interest to take part in the study were randomly allocated to either a control waiting list or intervention. A total of 58 participants ($N_{\text{intervention}} = 37$, $N_{\text{control}} = 21$) completed all required parts of the study and were entered in the group comparison analysis (mixed ANOVAs). All participants were enrolled in an online British Psychological Society-accredited Master's in Psychology degree at the authors' institution. Inclusion criteria required that participants to be fluent in English, aged 18 years or over, and currently studying in an online capacity at the University. Although the intervention was made available to all students, participants reporting current diagnoses of psychiatric, affective, or neurological disorder likely to impact one's ability to learn or critically analyse were asked not to take part in pre- or post-measures. Participants provided written informed consent in accordance with approved university research ethics protocols and British Psychology Society ethical guidelines by ticking a box on both the first and last pages of online survey.

Materials

The CriTT (Stuppel et al., 2017). The CriTT comprises 27 items that measure student perceptions of and attitudes towards critical thinking across dimensions of *confidence*, *valuing*, and *misconceptions* (e.g., "Critical thinking is essential in higher education"), using a 10-point scale. Each item is rated using a scale anchored from "1—Strongly disagree" to "10—Strongly Agree" This scale was originally tested with 133 students and showed high reliability (Confidence (Cronbach's $\alpha = .92$); Valuing (Cronbach's $\alpha = .79$); Misconceptions (Cronbach's $\alpha = .60$)). For this research, only the total CriTT scores were calculated and analyzed, with high scores indicative of greater levels of more positive perceptions of critical thinking. The scale also showed high reliability in our study (Cronbach's $\alpha = .89$).

¹ Since there were multiple outcomes, which requires standard error adjustments for multiple hypothesis testing, we adjusted probability significance to $p = 0.001$.

The Seven-item CRT (Toplak et al., 2014). The CRT comprises seven items that measure one's ability to resist and override intuitive responses by engaging analytic ability (e.g., "A bat and a ball cost \$1.10 in total. The bat costs a dollar more than the ball. How much does the ball cost?"). Here, one's intuitive response is to state that the ball costs \$0.10 (totalling \$1.20), when the correct answer is \$0.05. Each item is rated using as either correct or incorrect, with higher scores indicative of greater levels of cognitive reflection. This scale was originally tested with 160 students and showed high reliability (Cronbach's $\alpha = .72$). The scale also showed high reliability in our study (Cronbach's $\alpha = .79$).

The SABAS (Cheung et al., 2015). The SABAS comprises 17 items that measure beliefs and attitudes about academic writing (e.g., "I am able to document my ideas clearly in my writing") using a 6-point scale anchored from "1 = Strongly Disagree" to "6 = Strongly Agree." High scores indicated stronger beliefs about and more positive attitudes towards academic writing. This scale was originally tested with 445 students and showed high reliability (Cronbach's $\alpha = .89$). The scale also showed high reliability in our study (Cronbach's $\alpha = .88$).

Intervention. The intervention was designed and created by the research team for the purpose of this research using built-in screen capture software for a Macbook Pro (macOS Mojave, v.10.14.6), and was embedded within Qualtrics survey software to monitor compliance and to record responses. The intervention was approximately one hour in length (4 parts of 15 minutes) and focused on the enhancement of critical thinking through: observations, inferences, and assumptions (e.g., Halpern, 2003), fallacies, biases, and heuristics in reasoning and critical thinking (e.g., Kahneman & Tversky 1984; Tversky & Kahneman, 1983), argument evaluation (e.g., Stanovich & West, 1997), and contrasts in evidence comparison (e.g., Dunn et al., 2008). The intervention combined written and spoken materials and asked participants to complete tasks throughout. The survey could not move onto the next section until a task specific amount of time had passed.

Procedure

On expressing interest to take part in the research, participants accessed the baseline online survey, whereby they entered their demographic information and completed the CriTT, CRT, and SABAS. Participants were randomly allocated to either an active (intervention) or waiting list group and were emailed information on this placement by a researcher (JM), who would remain blind to the subsequent data collection, analysis, and interpretation. Over a four-week period, participants in the active group received weekly intervention materials via email and for completion that week. Each element of the intervention took approximately 15 minutes to complete. Following the final element of the intervention, all participants were sent a follow-up survey, asking them to complete the CriTT, CRT, and SABAS. After completion of the study, links to the intervention were made available and debriefing material were provided to all participants. GPAs were recorded before and after completion of the semester. The range was from 0 to 100 and consists of the average grades in the modules each student had completed at the time of the study.

Analytic strategy and scoring

Data were log transformed (LG10) if they didn't meet normality criteria (e.g., CriTT and SABAS subscales for logistic and multiple regression). Initial analyses used logistic regression to check whether student's willingness to engage with intervention could be predicted based on their scores in CRT, CriTT, and SABAS. Next, a multiple regression was conducted with three predictors: the CRT (Toplak et al., 2014); the CriTT (Stupple et al., 2017) and the SABAS (Cheung et al., 2015) with GPA at the beginning the semester as the outcome variable. Finally,

four mixed ANOVA ($N = 58$) analyses examined the effect of the intervention (before and after semester) and intervention attendance (students attended or did not attend intervention) on GPA, CRT, CriTT, and SABAS.

Results

Regression scores before semester

A logistic regression (Enter method) tested baseline differences in CRT, CriTT subscales (Confidence in CT, Valuing CT, and Misconceptions), and SABAS subscale (Authorial Confidence, Valuing Writing, and Identification with Author) as predictors of participation in the critical thinking intervention. The overall fit of the model is assessed using the log likelihood statistics (Table 1). The model was significant ($p = .001$) and indicated that students who took part in the intervention had lower confidence in their CT (CriTT Confidence) and authorial identity (SABAS Authorial Confidence).

Table 1

Beta and SE, CI, and Odds Ratio of Variables Included in Logistic Regression

	B (SE)	Lower	Odds Ratio	Upper	Significance
GPA	-0.02 (0.02)	0.95	0.98	1.02	$p = 0.31$
CRT	0.11 (0.76)	0.96	1.11	1.29	$p = 0.15$
CriTT (Confidence)	-0.02 (0.01)	0.96	0.98	0.99	$p = 0.006$
CriTT (Valuing)	0.01 (0.02)	0.96	1.00	1.05	$p = 0.76$
CriTT (Misconception)	-0.01 (0.03)	0.95	0.99	1/04	$p = 0.88$
SABAS (Authorial Confidence)	-0.99 (0.29)	0.20	0.37	0.66	$p = 0.001$
SABAS (Valuing writing)	-0.62 (0.44)	0.22	0.53	1.27	$p = 0.16$
SABAS (Identification with Author)	-0.19 (0.28)	0.47	0.82	1.41	$p = 0.48$

Notes. $\chi^2 = 0.10$ (Hosmer & Lemeshow), 0.12 (Cox & Shell), 0.16 (Nagelkerke), Model $\chi^2(8) = 24.23$, $p = 0.002$

A multiple regression (Enter method) tested the relative predictive strength of CRT, CriTT subscales (Confidence in CT, Valuing CT and Misconceptions), and SABAS subscale (Authorial Confidence, Valuing Writing and Identification with Author) for GPA baseline scores. After controlling for age and sex, data indicated that the seven predictors combined reliably accounted for 4% of the variability in GPA. The Beta for both CRT and CriTT Confidence scores showed a positive correlation. This indicated that the higher scores on CRT and CriTT Confidence were associated with greater GPA. The remaining variables were not significant predictors of GPA.

Table 2

Multiple Regression Analysis of Cognitive Reflection Test, Critical Thinking Toolkit and Student Attitudes and Beliefs about Authorship as predictors of student's Grade Point Average

Predictors	Values
Model "Enter"	$R^2 = 0.079$, $R^2_{adj} = 0.049$ $F(7,187) = 2.21$, $p = 0.03$
CRT scores	$\beta = 4.54$, $p = 0.03$
CriTT (Confidence)	$\beta = 15.60$, $p = 0.03$
CriTT (Valuing)	$\beta = 5.37$, $p = 0.41$
CriTT (Misconception)	$\beta = -3.72$, $p = 0.35$
SABAS (Authorial Confidence)	$\beta = -5.43$, $p = 0.35$
SABAS (Valuing writing)	$\beta = 1.81$, $p = 0.72$
SABAS (Identification with Author)	$\beta = 1.13$, $p = 0.78$

Notes. Durbin Watson = 1.93, VIF = 1.149; 1.052; 1.161; 1.085; 1.038; 1.097; 1.050
Student's performance before and after semester (with and without workshops attendance)

A Factorial Mixed Measures Design was used to examine the effect of time (before and after semester) and workshop-attendance on student GPA. The interaction effect between time and workshops attendance on GPA was also examined.

Data were analyzed using a 2 (Time) \times 2 (Workshop attendance) ANOVA. There was a significant interaction between time and workshop attendance showing that workshop attendance improved after semester scores $F(1, 56) = 58.51$, $p < 0.001$, $\eta_p^2 = 0.51$ such that GPA after the semester increased for the students that attended workshop whereas GPA did not increase for the student that did not attend workshop (Table 3). However, a significant main effect of Time $F(1, 56) = 4.35$, $p > 0.01$, $\eta_p^2 = 0.07$ and the main effect of workshop were not significant $F(1, 56) = 0.21$, $p = 0.65$, $\eta_p^2 = 0.004$. Overall, the results indicated that the workshop intervention increased GPA for students that attended the workshop.

Table 3

Student's GPA (Mean and SD) Before and After Semester and With or Without Workshop Engagement

	Before		After		Total	
	Mean	SD	Mean	SD	Mean	SD
Workshop	61.27	8.19	65.32	7.68	63.30	8.15
No workshop	67.76	6.58	60.66	8.10	64.21	8.12
Total	63.62	8.21	63.64	8.08		

Next, a Factorial Mixed Measures Design was used to examine the effect of time (before and after semester) and workshop attendance on student CRT scores. The interaction effect between time and workshop attendance on CRT scores was also examined.

Data were analyzed using a 2 (Time) \times 2 (Workshop's attendance) ANOVA. There was a significant interaction between time and workshop attendance $F(1, 56) = 11.55$, $p = 0.001$, $\eta_p^2 = .17$ where CRT scores after the semester increased for the students that attended workshop while CRT scores did not increase for the student that did not attend workshop (Table 4). There was a significant main effect of Time $F(1, 56) = 18.51$, $p < 0.001$, $\eta_p^2 = 0.25$. Student's CRT scores were higher after they completed the semester than before they started the semester. However, the main effect of workshop was not significant $F(1, 56) = 1.93$, $p = 0.17$, $\eta_p^2 = 0.03$.

Overall, the results indicated that the workshop attendance increased CRT for students that attended the workshop. Furthermore, CRT scores were overall lower before than after semester.

Table 4

Student's CRT scores (Mean and SD) Before and After Semester and With or Without Workshop Engagement

	Before		After		Total	
	Mean	SD	Mean	SD	Mean	SD
Workshop	3.51	2.17	4.73	2.02	4.12	2.17
No workshop	3.33	1.68	3.47	1.77	3.40	1.71
Total	3.45	1.99	4.27	2.01		

Next, a Factorial Mixed Measures Design was used to examine the effect of time (before and after semester) and workshop attendance on student CriTT scores. The interaction effect between time and workshop attendance on CriTT scores was also examined.

Data were analyzed using a 2 (Time) \times 2 (Workshop attendance) ANOVA. There was a significant interaction between time and workshop attendance $F(1, 56) = 27.51, p = 0.001, \eta_p^2 = .33$ where CriTT scores after the semester increased for the students that attended workshop while CriTT scores did not increase for the student that did not attend workshop (Table 5). However, the main effect of time $F(1, 56) = 0.19, p = .66, \eta_p^2 = 0.003$ and the main effect of workshop were not significant $F(1, 56) = 0.35, p = 0.55, \eta_p^2 = 0.006$. Overall, the results indicated that the workshop attendance increased CriTT for students that attended the workshop.

Table 5

Student's CriTT Scores (Mean and SD) Before and After Semester and With or Without Workshop Engagement

	Before		After		Total	
	Mean	SD	Mean	SD	Mean	SD
Workshop	180.51	28.26	193.95	32.39	187.23	30.93
No workshop	188.47	26.37	177.09	30.58	182.78	25.65
Total	183.39	27.63	187.84	30.58		

Last, a Factorial Mixed Measures ANOVA examined the effect of time (before and after semester) and workshop attendance on student SABAS scores. Data were analyzed using a 2 (Time) \times 2 (Workshop's attendance) ANOVA on students' SABAS scores related to attitudes and beliefs about academic writing. There was no interaction between time and workshop attendance $F(1, 56) = 0.76, p = 0.38, \eta_p^2 = 0.01$. The main effect of time $F(1, 56) = 1.82, p = 0.18, \eta_p^2 = 0.03$. and the main effect of workshop were also not significant $F(1, 56) = 0.01, p = 0.97, \eta_p^2 < 0.001$ (Table 6).

Table 6

Student's SABAS Scores (Mean and SD) Before and After Semester and With or Without Workshop Engagement

	Before		After		Total	
	Mean	SD	Mean	SD	Mean	SD
Workshop	5.28	1.11	5.21	0.45	5.24	0.85
No workshop	5.41	0.53	5.08	0.28	5.25	0.45
Total	5.33	0.46	5.16	0.40		

Discussion

The current study replicated previous findings (Stupple et al., 2017) that CT abilities, attitudes, and confidence predict students' GPA at baseline level. As predicted, attitudes, beliefs, and confidence related to both CT and academic writing predicted students' willingness to engage with the workshops. Moreover, it was observed that students who engaged with CT intervention exhibited improved GPA, CT skills, and CT attitudes scores. Results are discussed in detail in the following sections.

Intervention participation and engagement. The results from a logistic regression indicated that students who took part in the intervention had lower confidence in their CT (CriTT Confidence) and authorial identity (SABAS Authorial Confidence). This suggests differences in confidence levels between the intervention and control groups at baseline even though participants were randomly assigned to groups. These results can be interpreted in combination with the mixed ANOVAs. The lack of significant main and interaction effects of authorial confidence indicates that the intervention might have failed to address a lack in authorial confidence. However, even though students in the intervention group started with lower confidence in critical thinking, this was significantly improved with the intervention (see discussion of intervention effects). Such findings require further examination and represent tentative evidence in the predictive value of the CriTT in identifying students who lack confidence in their CT skills (Stupple et al., 2017), considering that the students who lacked confidence chose to sign up for the workshops. This coincides with evidence that identifying, challenging, and building stronger confidence in attitudes and beliefs about CT is an important facet for the development of students' CT skills (Celuch et al., 2009).

Differences in GPA at baseline. The current findings indicate that attitudes and beliefs towards CT (CriTT) and cognitive reflection (CRT) predicted differences in GPA at baseline. Specifically, it was found that students who are more confident about CT and scored higher on cognitive reflection had achieved higher grades in modules completed before the intervention. These findings are in line with the predictions and give support to previous literature showing that confidence and attitudes towards CT and cognitive reflection predict academic performance (Stupple et al., 2017). This indicates that the development of CT skills depends on dispositional attitudes that have an impact on student's confidence to develop and demonstrate their CT skills (Ennis, 1985). Moreover, this further implies that to successfully develop CT interventions, it is not only important to understand how students think and reason, but also what they believe and how they structure their belief system (Lamont, 2020).

In line with previous research the current findings indicate that there is a strong relationship between CT and cognitive reflection (Kember et al., 2000; Kraft, 2002; Kuiper, 2002). Based on the results from this study and previous research, it is reasonable to assume that cognitive

reflection—the ability to analyze and critically evaluate information and arguments—provides students with the capability not only to engage in learning strategies but also to use executive functions to be more reflective and organized in preparation for their assessments (Dwyer et al., 2014; Phan, 2006). Thus, reflective students are more likely to overcome uncertainties, to critically evaluate their argument, and to monitor and self-regulate their thinking. Considering the above, the various versions of CRT currently available may represent a potent measure of cognitive reflection that can be applied in higher education. The ability to measure the tendency to override initial biases in uncertain conditions and predict variance in students' GPA can be an important tool in understanding aptitude and identifying where to target tailored support for student who most need it (Simonovic et al., 2018; Stupple et al., 2017; Toplak et al., 2014).

Intervention effects. The most notable contribution of the present study is the indication of a strong relationship between online CT intervention and students' CT attitudes, skills, and academic performance. Significant interactions were observed between time (pre- and post-intervention) and intervention in CRT, CriTT, and GPA in students that took part in the intervention. Participants who took part in the intervention improved their scores in these three aspects significantly more than participants who did not take part in the intervention. Where there was a non-significant main effect of intervention, this might be explained by meta-analytic findings suggesting improvements in CT typically vary throughout temporal stages of educational courses (Huber & Kuncel, 2016). However, it remains unclear to what extent any gains are sustainable and so further exploration is required. Nevertheless, an explicit discussion of CT is important, which is one of the strengths of the present study. Abrami et al.'s (2008) meta-analysis with 117 studies indicated that CT interventions with explicit instructions and where it was part of the course objectives had the strongest effects, whereas immersion interventions (when CT content is simply embedded in the course and not part of the objectives) had the lowest effects. There is a strong relationship between our intervention and GPA increase, but only in students that were engaged in our intervention. The results of this study are encouraging given the suggestion that one hour intervention can produce significant effects, albeit only in students that were motivated to engage. Thus, the results indicate that motivation to engage in CT is also the key to success. Therefore, this can easily be included as part of a program of learning without adding a significant workload to students.

CT is rewarded in HE and has been consistently a moderate predictor of student achievement, as observed by Fong et al., (2017) in a meta-analysis with 23 studies, which assessed student achievement in different ways (e.g., retention in community college, degree attainment, and course completion or achievement related outcomes such as grades, GPA, or tests). Although some researchers suggest that CT skills might be decreasing in university students (Huber & Kuncel, 2016), our current findings inform that such skills are still relevant for academic achievement and need to be fostered in HE. Even though, the debate whether and how to improve CT skills is still ongoing (e.g., Puig et al., 2019), our results indicate that CT skills in online students can be improved by using a mixed method approach and providing students not only a specific instruction related to the assessments, but also teaching students “how to think” in more general terms about CT and the importance of metacognitive awareness about their thinking.

Limitations and Future Direction

Limitations of our research, and future directions are as follows. First, participants self-selected to take part in the study that explicitly informed that the intervention might have the potential to improve CT skills. Although a possible bias, this was circumvented as much as logistically and ethically possible using a waiting-list procedure whereby students in the comparison group also expressed their interest in taking part in the intervention—suggesting equivalent motivation between the two groups (although this was not formally assessed). Online students can lack motivation to succeed compared to students that attend face-to-face course (Stark, 2019). Thus, considering that motivation may positively influence CT (e.g., Riggs, 2014), and that lack of motivation could be one of the explanations for participant's lack of engagement with interventions, it is important that future studies assess students' motivation. It is also important to note that the students who engaged with all elements of our task were a subset of online learners who were motivated to enhance their thinking and learning skills.

Second, academic achievement was only measured as a function of GPA. Butler et al. (2017) suggested that students with higher CT skills also report more positive life events compared to students with lower CT skills. Therefore, future studies should consider the benefits of a CT intervention beyond academic achievement, including real-life events. Finally, even though the intervention was designed with an aim of enhancing general CT skill, it is noted that CT skills may be transferable between contexts; however, the current study only considered a short period of time. Thus, it is not certain if the learned skills are transferable and what the lasting effects of the intervention are.

There are further limitations with the use of the CRT. Some items are increasingly well-known (e.g., the bat and ball problem). Most CRT questions are mathematical and there are some gender differences in performance (e.g., Campitelli & Gerrans, 2014). Thus, some caution should be exercised when using variants of the CRT when predicting grades, particularly among math-anxious individuals (Morsanyi et al., 2014). There are, however, an increasing variety of cognitive reflection tests available that have varying difficulty levels and reduced reliance on mathematical ability (Thomson & Oppenheimer, 2016), and as such, with careful item selection and variation they can provide a useful tool in higher education settings.

Conclusion

To our knowledge, this was the first study to examine the effect of an explicit critical thinking intervention with online HE students. The results of this study indicate that CT skills can be enhanced with brief online workshop interventions, and that cognitive reflection, attitudes, and beliefs play an important part in the development of students' CT skills both through orienting toward opportunities to develop these skills and academic outcomes. Furthermore, it was demonstrated that a short, mixed-method intervention can improve students' GPA. Although there are some limitations to this study, the results are encouraging for offering opportunities to students to develop CT skills in addition to modules and class workload.

Declarations

All authors contributed to the conceptualization, design, and writing of the paper. The author(s) declare no potential competing interests with respect to the research, authorship, and/or publication of this article.

This work was supported by internal funding (Undergraduate Research Scholarship Scheme; £2,200) from University of Derby.

Data are available on request from b.simonovic1@derby.ac.uk

The study was approved by the University of Derby Undergraduate Research Scholarship Scheme Ethics Committee. Consent to participate and consent for publication were obtained from participants.

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Effect of Feedback with Video-based Peer Modeling on Learning and Self-efficacy

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Abstract

In this study, we examined the effect of video-based feedback designed to highlight a peer engaging in effective thinking processes on self-efficacy beliefs and learning outcomes (performance on a delayed quiz). Students in an introductory statistics course participated in an online learning activity where they received feedback in one of three randomly assigned conditions: a video of a peer demonstrating the process of arriving at a correct answer (mastery condition), a peer making mistakes then self-correcting those errors before arriving at a correct answer (coping condition), or a screenshot of a peer's correct worked example (as a control). Results indicated that students who watched the mastery videos, but not the coping videos, rated their self-efficacy higher and scored higher on a class quiz taken more than a day after the feedback intervention than students who viewed a worked example. However, students in the two video conditions did not significantly differ in terms of either self-efficacy and quiz performance. The results of this study, although modest in scope, illustrate how the design of feedback could lead to noticeable differences in student learning.

Keywords: video-feedback, peer-learning, self-efficacy

Eghterafi, W., Tucker, M. C., Zhang, I., Son, J. Y. (2022). Effect of feedback with video-based peer modeling on learning and self-efficacy. *Online Learning*, 26(2), 1-21.

Feedback is critical to learning, but some feedback is more effective than others (Hattie & Timperley, 2007). In online environments, feedback is typically outcome feedback—feedback that shows whether an answer is correct or the proportion of correct responses. Outcome feedback is usually shown after a student provides their responses (Geister et al., 2006), and offers some advantages; for instance, it can be delivered immediately to students during learning and can be implemented in several ways (e.g., text, color-coded responses, sound effects). However, the quickness and ease of showing students such outcome feedback often obscures the process by which students can achieve some desired outcome. In other words, outcome feedback shows the *ends* but what we want students to learn is the *means*. Synchronous, in-person, or more personalized instruction more often focuses on these processes (Korsgaard & Diddams, 1996).

The purpose of this study is to examine ways to emulate this richer, process feedback in asynchronous, online instruction. Such instruction is increasingly common as the use of interactive online textbooks and learning materials require students to engage in independent technology-mediated learning. An advantage of doing research that can be implemented in online textbooks is that insights gained can immediately be integrated into the product, thus impacting many users and teachers (e.g., Stigler et al., 2020). The results of the study reported here, a tightly controlled experiment to find out how to give more effective feedback, are not restricted to an academic journal article—they can be directly integrated in a free interactive online textbook called *Statistics and Data Science: A Modeling Approach* (see Son & Stigler, 2017–21) currently used by thousands of students. The “better book” approach to education research and development has the potential to close longstanding gaps between research and practice (Stigler et al., 2020). The experimental takeaways about feedback can also be implemented in other kinds of online learning experiences (e.g., MOOCs) and technologies.

We tested the effect of three different types of feedback on students’ learning and transfer of programming and data analysis concepts. Inspired by how effective feedback is given in synchronous learning contexts, we investigated whether process feedback delivered through social modeling might benefit learning and transfer more than process feedback delivered through text. Extensive research has shown that people learn from observing and imitating others. People often change their expectations and strategies after watching others. Watching others can also affect social-cognitive and motivational processes such as self-efficacy (Schunk & Zimmerman, 1997, 2007). Given these findings, asynchronous, online feedback carefully designed to maximize the effects of social modeling has the potential to confer cognitive and noncognitive benefits during learning.

Literature Review

Benefits of process feedback

Students often need feedback that contains information beyond whether an answer is correct. For example, when a student is stuck on a wrong answer and does not know what to do when they are stuck, it may help to have feedback that provides insights on *how* to improve (Geister et al., 2006). Insightful teachers and coaches may implement this naturally in synchronous, face-to-face settings. For example, in a study investigating the verbal feedback of a highly successful basketball coach, John Wooden, over 65% of the comments given during practice focused on what the players needed to do to improve, not just that they were wrong or

what they did wrong (Tharp & Gallimore, 1976). Much research shows that such process feedback—feedback that includes information about actions or strategies to improve—benefits learning over and above feedback that solely provides performance information. In a meta-analysis of studies investigating the effects of different forms of feedback on learning in face-to-face classrooms, the largest effect sizes were reported in studies in which students received such process feedback (Hattie & Timperley, 2007).

Although process feedback has been far less studied compared to outcome feedback, its effects have been explored in a variety of contexts and have been shown to affect learning in many ways (Geister et al., 2006; McLeod et al., 1992; Rust et al., 2003; van Gog, Paas, van Merriënboer, 2006; Ketchum et al., 2020). One way to provide process feedback is through examples (see van Gog & Rummel, 2010 for a comprehensive review of the research on example-based learning).

Worked examples—examples that provide the problem-solving steps that lead to the eventual solution—have been shown to facilitate performance in domains like math, physics, and computer science (Renkl, 2005); such worked examples also seem to be especially helpful for skill acquisition in the early stages of learning (Atkinson et al., 2000; Huang et al., 2015; Renkl, 2005; Sweller et al., 1998).

One potential mechanism to explain the effect of worked examples is cognitive load. Showing the students a worked-out solution reduces the strain on their working memory, which allows them to focus more holistically on the problem-solving process rather than the details associated with each step of the problem solution (Sweller, 1988; Sweller et al., 1998). In addition, worked examples may also help students by providing information about problem-solving strategies, modeling multiple solutions, and stimulating metacognitive strategies such as reflection and self-monitoring (Hawe et al., 2019).

Traditionally, research on worked examples has focused on *static* examples. However, process feedback can also be delivered *dynamically*, such as when people work through examples together or students watch a model work through examples. In computer science education, for example, live coding—the process of writing code in front of students during lecture—has been shown to support strategy development and engagement more than viewing a static worked example (Brown & Wilson, 2018; Robbins, Rountree, & Rountree, 2003; Rubin, 2013). Beyond providing information about problem-solving strategies, working through examples dynamically can also help to direct students’ attention and engage students in active learning processes, such as questioning and elaboration. For example, the process of coding “live” slows instructors down, allowing more time for students to process the material and ask questions (Paxton, 2002). Instructors can also solicit and correct students’ misconceptions in the moment (Vihavainen et al., 2011).

As more learning occurs online, both synchronously and asynchronously, researchers have begun to explore a variety of ways to implement process feedback in these novel environments. Prior studies have largely implemented text-based feedback, such as static worked examples (Gee, 2009; Zhi et al., 2019) and “just-in-time” prompts (Graesser et al., 1999). However, little has been done to explore the effect of different implementations of

process feedback (e.g., dynamic versus static) in asynchronous online learning contexts. Although some work has explored possible non-cognitive benefits of dynamic feedback (e.g., in Rubin [2013] students report enjoying live coding as feedback), there is little research on how to effectively increase the non-cognitive benefits of dynamic feedback.

To address these gaps in the literature, our present study focuses on these research questions: How should we implement process feedback in an asynchronous learning context? Can well-designed process feedback impact both students' learning as well as attitudes around their own learning? We propose that dynamic feedback implemented as video-based peer models can result in both cognitive and non-cognitive benefits. For this study, we define *video-based peer modeling* as videos in which a peer model is shown performing a task or activity similar to one that the learner has just attempted.

Our hypothesis draws upon a rich literature in psychology regarding the role of social models and implements these ideas in an online, asynchronous learning environment with brief videos of a peer model. In the following section, we will draw the links between prior work on peer modeling and the possible mechanisms that would lead to cognitive and non-cognitive benefits.

Implementing process feedback with video-based peer models

There have been many demonstrations of the positive impact of peer models in face-to-face settings (Schunk et al., 1987; Ledford & Wolery, 2015), but a growing body of research suggests that video-based models may similarly promote learning in online settings. Video-based models have been used to promote motor skill development (i.e., Obrusnikova & Rattigan, 2016), problem-solving (Hoogerheide et al., 2014), and have been shown to support learning in unstructured, creative domains (Groenendijk et al., 2011). Most of these studies have used video-based examples as a way to introduce new skills and knowledge; few studies have investigated the use of video-based modeling as feedback *after* students have completed a task.

Unlike other forms of process feedback, which focus on cognitive and metacognitive strategies, video-based peer modeling may play an outsized role in the non-cognitive aspects of learning. Social Learning Theory (Bandura, & McClelland, 1977; Maisto et al., 1999) proposes that new skills and behaviors are acquired by observing and imitating others. Observing a peer attempt the same problem that the learner just attempted may offer the potential to provide key social and attitudinal information. For example, video-based models have also been shown to increase self-efficacy (Raedts et al., 2007), helping learners feel as though they too have the capacity to perform and learn to excel in difficult tasks. Such social information can buffer against negative experiences (e.g., failures, barriers) and promote self-regulation during learning (i.e., Delen et al., 2014). Adding even a small amount of social information to feedback has been shown to affect students positively. For example, personifying feedback by adding a friendly face made novice programmers more likely to persist during a computer programming activity (Lee & Ko, 2011).

Much of the research on peer modeling has assumed that similarity and connectedness to the peer drive much of the positive effects on learning and self-efficacy (i.e., Braaksma et al., 2002). Although there has been active research interest in different types of peer models, less is

known about the behavior of peer models in the videos, that is, what the model should be doing and saying as they provide feedback to the learner. For example, should the model exemplify the errors that learners are likely to make as well as the solutions to remedy those errors? Or should the model give guidance on the correct path to take? The former is called a coping model while the latter is called a mastery model.

The few studies that have attempted to contrast the coping and mastery models have found that both lead to better performance compared to no model (Schunk & Hanson, 1989; Klorman et al., 1980; Selzler et al., 2020) but there is some hint that the coping model might have some slight advantage in particularly difficult situations (Selzler et al., 2020), possibly by demonstrating how to respond to difficulties, failure, and barriers during learning. In health contexts, for example, coping models have been shown to help people cope with stressful medical procedures, possibly because they increase self-efficacy for coping and reduce anxiety and avoidance-related behaviors (i.e., Selzler et al., 2020). Coping models have also been used to facilitate athletic skill acquisition. For example, Kitsantas et al. (2000) showed that girls who watched a peer struggle and then eventually master a difficult dart-throwing technique showed increased self-efficacy, interest, and dart skills than girls who watched a peer master the technique right away.

Given these findings, it is possible that coping models may benefit learning and self-regulation in academic contexts. However, few studies have investigated the potential benefits of coping in higher education settings. In addition, previous studies comparing the effects of coping and mastery models have focused on coping and mastery models as a form of initial instruction delivered *before* students have attempted a problem on their own. Whether coping and mastery models are effective forms of *feedback* is not yet known.

Present Study

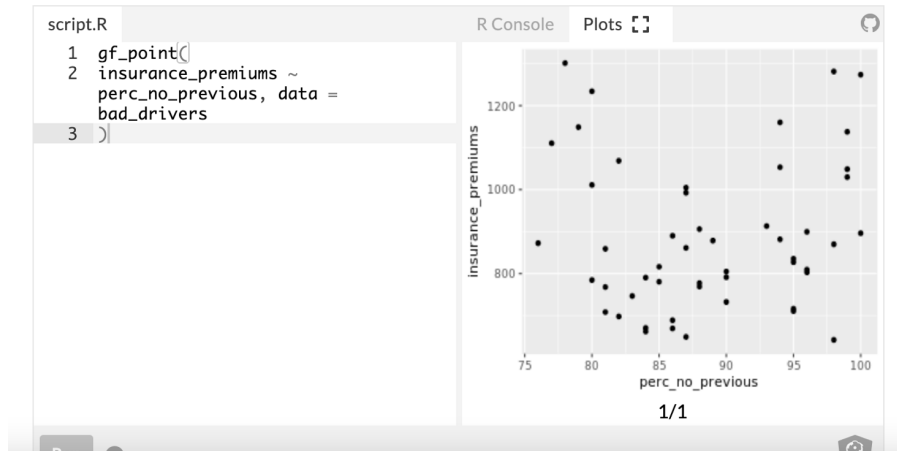
To address these apparent gaps in the literature, we investigated the potential benefits of a video-based peer modeling intervention in which students received different forms of process feedback during an interactive problem-solving activity. The activity was similar in format to pages of the free interactive textbook our university student participants were using in their statistics course (Son & Stigler, 2017–21): text and figures interleaved with brief coding exercises. After the coding exercises, students received different types of feedback.

Students were randomly assigned to receive one of two peer-modeling videos: (1) a coping model where the peer modeled first making mistakes then remedying those mistakes and (2) a mastery model in which the peer modeled the correct answer. There were also students randomly assigned to a worked example condition serving as a comparison group. In this condition, students saw a static screenshot of another students' correct solution and the code they used to produce it. It is worth noting that in all three conditions (mastery, coping, and worked example), the feedback provided is process feedback. The difference is that the worked example is a type of *static* feedback (a still picture of the components of the solution) whereas the two types of peer-modeling feedback, coping and mastery, are *dynamic* feedback implemented as videos. After engaging students in the feedback activity, we then measured the effect of the intervention on students' beliefs about their ability to succeed on a delayed quiz and on their actual quiz performance.

Figure 1
Screenshot of a worked example

5. Create a visualization to show the relationship between **insurance_premiums** and **perc_no_previous**. Is there a relationship here? If so, describe the relationship you see.

Yes, it looks like there is a u-shaped relationship. States with low `perc_no_previous` tend to have higher `insurance_premiums`. States with medium `perc_no_previous` tend to have lower `insurance_premiums`. States with high `perc_no_previous` tend to have high `insurance_premiums`.



The video feedback conditions in our study implemented dynamic feedback with a special focus on capitalizing on the benefits of peer modeling by making the model’s implicit thinking and decision-making process more explicit. The goal was to show students the intermediary steps necessary in approaching more complex problems, the timing of the outcome (e.g., that the solution isn’t an instantaneous “Eureka!” moment), and the strategies that can be effective (e.g., some parts of the solution are easier to start with first). In the coping condition, the goal was to model the process of mistake-making and struggle, demonstrating how to react when a solution does not work as expected and strategies that can be implemented when faced with a setback. We hypothesized that both the coping and mastery feedback will lead to enhanced self-efficacy and cognitive performance than the worked example feedback.

To summarize, this study adds to the existing literature on feedback and learning in three important ways. First, this study combines the use of video-based feedback and peer models to mimic process feedback in an asynchronous, online learning environment. Second, unlike past studies of online feedback that have mainly focused on cognitive outcomes such as enhancing students’ learning of concepts and strategies (i.e., Pratiwi et al., 2018) this study also includes socio-emotional outcomes. Thus, we examine both measures of self-efficacy and cognitive performance. Finally, to date, most studies examining video-based peer modeling have focused on the type of person who is the peer model. Little is known about the content of the model—what the model should *do*. We compared two different types of video-based models

hypothesized to support learning: a mastery model in which a peer demonstrates an effective problem-solving process without making any mistakes and a coping model in which a student model makes and corrects mistakes.

Method

Participants

Participants were 208 undergraduate students enrolled in a 10-week introductory statistics course offered through the psychology department at the University of California, Los Angeles during the winter 2020 quarter. Because this class was a prerequisite class for students to major in psychology, students in this class were mostly pre-psychology majors. Due to the impact of COVID-19, the class was taught in person for the most part but switched to an online format at the end. All data collection for this study concluded before COVID-19 lockdowns and the switch to remote schooling began. The class had weekly homework from the online textbook and five quizzes throughout the 10-week period.

For their participation, students were offered extra credit. We excluded participants who did not consent to share their course data ($n = 12$) and students who did not complete the experiment ($n = 46$), creating an analytic sample of 162 students. Students were determined to have completed the experiment if they answered the questions on both the pre- and post-surveys and if they spent at least 30 seconds on pages that included videos (video conditions). The final sample included 57 students in the worked example condition, 54 in the mastery condition, and 51 in the coping condition. They were traditional college-aged students, with the majority of ages ranging between 18 and 24. The sample was mostly female (77.78%) and the majority of students were in their second or third year (80.50%) at the university.

Procedure & Materials

Participants were randomly assigned to one of three feedback conditions (worked example, mastery, or coping). Students were told that this online activity would help them prepare for an upcoming quiz. In the activity, students were presented with a dataset about insurance prices in the United States. They were asked eight questions and used R, a statistical programming language, to analyze the provided data set (coding windows were embedded in the online activity). After each question, students were provided with feedback based on their randomly assigned condition.

Feedback. In the worked example condition, the feedback was a screenshot of a peer's correct response after completing an exercise. In the other two modeling conditions, the feedback was an embedded video of a student thinking aloud while solving the same problem. In the coping condition, the model made an error common to that type of problem, realized their mistake, then self-corrected. In the mastery condition, the model's strategy and answer were correct. For example, one of the questions in the activity asked students to find the highest value in an array or list of numerical values. The student model in the mastery video sorted the list variable from highest to lowest values and then printed out the first five entries of the new array to the console. In contrast, the student model in the coping video first made the mistake of simply printing out the unorganized list of numerical values and then realized he needed to order the list. From there, the video matched the mastery condition, and the student correctly ordered and printed out the list.

Both mastery and coping videos included both the screen recording of the R programming activity and a smaller window featuring a talking-head-style shot of the student model (see Figure 2). The duration of the videos ranged from 47 to 299 seconds. Each feedback video was presented after students submitted their answers to a question. The total duration of videos in the coping condition was 907 seconds and the total duration of videos in the mastery condition was 1094 seconds. Two of the videos (1 and 6) were the same for students in both conditions (these videos did not feature a common error because the questions were relatively simple). Table 1 shows the duration of the videos for each condition.

Figure 2
Screenshot from one of the videos shown to students after each practice activity

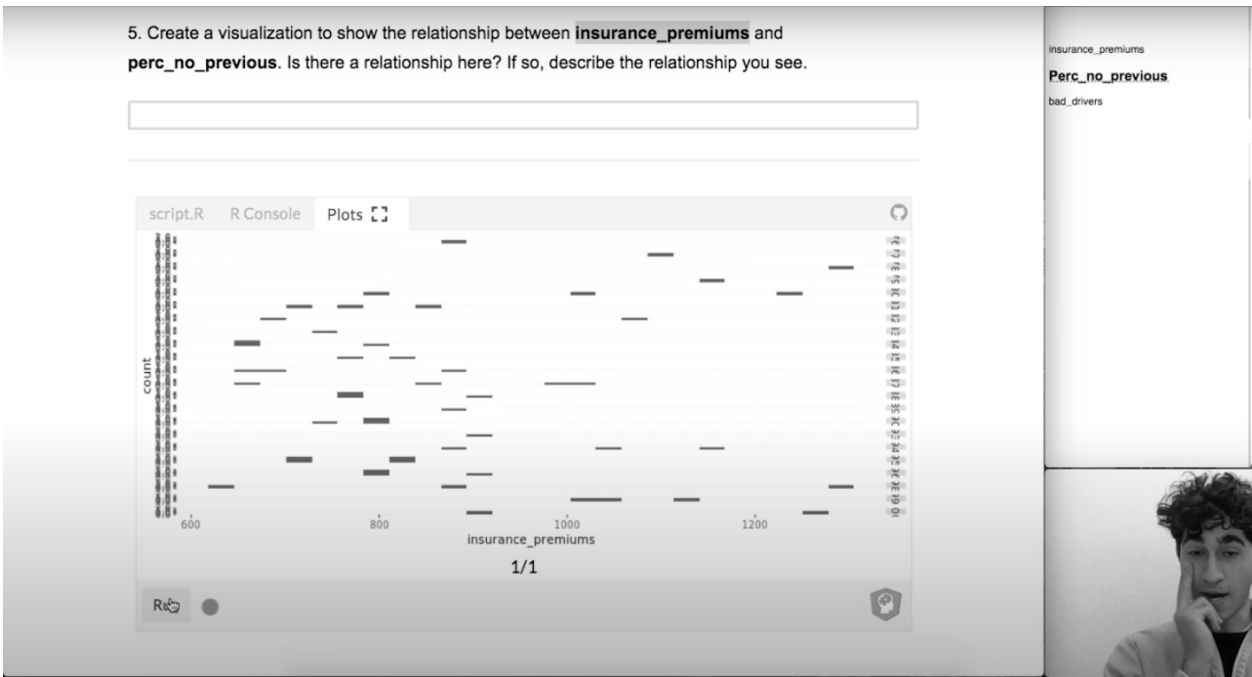


Table 1
Duration of the Peer Modeling Videos

Condition	Video								Total Mins. (s)
	1	2	3	4	5	6	7	8	
	Length	Length	Length	Length	Length	Length	Length	Length	
	Mins.	Mins.	Mins.	Mins.	Mins.	Mins.	Mins.	Mins.	
	(s)	(s)	(s)	(s)	(s)	(s)	(s)	(s)	
Mastery	2:04	1:46 (106)	1:39 (99)	1:01 (61)	2:05 (125)	2:36	0:47 (47)	3:09 (189)	(1094)

Coping	(124)	2:53 (173)	2:08 (128)	1:31 (91)	2:22 (142)	(156)	0:51 (51)	3:49 (229)	(907)
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Note. Videos 1 and 6 (shaded in gray) were the same length for both conditions.

Measures

Performance. As a delayed, authentic measure of learning from this asynchronous activity, we collected students' scores on a weekly quiz that took place approximately two to three days after the intervention. The quiz included 17 questions that covered basic data analysis concepts (e.g., inspecting a dataset, creating graphs to visualize relationships, fitting simple linear regression models, creating ANOVA tables) and were aligned with the tasks students completed during the intervention. As in the intervention, students were given an unfamiliar dataset and asked to write and interpret R code to answer questions about those data. Of the 17 questions, four were open-ended responses, eight required students to generate R code, and five were multiple choice questions that required students to interpret R code or output. The open-ended response and coding questions were graded by the instructional team. Quiz scores were calculated as the number of questions answered correctly out of 17, with higher scores representing higher quiz performance.

Self-efficacy. Students rated self-efficacy by indicating confidence in five scenarios (i.e., *Earn an A on the next quiz; using R to analyze a new data set; achieving the goals you set for yourselves in this course; overcoming challenges in this course; and performing effectively on many different tasks in this course*). All five scenarios were also rated on a 5-point rating scale from “not at all confident” to “extremely confident.” These ratings were averaged together for one composite self-efficacy score. The Cronbach’s Alpha for the self-efficacy items was $\alpha = .933$, 95% CI[.913, .947].

Perceived similarity to the peer model. Immediately after the online activity, students reported their perceived similarity to the peer model, self-efficacy, and evaluated the activity. Students judged their similarity to the model (*Think about the student whose responses you saw after each question. How similar is that student to you when it comes to this course?*) using a single item with a 5-point rating from “not at all like me” to “extremely like me.”

Perceptions of the activity. Students rated the activity by indicating agreement with three statements (i.e., *I think the instructor should use more activities like this throughout the course. I learned a lot from this activity. I would be interested in doing another activity like this to prepare for the final exam.*) using a 7-point rating scale from “strongly disagree” to “strongly agree.” All three ratings were averaged together to create a composite activity evaluation score. Higher scores indicate more positive perceptions of the learning activity. The Cronbach’s Alpha for the activity rating items was $\alpha = .885$, 95% CI[.834, .923].

Analysis

The data were analyzed using multiple regression and ANOVAs in R version 3.6.2 (R Core Team, 2019). The focal predictor was the experimental condition. The outcomes of interest were self-efficacy and quiz performance. We predicted that students in the two *video-based peer modeling (dynamic feedback)* conditions would rate their self-efficacy higher and perform better on the quiz than students in the worked example condition.

Additionally, we predicted that perceived similarity—how similar the students rated the model to be to themselves—would be positively related to both self-efficacy and performance, as past research has shown the effect of peer modeling to be greater for “near peer” models

(those that share similarities with the observer) (Bandura, 1986, Murphy, 1995). Finally, we examined students' ratings of the activity itself.

Results

The groups did not differ significantly in the proportion of females, $X^2(2) = 1.19, p = .55$, or the number of current answers students initially achieved in the intervention activity, $F(2, 160) = 1.405, PRE = 0.02, p = 0.25$. However, the groups did differ significantly in terms of total time spent on the intervention activity (seconds), $F(2, 156) = 130.2, PRE = 0.63, p < .001$. PRE, the Proportional Reduction in Error (see Judd et al., 2009), indicates how much error is eliminated by including the grouping variable in the model (PRE is also notated as η^2 in grouping models and equivalent to R^2 in a simple regression model). As expected, given the different requirements of the two conditions, students in the worked example group ($M = 220.36, SD = 106.79$) spent significantly less time on the feedback pages than students in the two dynamic video conditions (mastery: $M = 1017.27, SD = 381.80$; coping: $M = 1066.75, SD = 362.80$). Table 2 shows descriptive statistics for self-efficacy, quiz performance, perceived similarity to the peer model, and students' ratings of the learning activity across the three groups.

Table 2

Descriptive Statistics for Self-efficacy, Quiz Performance, Perceived Similarity, and Perceptions of the Learning Activity

Variable	Condition						Overall	
	Worked Example		Coping		Mastery		M	SD
	M	SD	M	SD	M	SD		
Self-efficacy	2.96	0.88	3.20	0.93	3.46	0.77	3.21	0.88
Quiz performance	87.65	11.45	86.53	17.90	93.21	7.15	89.12	13.08
Perceived similarity	2.82	0.76	2.75	0.80	3.04	0.73	2.87	0.77
Perceptions of the activity	6.08	0.84	5.67	1.35	5.85	1.05	5.88	1.10

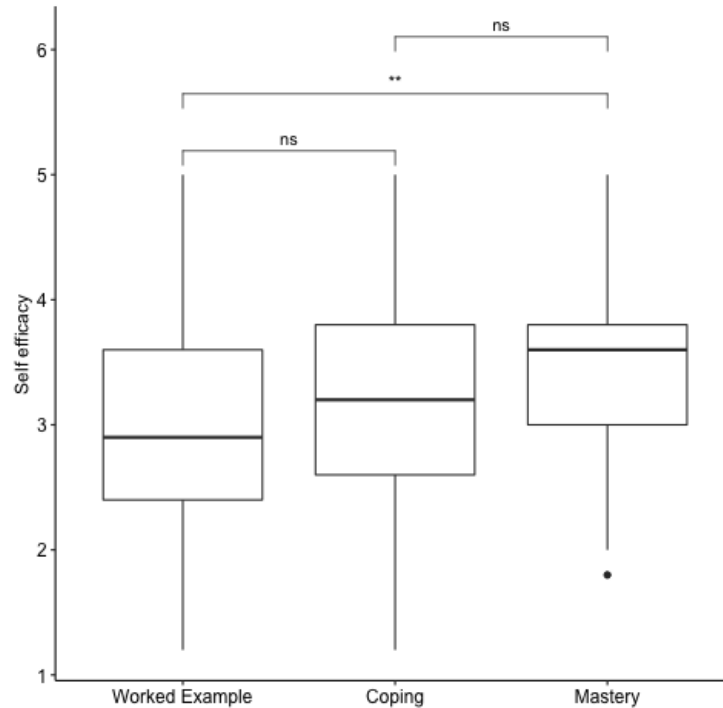
Self-efficacy

A breakdown of self-efficacy scores across the three experimental conditions is shown in Figure 3. Results from a one-way ANOVA revealed a significant main effect of condition on self-efficacy, $F(2, 158) = 4.68, PRE = .06, 95\% CI[.01, .12], p = .011$. A post-hoc Tukey test further revealed that students in the mastery condition ($n = 54, M = 3.46, SD = 0.77$) rated their self-efficacy significantly higher than students in the worked example condition ($n = 56, M = 2.96, SD = 0.88$), $p = .007, d = 0.54$, but not students in the coping condition ($n = 51, M = 3.20$,

$SD = 0.93$), $p = .313$, $d = 0.26$. Self-efficacy did not significantly differ for students in the coping and the worked example conditions, $p = .275$, $d = 0.28$.

Figure 3

Comparison of self-efficacy for students in the Worked Example, Coping, and Mastery conditions



Quiz Performance

Results from a one-way ANOVA revealed a significant effect of condition on quiz performance, $F(2, 158) = 4.104$, $p = .0183$. However, the effect size was small, $PRE = .05$, 95% CI[.00, .11]. A post-hoc Tukey test further revealed that students in the mastery condition ($M = 93.21$, $SE = 1.76$) performed significantly better than students in the coping condition ($M = 86.53$, $SE = 2.52$), $p = .0238$, $d = 1.86$, but not significantly better than students in the static worked example condition ($M = 87.65$, $SE = 2.45$), $p = .0630$, $d = 1.55$. Students in the coping condition did not differ significantly from students in the static worked example condition, $p = .893$, $d = 0.31$.

Perceived Similarity to the Peer Model

On average, students perceived the peer model to be somewhat similar to themselves ($M = 2.87$, $SD = 0.77$). The distribution of similarity ratings was roughly symmetrical with a median of 3 and a range of 4. Perceived similarity to the peer model did not differ significantly by condition ($F(2,159) = 2.09$, $PRE = .03$, $p = .127$); on average, students across the three conditions perceived themselves to be somewhat similar to the peer model.

To test whether students’ perceptions of how similar they were to the peer model influenced self-efficacy and quiz performance, we fit separate linear regression models with perceived similarity as a predictor and self-efficacy and quiz performance as the outcomes. First, we fit a simple model with perceived similarity as the predictor for each of the two outcome variables. Next, we tested the effect of perceived self-efficacy on each outcome variable with condition as a categorical covariate. Finally, we tested the interactive effect of condition and perceived similarity on each of the two outcome variables to see if the effect of perceived similarity varied based on condition.

Results from the regression analyses for perceived similarity predicting self-efficacy are shown in Table 3. A simple regression revealed that similarity positively predicted self-efficacy ($F(1, 159) = 65.90, PRE = .29, p < .001$). Perceived similarity also positively predicted self-efficacy when condition was included in the model ($F(1,157) = 63.13, PRE = .29, p < .001$) suggesting that among students in the same condition, those who perceived themselves to be more similar to the peer model rated their self-efficacy higher. The interaction between condition and self-efficacy was not significant ($F(2, 1555) = 0.45, PRE = .01, p = .640$).

Table 3

Summary of Regression Analyses for Perceived Similarity Predicting Self-efficacy With and Without Condition as a Categorical Covariate

	<i>B</i>	<i>SE B</i>	<i>95% CI B</i>		<i>t</i>	<i>p</i>
			<i>2.5%</i>	<i>97.5%</i>		
Simple regression						
Intercept	1.47	0.23	0.98	1.87	6.27	< .001
Perceived Similarity	0.62	0.08	0.47	0.77	8.12	< .001
Notes: $R^2 = 0.29$ ($ps < .001$)						

Model with condition as a covariate

Intercept	1.25	0.24	0.79	1.72	5.32	< .001
Condition: Coping	0.29	0.14	0.01	0.57	2.05	.042
Condition: Mastery	0.37	0.14	0.10	0.65	2.66	.009

Feedback for Video-based Peer Modeling

Perceived Similarity 0.61 0.08 0.45 0.76 7.95 < .001

Notes: $R^2 = 0.31$ ($ps < .001$)

Results from the regression analyses for perceived similarity predicting quiz performance are shown in Table 4. A simple regression revealed that perceived similarity was positively related to quiz performance ($F(1,159) = 29.31$, $PRE = .16$, $p < .001$). On average, students who perceived themselves to be more similar to the peer model in the video performed better on the subsequent quiz. The effect of perceived similarity on quiz performance remained significant even when condition was included in the model ($F(1,157) = 142.59$, $PRE = .14$, $p < .001$), suggesting that among students in the same condition, those who perceived themselves to be more similar to the model performed better on the subsequent quiz. The interaction between perceived similarity and condition (Model 6) was not significant ($F(2, 155) = 2.89$, $PRE = .04$, $p = .059$).

Table 4
Summary of Regression Analyses for Perceived Similarity Predicting Self-efficacy and Quiz Performance with Condition as a Categorical Covariate

	<i>B</i>	<i>SE B</i>	<i>95% CI B</i>		<i>t</i>	<i>p</i>
			2.5%	97.5%		
Simple regression						
Intercept	69.84	3.69			18.94	< .001
Perceived Similarity	6.72	1.24			5.41	< .001
Notes: $R^2 = .16$ ($ps < .001$)						
Model with condition as a covariate						
Intercept	69.91	3.85	62.29	77.53	18.12	< .001
Condition: Coping	-0.62	2.30	-5.17	3.93	-0.27	.788
Condition: Mastery	4.23	2.29	-0.31	8.75	1.84	.068
Perceived Similarity	6.28	1.25	3.82	8.74	5.04	< .001
Notes: $R^2 = .18$ ($ps < .001$)						

Perceptions of the Activity

Overall, students rated the intervention activity highly. The distribution of composite activity ratings was left-skewed with a mean of 5.88, a median of 6, a standard deviation of 1.10 and a range of 6. Activity ratings did not differ significantly by condition, $F(2,159) = 1.90$, $PRE = .02$, $p = .153$; students in all three conditions reported positive perceptions of the activity, overall.

Discussion

In summary, students in the mastery condition performed significantly better than students in the coping condition on a delayed performance assessment but did not differ from students in the worked example condition. Additionally, students in the mastery condition, but not the coping condition, rated their self-efficacy significantly higher than students in the worked example condition. Across all three conditions, students who perceived themselves to be similar to the peer model on average, rated their self-efficacy higher and scored higher on the delayed performance test.

The results of this study add to the existing literature regarding the effectiveness of static and process feedback and provide preliminary insights into the potential benefits of integrating video-based feedback in online learning environments. In line with previous studies, we found that students benefited more from process feedback delivered through videos than from static feedback delivered through text. This is similar to the finding that students learn more from watching someone else code and debug errors than from writing code themselves and getting feedback on their responses (Raj et al., 2018).

This study also extends our understanding of *how* and *in what contexts* process feedback can be implemented to benefit learning. In the past, feedback in online learning environments has been limited to feedback about students' performance. This study contributes to a growing body of research investigating ways to deliver process feedback in online environments. But whereas most studies of process feedback in online environments focus on adaptive, text-based feedback, our research explores the potential of videos as a potential method for delivering process feedback online. One benefit of videos is that they convey richer, social information, which may benefit social-cognitive and motivational processes during learning. In contrast, text-based process feedback typically addresses cognitive and meta-cognitive processes alone.

Beyond extending our knowledge of process feedback, our results highlight how classical psychological insights about social learning might help us design more effective process feedback and instructional sequences. Though it is common to find educational videos with a knowledgeable instructor as the speaker, these videos were specifically designed to provide a peer model who could demonstrate a more realistic sequence of thinking and problem solving that the students could aspire to. By experimentally manipulating whether students saw a coping model or mastery model and measuring both cognitive and socio-emotional outcomes, we were able to see that the coping model was limited to socioemotional benefits while the mastery model led to both enhancing both types of outcomes.

Under some theoretical frameworks, modeling self-corrective behavior could have been *more* beneficial. However, the initial results of this study suggest that the coping model did not benefit self-efficacy or performance compared to a worked example, whereas the mastery model benefited both self-efficacy and future performance. These results are contrary to past findings that have shown no difference between mastery and coping models (e.g., Schunk & Hanson, 1989) and those that have found coping models to benefit learning more than mastery models (Schunk et al., 1987). What are the psychological processes that lead to the mastery condition having both the highest self-efficacy ratings and significantly higher delayed performance?

One possibility is that there may be differences in how higher-performing students engage with this feedback than lower-performing students. This sample was drawn from a highly competitive public university; would students from different institutions engage differently? We are currently pursuing data collection in other populations that make use of our data (e.g., community college, high schools) in the context of a broader approach to research and development in improving learning statistics, data science, and programming using R (e.g., Stigler et al., 2020).

Another possibility is that the mistakes modeled in the coping condition were too infrequent in this sample. Although these mistakes were chosen from *common* misunderstandings exhibited by prior students from the same introductory statistics course, the majority of students did not make the same errors. One future area of inquiry is whether matching feedback up with mistakes (e.g., if you made this error, click on this video) would be more effective than generally presenting a mistake-correcting model to students.

A third possibility is that students in our sample may benefit more from models that include only the correct responses. Though coping models have been shown to be beneficial in some contexts, they may be less useful in others. For example, in the context of interpersonal skills training, Baldwin (1992) compared the effect of observing only correct models and the effect of observing models that were correct sometimes and sometimes incorrect. They found that participants who observed the correct-only model performed better on the subsequent behavioral task than participants who observed the correct and incorrect model. Similarly, in a study that used both correct and incorrect worked examples to teach mathematics, Grobe & Renkl (2007) showed that students with more prior knowledge learned better from both correct and incorrect examples, whereas students with low prior knowledge benefitted only from correct examples. Most of the students in our sample had low prior knowledge for statistics and R programming, thus, it is possible they would have benefited more from a correct model than a model that demonstrated correct and incorrect responses (coping model).

The current study is only concerned with the modelling effect of peers. It does not examine potential differences between video-based feedback delivered by peers and feedback delivered by instructors. Therefore, an interesting topic for further studies to investigate is the effect of different types of video-based models on students' self-efficacy and performance. On one hand, literature suggests that peer-modelling may be potentially superior (Ledford & Wolery, 2015). On the other hand, if the modeled behavior is the essential part, we would suspect feedback depicted by a master instructor to be just as beneficial as a highly skilled peer. Furthermore, we did not account for differences in learners' backgrounds and how that may

have influenced their perceptions of and interactions with the activity. Online learners are becoming increasingly diverse. Would a peer model representing a more traditional college-aged student be equally as effective for learners in a different age bracket? Our results provide evidence that students' perceptions of how similar they are to the peer model predict both self-efficacy and quiz performance. Thus, an important future direction is to investigate how students' form these perceptions, what factors they consider when making similarity judgements, and how individual student characteristics interact with features of the peer feedback to influence students' perceptions.

A limitation of this study and any video-based intervention is that we have no way to guarantee that students watched these videos. Although most students clicked on the videos and played them for a reasonable duration of time, some students in the video conditions may have engaged with the videos in less meaningful ways than others. Even so, it seems that either enough students watched the videos that we could detect the effect of them, or the effect was strong enough to overcome any noisy data from students who did not. Still, further research is required to examine whether students typically watch videos that are assigned in instructional settings. In follow-up studies, we plan to implement more effective ways of measuring whether students watched the videos, specifically, by pairing timestamp data from the online environment with a series of questions on the post-survey that asks students to indicate whether or not they skipped any of the videos, whether they changed the speed of the video playback, and whether or not they were multitasking while watching the videos.

Conclusion

The results of this study, although modest in scope, illustrate how the design of feedback could lead to noticeable differences in student learning even days after the intervention. This encourages us to consider how feedback functions in a longer course with presumably many more assignments and more opportunities for feedback. For example, in the online textbook *Statistics & Data Science: A Modeling Approach* (Son & Stigler, 2017–21), there are roughly 400 coding exercises. Currently, feedback on those exercises is based on outcomes (e.g., correct/incorrect) or look very much like the worked example condition (e.g., the correct code). Our results showed that showing brief peer modeling videos (just six experimental videos) in a single session led to changes in attitudes and learning detectable on a real class quiz. This spurs our research team to implement these changes in the context of our larger “better book” project to transform the way research-based improvements can impact many students and teachers (Stigler et al., 2020). The video feedback is a form that can be implemented in this textbook and our goal is to study the longer-term impact of improved feedback on a diverse array of student users (ranging from high school students who have not taken Algebra II yet to university students at a highly selective institution).

Instructors and instructional designers in many technology contexts have to make a decision on how to give feedback and simply showing students a correct worked response is an easy method of implementing feedback. Research such as ours gives them not only the motivation to give feedback differently but also suggest methods of implementing that feedback.

Feedback is a very small component of a whole course but because feedback happens frequently, a slightly better version of feedback may have recursive effects: small changes allowing students to learn a little better earlier may be able to act as a lever on later learning. Well-designed process feedback may be able to teach students how to learn and give them the confidence to persevere through it.

Declarations

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

The authors asserted that ethics board approval was obtained from the University of California, Los Angeles for this study.

The authors gratefully acknowledge the support of the Chan Zuckerberg Initiative DAF, an advised fund of Silicon Valley Community Foundation (DRL-1229004) and the California Governor's Office of Planning and Research (contract OPR18115).

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Understanding the Lived Experience of Online Learners: Towards a Framework for Phenomenological Research on Distance Education

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Abstract

Not all instructors in higher education enter the classroom with teaching experience, but all have observed teaching in higher education from the perspective of a student. This “apprenticeship of observation” that Lortie (1975) wrote about decades ago at least gives instructors the opportunity to empathize with their students, an important disposition for successful instructors. As more and more instructors are being asked to teach via distance education, they are being asked to do so with no online teaching experience and no or limited experience as an online student. One way, then, for them to develop empathy for online students and become a better online instructor would be to read systematic explications of the lived experiences of online learners. Phenomenology as a research design is purposeful towards gaining an understanding of “lifeworlds.” There is a small but growing body of phenomenological research on distance education, but most of the work is thin, not consistent with core principles of phenomenological research, and not tailored to the uniqueness of the distance education environment. This article makes the case for more phenomenological research on distance education and works towards a framework for this kind of research.

Keywords: phenomenology, distance, online, learning

Backer, J.D. & Schad, M. (2022). Understanding the lived experiences of online learners: Towards a framework for phenomenological research on distance education. *Online Learning*, 26(2), 296-322.

Over a decade ago, an anthropology professor pseudonymously calling herself Rebekah Nathan published a book about the year she spent as an undergraduate at the university for which she had been teaching. Nathan, later revealed to actually be Dr. Cathy Small, fully immersed herself in university life for a year, including living in a freshman dormitory and participating in extracurricular activities. She wanted to understand the culture of her university as an example of the American public university and wanted to know what students want from college and how they negotiate university life. *My Freshman Year* represents all that she learned as she explored her interest in the changing American university.

Underlying Small's work was the idea that by undergoing a recent and in-depth firsthand experience as a student, the author-professor would be a better, more empathic professor. That is, she believed that she needed to understand better and more fully what it is like to be a college student to be the best professor she could be. While college and university teaching faculty are often asked to teach traditional, face-to-face classes without any prior teaching experience, they are at least fully equipped with experiences as students in higher education at multiple levels. In the K-12 context, Lortie (1975) referred to this as the "apprenticeship of observation." Currently, though, huge numbers of faculty members are being asked and challenged to translate traditionally face-to-face courses to a qualitatively different modality: online learning. Many of these faculty members have little to no experience with distance education either as a student or an instructor. Though all faculty members cannot be expected to undertake the work of experiencing life as an online student, in the same way Small did as a traditional, face-to-face student, these faculty members would surely benefit from the research and writing of others about the experiences of online students.

One way that the American university is currently changing is in the growing number of online courses and programs being offered. According to a 2019 report from the Education Department's National Center for Education Statistics (NCES), from fall 2016 to fall 2017, overall postsecondary enrollment dropped by half a percentage point. However, over that same time, the number of students who took at least some of their courses online grew by 5.7%. Furthermore, during that same time, the proportion of all students who were enrolled exclusively online grew from 14.7% to 15.4%. And, whereas 31.1% of students took at least one course online in 2016, by fall 2017, 33.1% of students had done so (McFarland et al., 2019). Per the subtitle of a 2016 report, distance education is "no longer an institutional accessory" (Poulin & Straut, 2016). Therefore, we need research to guide practice in a growing discipline.

Small's main goal for publishing her findings in a book was to share her observations and understanding of the contemporary academic experience with other similarly situated professionals. That is, other university and college professors could read her account of life as a contemporary college student and tailor their own work to what they learned from Small's research. Small is an anthropologist and chose to design her research using anthropological methods. The field of distance education would benefit from anthropological investigation as well, but there are other ways to systematically investigate the experiences of individuals or groups of individuals, including, but not limited to, phenomenological research.

Therefore, this article attempts to accomplish the following:

1. Make the specific case for phenomenological research on distance education.
2. Review and critique the existing phenomenological research base.
3. Lay out a comprehensive framework for future phenomenological research on distance education.

The Case for Phenomenological Research on Distance Education

As with any field looking to be guided by research, in higher education, within the scholarship of teaching and learning, we need a diverse array of research from a range of philosophical orientations. Much of the research in the field of distance education is comparative, attempting to establish the relative efficacy of distance education. An examination of the trends in the field of distance education research during the period of 2009 to 2013 revealed that less than half of the research on distance education used qualitative data exclusively (Bozkurt et al., 2015). Furthermore, two-thirds of the naturalistic inquiry was small-scale case studies of one class or one particular practice. To generate research that is helpful to online instructors, though, we need more research about the students and their essential experiences. In other words, there is a need for naturalistic inquiry that is conceived as “narrow and deep”; intimate research that focuses definitively on internality and on first-hand experiences of learning. That is what phenomenological research is about. This section lays out a comprehensive argument for phenomenological research in distance education.

Why Phenomenology?

Research can be roughly categorized into three types: descriptive, correlational, and causal (National Research Council, 2002). The latter two types of research necessarily involve quantitative data. Descriptive research can involve quantitative data (e.g., survey research and descriptive statistics) and/or qualitative data. There are many designs for research that intend to be descriptive and that involve exclusively qualitative data. Ethnography, case studies, etc. are all valuable designs for answering relevant research questions and that yield qualitative data. Ethnography, for example, might be an appropriate design where the research question(s) are about social life and/or culture in a particular social system. There are certainly even research questions about distance education that need to be asked and answered via ethnography or any number of designs and methods that yield qualitative data. However, if our goal is to truly describe the experience of learning at a distance, to be able to share what those experiences are like for faculty members who are new to teaching online, phenomenological research is likely the most appropriate approach.

The operative word in phenomenological research is “describe.” In other words, the goal of the phenomenological researcher is to describe as accurately as possible the phenomenon, refraining from any preconceived notions while remaining as true to the facts as possible. According to Welman and Kruger “the phenomenologists are concerned with understanding social and psychological phenomena from the perspectives of people involved” (1999, p. 189). Put simply, phenomenology is an approach to research that seeks to describe the essence of a phenomenon by exploring it from the perspective of those who have experienced it.

More specifically, phenomenology asks us to consider the ontological presence of a being before considering the epistemological presence. Traditional scientific and social scientific research designs and methods tend to shy away from looking at the subjective aspects within a study, but phenomenology calls researchers to move towards understanding the lived experience of the subjects. By getting at the lived experience, the goal of the phenomenological researcher is to understand how to interact and get along, which is a nuanced understanding of humanity. Not only do phenomenological methods allow us to look at the lived experience, but the ultimate hope is that it reveals the pre-predicated consciousness, thus allowing a natural attitude to come through and be fully realized. Furthermore, phenomenology allows the researchers to acknowledge their role and bias in order to bracket or bridle their experiences and capture the lifeworld of the participants (Dahlberg, Dahlberg, & Nyström, 2008). In effect, phenomenology offers researchers the opportunity to look deeply into subjects that might allow for a nuanced understanding.

Why Phenomenology on Education?

The context of education is more complex than can be communicated through even observational data. Glimpsing into the world of an educator or a student can be difficult as there are many factors to consider. Furthermore, research does not occur in a vacuum but in a world full of meaning. Research performed in a dynamic environment, as all learning environments can be, therefore requires a method to facilitate a deeper understanding of the subject, which is what phenomenological research encourages. Thus, phenomenological researchers in education choose to employ phenomenological methods to explore the nuances of the human experience in the context of education, a deeply human endeavor.

Oftentimes in education research there is too much emphasis on looking at systems and understanding how they impact people; the individual is glossed over. In phenomenological research, though, the hermeneutic cycle of creating meaning allows the researchers to understand the subject matters' intentions that become clearer as their being, their essence, is unraveled. Phenomenology aims to capture the lived experience of a person as they experience their lives within a system; learning is usually experienced within a complex system. It is the job of the educational researcher using phenomenological methods, then, to bracket/bridle things that are not really part of their natural attitude in order to understand their being.

Once the experience of students can be understood, the complex systems of learning can be comprehended, and improvements can be made that benefit these individuals whose lifeworlds are so tightly bound to the educational experience and institution. The hermeneutic circle is also where the researcher begins to develop a level of understanding that allows for empathy as the ontological knowledge helps in the acknowledgment of another's being. Ultimately, empathy is important in education for a couple of reasons. First, empathy is critical for educators looking to improve their practice. "Empathy is commonly described by researchers as the moral emotion concerning the welfare of others that facilitates interpersonal relationships and positively influences people to engage in prosocial and altruistic behaviors" (Mencl & May, 2009, p. 208). Empathic teachers, then, are facilitators of learning who have high moral standards, communicate well with their students, and encourage students to build these kinds of interpersonal relationships. There is a significant body of research linking instructor empathy to student success. In a study of teachers using grounded theory methodology, Cooper (2010)

concluded that “[e]mpathy was considered central to successful teaching and vital to demonstrating care, even ‘the most important thing in life’” (p. 86).

The second reason empathy matters is that there is research that indicates that teachers can learn to be more empathic (Ming Lam, Kolomitro, & Alamparambil, 2011). The argument presented here is premised on the idea that phenomenological research on distance education is necessary to help instructors who have no personal experience with teaching or learning online. That is, by conducting phenomenological research on distance education and sharing it, instructional faculty can gain levels of empathy necessary to be successful in the endeavor. Thus, the next section ties those ideas together in making the case for phenomenological research in distance education.

Why Phenomenology on Distance Education?

In the K-12 realm, Lortie (1975) wrote about the “apprenticeship of observation,” the phenomenon whereby student teachers begin their preparation programs having spent thousands of hours as students in classrooms observing and evaluating teaching professionals in action. Buchmann (1987) refers to the behaviors that follow from this apprenticeship as “folkways of teaching” or “ready-made recipes for action and interpretation that do not require testing or analysis while promising familiar, safe results” (p. 161).

Yanchar, Spackman, and Faulconer (2013) offered a revised take on Dreyfus work simplifying his skill acquisition model to include three progressive terms: “basic, working, and skilled” (p. 227); these terms work under the larger ethos they defined as “embodied familiarity.” This ideal coalesced from many (Heidegger, etc.) who have worked in the development of phenomenological methods as a valid instrument for empirical work. While their work is not wildly disparate in nature from Lortie (1975) and Buchmann (1987), the authors do signify the importance that “agents will not fit squarely into any category and will exhibit features of multiple categories simultaneously, especially in cases of complex learning over time” (p. 227). Put simply, they acknowledge the complex nature of acquiring new knowledge, yet in line with Lortie and Buchmann, Yanchar et al. (2013) places emphasis on knowledge growth through exploration over time.

While the apprenticeship of observation Lortie describes can be problematic and constraining for new and aspiring teachers, equally troubling is the teaching professional who brings no experience to the classroom, or, in the case of distance education, the virtual classroom. That is, it can be unsettling and/or excessively difficult for college and university faculty members to attempt to facilitate learning online or from a distance with absolutely no preconceptions or understanding of what it is like to be an online learner or to learn from a distance. In other words, the instructor cannot be empathic where empathy is defined as “the ability to express concern and adopt the perspective of the student involving cognitive and affective domains of empathy” (Tettegah & Anderson, 2007, p. 50).

Therefore, one way to help new online faculty understand the experience of learning from a distance is to provide them with research that systematically investigates individual learners’ experiences with distance education; research that would help them be more empathic. Cilesiz

(2011) argues for the suitability of phenomenology to investigate the learner experience with technology, which now mediates much of modern life and increasingly more of education.

Because phenomenology is concerned with uncovering and describing the essence of human experiences, it has the potential to offer valuable insights about the use of technology in teaching and learning; its increased application to study experiences with technology has the potential to both expand existing areas of research at the core of educational technology as well as to help create new lines of inquiry. (p. 506)

Similarly, instructional faculty are increasingly being asked to use new digital technologies for teaching, while bringing myriad preconceived ideas to the experience. This is something that phenomenological research can address.

So, the phenomena of Technology Enhanced Learning might then benefit from being seen anew, devoid of conceptual expectations that lead us too often to the familiar. Seeing it anew means not using those concepts already researched as a lens for gazing, but as Husserl (1980) argues abstaining from the natural view of understanding and looking anew by going back to the things themselves, their essences. Here, a person builds knowledge of reality through conscious awareness and by intentionally directing his/her focus on the world around them. By the researcher intentionally attempting to ‘bracket’ his/her biases, beliefs, theories or preconceived ideas about the world s/he can get to the phenomena’s essence. (Oberg & Bell, 2012, p. 203)

Thus, experiences with technology are increasingly embedded in students’ and teachers’ lifeworlds. Distance education, in particular, is a space that is a growing presence in the lifeworlds of individuals within institutions of higher education. Additionally, many faculty members come to the endeavor of distance education with strong beliefs and biases. Phenomenological research on the lived experience of online learners, therefore, can help us see these experiences anew and be more empathic instructors.

Existing Phenomenological Research on Distance Education

In 2005, Sharpe & Benfield reviewed research on the student experience of e-learning in higher education. They concluded that students, “[c]ommonly positively evaluate having access to course materials and key contacts online... Experience intense emotions characterised [sic] by one learner as ranging from inspiration to frustration... [and] are concerned with time” (p. 6). Additionally, Sharpe & Benfield found online learners needed to learn online. More recently, in 2012, Blackmon and Major conducted a synthesis of the research on student experiences of distance education and generated five recurring themes about online student experiences: the ability to balance school and life; time management skills; acceptance of personal responsibility; instructor (in)accessibility; and connection with peers. Of online students, they conclude

Several factors influence their experience, some of which students control and some of which faculty control. Students have to balance work and family, to manage time, and to make a personal commitment. Instructors should work to establish presence in the

absence of physical copresence, work to build intellectual relationships with students, and work to create a sense of community. It is a balance of student and instructor factors that influence faculty and student experiences. (p. 83)

In 2013, Pazurek-Tork claimed that “[v]ery little phenomenological research has been published on technologically mediated learning contexts such as online learning environments in which communication and interaction (among instructors, learners, and content) is facilitated exclusively through online technologies...” (Pazurek-Tork, 2013, p. 25). That was true then, but it is less true now. While we lack true rich, thick descriptions of the student experience of distance education, there is a small but growing body of research on the lived experience of distance education students.

To develop the research framework articulated in this article, some of the studies reviewed by Blackmon and Major as well as new studies published since their review were identified and retrieved. Ultimately, 36 studies were reviewed. Those studies included 1 book chapter, 19 dissertations, and 16 peer-reviewed journal articles. They are all referenced with an asterisk in the references section.

A comprehensive synthesis of that literature is surely warranted, but what follows is purposefully a surface-level description and summary of what is in that literature. The summary is intended only to be descriptive; to give context to the methodological critiques that follow and to the research framework that is ultimately proposed in this article.

The participants in the studies reviewed include undergraduate and graduate students and represent experiences ranging widely, from those taking online courses while active-duty military to K-12 teachers working in rural areas. Additionally, most of the studies examined the lived experience of online learners broadly. That is, in most of the research, the phenomenon under study is simply that of being a learner at a distance. However, there are some studies that are more narrowly focused on a particular aspect of being a learner. Some of those phenomena are aspects of the lives of any learner irrespective of modality, but some are focused on phenomena that are likely unique to the distance learning. For example, the research on the lived experience of the distance education student examines a number of different, related phenomena, including, but not limited to learning support needs (Brown et al., 2013), caring and uncaring behaviors in distance education courses (Bork, 2014), student disabilities (Heindel, 2014), and technological breakdowns (Cresman & Hamilton, 2014).

Substantively and procedurally, the literature suggests that the lived experience of the distance learner is multifaceted and qualitatively different from that of a traditional, face-to-face higher education student. Without dedicated class time and with no other students or faculty or staff in the day-to-day life of a fully online student, self-regulation skills become paramount. For example, time management and self-discipline take on a particular primacy for students in distance education courses and programs. Also, in the absence of physically proximate students, faculty and staff, distance learners seek a sense of community online, and that community may or may not be facilitated or supported institutionally. Finally, given that many distance education students are “non-traditional,” that is, adults with complicated professional and personal lives,

they often have to lean more heavily on external supports such as family and friends to be successful as an online student.

There is much to be learned from the extant phenomenological research on the lived experience of learning at a distance, but for practitioners and policymakers to truly be able to tailor and develop online learning experiences that are most responsive to the distinctiveness of learning at a distance, we need more and higher quality phenomenological research. Too much of the existing phenomenological research on distance education suffers from poor conceptualization and design and is not methodologically rigorous enough. The modal study reviewed simply involved one-time, in-depth interviews with a convenience sample of participants followed by standard coding and theming typical of any study involving qualitative data. A study is not phenomenological simply because there is a specific phenomenon under investigation. In the next section, then, we offer both a critique of the existing research base and a more comprehensive framework for phenomenological research of distance education.

A Comprehensive Framework for Phenomenological Research on Distance Education

In this section, we build up to a framework for phenomenological research on distance education by working through four core areas of the framework: phenomenological research as ontological and epistemological pursuits; alignment of research questions around bounded phenomena; positionality; and data collection and explication. These areas have general considerations but need to be particularly focused for phenomenological research on distance education.

Phenomenological Research as Ontological and Epistemological Pursuits

Phenomenological research is a systematic attempt to expose and describe structures and textures of lived experience to gain a deeper understanding of the nature or meaning of experiences of phenomena (Husserl, 1970; Moustakas, 1994; van Manen, 1990). Also, phenomenology is the study of the lifeworld (*lebenswelt*), defined as “what we know best, what is always taken for granted in all human life, always familiar to us in its typology through experience” (Husserl, 1970, pp. 123–124). According to Cilesiz (2011),

...the philosophical background of phenomenology is intimately tied to any proper application of the phenomenological method, making it essential for a researcher to understand the philosophical underpinnings of phenomenology in order to conduct sound and rigorous phenomenological research (Giorgi, 1997). Consequently, any phenomenological researcher is strongly advised to include some discussion about the philosophical presuppositions of phenomenology along with the methods in this form of inquiry. (p. 494)

There are different kinds and approaches to phenomenological research, with each approach essentially based in a different school of philosophical thought. Ideally, then, phenomenological researchers are purposeful and reflective of the philosophy they embrace. Neubauer, Witkop, & Varpio (2019) highlight two of the more widely used approaches, the transcendental and hermeneutic approaches. The former approach, a largely descriptive approach, draws most on the

work of Husserl wherein the goal is to achieve “transcendental subjectivity;” the researcher is regularly checking their bases and preconceptions to not influence the study. “The researcher is to stand apart, and not allow his/her subjectivity to inform the descriptions offered by the participants” (p. 93). The latter approach, more interpretive, is based on the work of Heidegger who held that individuals understand themselves within the world. Therefore, “hermeneutic phenomenology must go beyond description of the phenomenon, to the interpretation of the phenomenon” (p. 94). To embrace hermeneutic phenomenology, then, is to be aware of the influence of the research subject’s background. The researcher must account for the influences they exert on the research subject’s experience of being.

Phenomenological research, then, is an epistemological and/or ontological pursuit. The importance of the ontology is encapsulated by “Dasein,” a term coined by Heidegger to explain the complex nature of looking closely at phenomena. Dasein has two meanings: exists, “the essence of Dasein lies in its existence” (Heidegger, BEING AND TIME, p. 67) and mine, “the Being; whose analysis our task is, is always mine” (Heidegger, BEING AND TIME, p. 42). These two meanings coalesce to confront the Western philosophical idea of separation of body and mind, and even the elevation of the mind over the body. This is where the ipso facto catchphrase associated with phenomenology, “being-in-the-world,” emanates from. Placing ontology back into the equation when performing research allows for the consideration of the entire being with their lifeworld, and ultimately as van Manen (2017) states, “And the methodological meaning and significance of the concept of lived through experience is that we can ask the basic phenomenological question, ‘What is it like?’ ‘What is this experience like?’” (p. 811).

Considering just the transcendental and hermeneutic approaches to phenomenological research, Neubauer, Witkop, & Varpio (2019) compare the ontological and epistemological assumptions of each. Table 1 is a modified version of a table created by Neubauer et. al (2019) on page 92.

Table 1
Comparison of transcendental and hermeneutic phenomenology

	Transcendental (descriptive) phenomenology	Hermeneutic (interpretive) phenomenology
Ontological assumptions	<i>Reality is internal to the knower; what appears in their consciousness</i>	<i>Lived experience is an interpretive process situated in an individual’s lifeworld</i>
Epistemological assumptions	<i>Observer must separate him/herself from the world including his/her own physical being to reach the state of the transcendental I; bias-free; understands phenomena by descriptive means</i>	<i>Observer is part of the world and not bias free; understands phenomenon by interpretive means</i>

Too many of the existing studies, however, failed to treat the research project as a venture with philosophical underpinnings. Very few, for example, commit to a particular approach. Most of the studies reviewed were reported as doctoral dissertations. While it may be understandable that dissertation research may not be as rigorous or of equal quality to studies reported in peer-reviewed journals, dissertations are themselves peer-reviewed by a committee of faculty.

Therefore, it is disappointing to see the philosophical shallowness of much of the phenomenological research reviewed.

For researchers to claim phenomenological methods, they must state and understand the aim of phenomenological research is not simply objective knowledge gathering, but as van Manen (2017) stated:

The entire endeavor of phenomenological inquiry, the point of phenomenology as qualitative research method, is to arrive at phenomenal understandings and insights—phenomenal in the sense of impressively unique and in the sense of primordially meaningful. (p. 820)

A good example of epistemological awareness in doing phenomenological research is Groenewald's (2004) study of co-operative education. In the article reporting both the methods and results of his research, Groenewald wrote:

My epistemological position regarding the study I undertook can be formulated as follows: a) data are contained within the perspectives of people that are involved with co-operative education programmes, either in a co-ordinating capacity or as programme participant; and b) because of this I engaged with the participants in collecting the data. (p. 45)

Similarly, while not explicitly using phenomenological methods, Paulsen & McCormick (2020) attempt to reassess disparities in online learning environments by using the 2015 National Survey of Student Engagement data. The motivation of their work lies in understanding the effects of online learning on student engagement. Their work touches on the same stream of phenomenology, even if it is more implicit, looking to understand the ontological presences of online students through surveys helps to gauge student engagement. Furthermore, the survey (ontological knowledge) does not operate outside of the bounds of the students' epistemological gains in an online environment. The interplay between the ontological and the epistemological supports the relevance of phenomenological research in distance education as it calls for in-depth knowledge creation of student experiences. While Paulsen & McCormick (2020) use quantitative methods to compare student engagement, phenomenology offers a similar perspective by compiling student "Dasein" moments where the researchers are identifying moments wherein the learners are expressing their being in an online environment. By capturing students' being, or epoche moments, distance education researchers can further understand best practices associated with online learning.

Aligning the Study: Research Questions and Bounded Phenomena

At the heart of rigorous research lies the research question or questions. These inform readers of the study's parameters. However, what often occurs with phenomenological research is the lack of alignment between the research questions and the overall research design. This is incredibly problematic as the collection of data while performing phenomenological research relies on the full commitment of the study to phenomenological methods. In other words, researchers cannot simply apply phenomenological research analysis at the end of the study

because it seems appropriate. From the very beginning, researchers should be explicit in their approach and understand the implications of relaying the belief they will be conducting a phenomenological research project. This seems obvious, but often as phenomenological research is seen as less restrictive in the sense of research design, many researchers do not see the importance of maintaining alignment starting with research questions all the way to the analysis.

The research question and the system within which it is answered should be bounded. A bounded system is a term associated with case studies (Yin, 2017); however, in the context of phenomenology it could have similar implications. As case studies seek to closely understand connections within a specified system, phenomenologies look to expose the lifeworld complexities. While the former tends to focus on observational data and looking for trends which coincide with epistemological collation, the latter looks deeply at how participants are creating ontological meaning through their interactions with the exterior world. Borrowing from the case study concept of a bounded system it behooves phenomenological researchers to approach the work with a similar ideal.

Before embarking on a phenomenological research methodology within distance education, researchers must define the lifeworld they are studying. Binding the lifeworld to a specific sphere would allow for the ontological presence of the distance education participants to be front and center. The removal of some of the noise from the equation of phenomenological research allows for a deeper take of a specific characteristic of a person's being. Researchers tend to use phenomenological methods as a lens to excavate deeper meaning from previous research, but this does not allow for the careful construction of a research project which, if created with the intent of using phenomenological methods, allows for a more complete picture to emerge. Furthermore, when researchers clarify and communicate the bounded phenomena that is being analyzed, it allows for a concise analysis of the intentionality associated with the specific phenomena. Focusing on a specific lifeworld allows for the research to revolve around the experiences within the lifeworld that call forth the being of the person to the forefront of the research.

An example of a bounded research question is as follows: *How do male freshmen who have been cyberbullied by fellow students in the past experience an online composition class?* The example specifies not only the participants but allows for an introspective look at a male freshmen creating meaning through an experience that begins and ends during a specified time. This type of question allows for a glimpse of not only the present being of the participant, but also to understand how the past experiences influence the current experience. Therefore, the question aligns with and binds what the phenomenological researcher is concerned about.

Similarly, Brown et al. (2013) studied online students' experiences of learning supports provided by the institution. This is an example of a good decision to conduct phenomenological research in distance education because the bounded phenomenon (learning supports) is actually and qualitatively different in the realm of distance education. As Brown et al. (2013) frame it:

Amid rising numbers of online learners, there is increasing interest in ways to support students from a distance. Distance students and campus-based learners have a very different student experiences and engage with their study differently... which means that

bespoke interventions are called for. Against this background, the objective of the current research was to investigate the nature of the distance learner experience in their own words... and the interactions they have with learning supports during the first semester of university-level study. (p. 347)

Thus, in addition to asking a research question that was justifiable in the space of distance education and that specifically called for phenomenological research, the researchers bounded the study in scope (interactions with learning supports) and time (the first semester of university-level study).

Finally, for phenomenological research in distance education, it is important to consider the uniqueness of online learning environments and approaches and to bound the study appropriately. For example, a growing space within the distance learning ecosystem is competency-based education (CBE) programs, which are often offered via distance education. If the study involves participants in a CBE program, it may prove difficult to bound the study with respect to time as CBE programs effectively do away with things like seat time and semesters.

Positionality

A major consideration in performing phenomenological research is the researchers' positionality. Being clear and upfront about the bias/es present from the researcher/s conducting the study can add or distract to the final analysis of the data. Therefore, when performing phenomenological research, a clear communication of the state of being of the researchers and their perspectives of the proposed study is essential for interpreting the data.

Once a clear communication of positionality has taken place, then there can be the further development of its impacts on the overall study. This is important in the consideration of the specific phenomenological methods (e.g., descriptive, interpretive, post-intentional, etc.). The implications associated with bracketing and bridling as they pertain to you the research methodology adds to the clarity of overall phenomenological research.

Bracketing assumes the ability to remove or suspend one's biases and perspectives from the study, which is typically aligned with descriptive phenomenological research. Bridling is more of an ongoing process that adds to bracketing the goal of not making definite what is indefinite. "Researchers should practice a disciplined kind of interaction and communication with their phenomena and informants, and 'bridle' the event of understanding so that they do not understand too quickly, too carelessly or slovenly" (Dahlberg et al., 2008, p. 130). Additionally, bridling looks forward beyond restraining pre-understanding. Both bracketing and bridling allow for the acknowledgement of the researcher in the study; it is when there is no acknowledgment of researcher's presence that problems can arise as the research does not acknowledge his presence and possible bias, which could affect the validity of study. The purpose of phenomenological research is to capture the state of being of defined subject/s, yet by not being transparent about it clouds the interpretation of the data.

Al-Harathi (2005) explored the distance education experiences of Arab graduate students pursuing degree programs in the United States. Specifically, they looked deeply at the role of

their culture in their distance education experiences. Al-Harthi's positionality statement is noteworthy as it essentially confesses to an important assumption.

Since the researcher is the main instrument in qualitative research, qualitative research carries with it a lot of the researcher's perspective... Therefore, the researcher finds it important to address a number of assumptions here. The researcher assumes that research participants knew their home culture well, which is not always the case, given their young age and potential lack of involvement in their society due to living abroad for a long time. (p. 6)

Here, Al-Harthi (2005) explicitly stated that they are the main instrument of the research and admits to awareness that their perspective is carried into the study. Also, they are upfront with at least one particular assumption or bias. This bracketing and bridling are one hallmark of good phenomenological research

In the field of distance education, where researchers are embedded within the world of higher education, clearly defining our interests in the relative success of distance education should be stated at the forefront, as we may be deeply involved in its epistemological growth as a field, and its importance as a whole in comparison to other fields. Alternatively, researchers within higher education may have a priori biases against distance education. Furthermore, while our knowledge of the field does allow us insight into the nuances of what a participant or participant might state, the experiences that we might consider outside the bounds of distance education that might affect the participants, may be oblivious to us. We then have to ensure that we check and reflect on our own experience not just with whomever we may be interacting with, but also our past history with the subject at hand, so that we can bracket/bridle our own experience to allow for the participants to come through. The best position statements start from reflective journaling and develop into a complete picture of the researcher's perspective.

Data Collection and Explication: Towards the Hermeneutic Circle

Many researchers who purport to have used phenomenological research methods failed to gather data pertaining to the lifeworld of the subject. The lack of data from which to construct an in-depth understanding of the complexities from the whole being creates a misunderstanding of the purposes associated with phenomenological research methods. Analysis within phenomenological research is not merely describing the environment and context, like an ethnography, but it is distilling the encapsulated experiences of your subject matter in order to gain insight into their being-in-the-world.

Data collection and analysis methods in phenomenological research are often too thin. Again, according to Cilesiz (2011),

To study experiences with technology through phenomenology and based on the phenomenological concept of experience, research methods such as phenomenological interviewing and phenomenal analysis are most suitable. Participant selection, validity considerations, and ethics are also among the important elements of research design in phenomenology and contribute to the rigor of a phenomenological study. (p. 498)

Methodologically, then, phenomenological interviewing and phenomenological analysis are the most suitable forms of data collection and analysis. However, interviews alone, even in-depth interviews of a group of people about a distinct experience or “phenomenon” does not a phenomenology make. Yet far too many of the existing studies that purport to be phenomenological study of some aspect of distance education do not go beyond surface level interviews and basic qualitative data analysis techniques.

Furthermore, in phenomenological research, different data sources and data collection activities are more consistent with the various traditions of phenomenology. For studies framed as transcendental phenomenology, for example, in-depth interviewing is the most sensible method to collect data on personal experiences (Kvale, 1996). However, interviewing participants one time, no matter how long, is probably not appropriate or sufficient. Practitioners of transcendental phenomenology should, then, consider using something like Seidman’s (2006) framework of three open-ended interviews that combines life-history interviewing and more focused, in-depth interviews. Based on the work of Dolbeare & Schuman (Schuman, 1982), Seidman’s method for interviewing involves three semi-structured interviews per participant. The first interview establishes the context of the participants’ experience (“How did you get here?”). The second allows participants to reconstruct the details of their experience within the context (“What is it like being you?”). The third interview extracts participants to reflections on the meaning they associate with the experience (“What does it mean to you?”) (Lauterbach, 2018; Granot, Alejandro, & Motta, 2012). This interview format is more philosophically compatible with phenomenology.

It is also possible that data collection activities can be even more specifically matched to the phenomenon under investigation. Lauterbach (2018) conducted a phenomenological exploration of expert teachers’ perceptions of teaching literacy within their content area to secondary students with learning disabilities. Previous literature suggested that interviews with expert teachers may be flawed because they often depend solely on teachers’ ability to think about and describe their instruction retrospectively. Therefore, Lauterbach included think-aloud interviews, claiming that “[r]esearch on think-aloud interviews has demonstrated they provide an accurate source of data regarding participants’ thinking, especially when interpreted through a qualitative lens” (p. 2884). Ultimately, Lauterbach (2018) started collecting data through a semi-structured initial interview, before conducting two think-aloud interviews with each participant. Then, the study concluded with two stimulated recall interviews in which the participant and the researcher watched a videotaped observation.

I instructed teachers to identify moments in the lesson that demonstrated the provision of instructional support for student literacy needs. I asked the teachers to elaborate on what knowledge they had been drawing upon, and on the source of that knowledge. Furthermore, I asked the participants to explain the rationale behind their choice of practice. I also pointed to the moments in the instruction that I had identified prior to the stimulated recall interview. By asking teachers to reflect on their teaching practice through watching their video, I situated their reflections and perceptions within their particular classroom context so as not to depend on teachers’ memory. (p. 2888)

In a similar vein, when conducting phenomenological research on distance education, it makes sense to take advantage of technologies as a technological lifeworld is under investigation. Andrews et al. (2011) studied the everyday “lived” experience of distance learners’ use of information and communication technologies (ICTs), including new media, for teaching and learning. To gain an understanding of those experiences, the researchers used multiple modes of data collection including pictures of learning spaces, the Day Experience Method (DEM), Charting the Week’s Activities (CWA), and follow-up group discussions with twelve participants. “The DEM requires students to respond to irregular SMS prompts on their mobile phone” (p. 324) over an 18-hour period. The student participants were prompted to respond to brief questions about what activities they were engaged, the resources they were using, and other people they were engaged with at the time they were prompted. The CWA method involved student participants keeping diaries that “...outlined their typical work, learning, family and social activities over a week” (p. 324). Collectively, these modes of data collection allowed the researchers to develop a rich description of the lived experiences of the distance education student participants.

Similarly, Brown, Hughes, & Delaney (2015) studied the lived experiences of first-time distance education students. Methodologically, they adopted a “Reflective Prompt” protocol wherein participants uploaded at least one five-minute digital video file per week via a secure website. A research assistant sent an email to participants with a set of four prompts.

The original intention was that the email would contain an amiable, yet emotionally detached greeting followed by a set of “reflective prompts” designed to trigger reflections for the participant’s next video diary. In other words, all participants would be encouraged to reflect on their online/distance learning experiences by prompting their thoughts with personalised “fish-hooks” that were based on each individual trajectory, as it emerged over time. (p. 178-179)

This method ensured both consistency in responses and also remained true to the particular intent of the study, which was to understand what it means to experience distance education for the first time.

A consideration in the explication of data is the creation and consideration of how information captured through the data is being re-contextualized through the researcher’s perspective as well as the students. The creation of meaning that occurs from a phenomenon happens within a hermeneutic circle, which means the subject creates meaning from talking to a specific part and back to the whole. This creates a sort of transitional meaning whereby the researcher is not only looking at how the subject matter might arrive at the definition of a thing, but also its departure. Phenomenological research calls for the analysis of the process even more so than either the departure or arrival of the latent meaning. Furthermore, the concrete nature of the definition is not always ensured as the person is constantly constructing and deconstructing meaning from their surrounding environment and their personal life. Looking towards the hermeneutic circle as a way to construct knowledge from gathered data will allow for a nuanced approach to phenomenological methods employed in a study.

Discussion

We argue that there is a significant need for phenomenological research in distance education because this design is ideally suited to uncover data and information that will allow instructors and instructional designers to better understand and, therefore, sympathize with the learners’ experiences of learning from a distance. And a more sympathetic instructor is a better instructor. But it is not just about the experience of humanity for the instructor.

...when researchers in educational studies... make use of phenomenology, it is generally because they have a deeply felt interest in the ‘humanity of experience’—rather than the experience of humanity—and thus, have adopted a philosophy and a methodology that lend themselves to existential considerations of Being on the one hand, and the possibilities and challenges of accessing unselfconscious, concretized, inadvertent revelations of experience on the other. (Thomson, 2009, p. 796)

Researchers who choose to use phenomenological methods must fully commit to the phenomenological process and not think of it as an afterthought, which will help in the analysis of the data. This is challenging, but it helps to alleviate the complexities found through performing this type of research, as more often than not distilling the findings to one simple generalizable nugget is not what occurs at the finish of the data explication. The potential beauty and importance of distance education, the humanity of the experience, we contend, can be unearthed by digging through the layered complexities of human experiences of distance education.

To do that work, we lay out a framework for conducting phenomenological research in the field of distance education. That framework is summarized in Table 2 below. Combining the considerations in Table 2 along with the four dimensions outlined in Table 3, a comprehensive framework for conducting phenomenological research on distance education emerges.

Table 2

Summary of framework for phenomenological research in distance education

	General considerations	Distance education considerations
<i>Phenomenological research as ontological and epistemological pursuits</i>	<ul style="list-style-type: none"> ● Commit to a particular approach to phenomenological research (e.g., transcendental, hermeneutic, etc.) and its philosophical underpinnings. ● Be aware of and state explicitly the ontological and epistemological assumptions of the chosen approach. ● Align all aspects of the design of the study to the chosen approach 	<ul style="list-style-type: none"> ● Consider at the outset whether being descriptive or interpretive would be best for answering your research question and what would most help an audience interested in pedagogical or policy issues in distance education. ● Consider a transcendental approach wherein the participants’ background is less relevant if the study participants are students and/or faculty newly come to distance learning.
<i>Alignment of research questions around bounded phenomena</i>	<ul style="list-style-type: none"> ● Ask research questions for which phenomenological methods are suited ● Ensure that the study takes place within a bounded system; a clearly defined lifeworld ● The study should be bounded 	<ul style="list-style-type: none"> ● Ask research questions that are phenomenologically important and unique to distance education (see e.g., Cressman & Hamilton (2010) and “technology breakdowns”) ● Consider the uniqueness of online learning environments and approaches

	within a reasonable time frame	and bound the study appropriately
<i>Positionality</i>	<ul style="list-style-type: none"> ● Be clear and upfront about biases ● State assumptions clearly early on ● Use bracketing and bridling techniques to keep biases and assumptions in check throughout the research process 	<ul style="list-style-type: none"> ● Consider your experiences with and biases around distance education and how those might influence the study. ● Consider your relationship to the participants. If they are colleagues and/or students, that needs to be accounted for.
<i>Data collection and explication: toward the Hermeneutic Circle</i>	<ul style="list-style-type: none"> ● Consider data sources and data collection activities that are more consistent with the chosen tradition of phenomenology. ● Match data collection methods to the phenomenon under investigation. ● Look to the hermeneutic circle as a way to construct knowledge from gathered data. 	<ul style="list-style-type: none"> ● Take advantage of the technology-rich environment of distance education and use technologically aided data collection methods. ● Match data collection methods to the distance education phenomenon under investigation, including having participants do things like take screenshots, share artifacts of learning, video diaries, etc.

Additionally, Cressman & Hamilton (2010) wrote about studying distance education phenomenologically, with specific reference to the “...four existentials—how does the user-experience of online education filter through their experience of space, body, time, and relation?” Table 3 includes questions and considerations around the four existentials for anyone conducting phenomenological research in distance education.

Table 3
The Four Existentials and Distance Education

	Distance education considerations
<p>Lived space—spatiality “Lived space is 'felt space' and thus it is hard to put into words since the experience that is felt is in some ways pre-verbal - we rarely reflect on it, yet we still experience it .”</p>	<p>“Do users set aside a specific space for interacting with online educational programs? How does the experience differ if one is performing a task on a campus or in the comfort (or discomfort) of one's home? What are the experiential differences between online and face-to-face education, or between different experiences of both, if the researcher attempts to understand the relation between lived space and use? What is the difference, because surely there must be one, between the physical space of the classroom and the virtual space inhabited by a person in a networked learning situation? How does sitting alone at a computer at home compare to sitting in a seminar room with other students?” (p. 60)</p>
<p>Lived body—corporeality “This concept answers to the phenomenological fact that we are always already inhabitants of bodies in the world, and that it is only through our embodiment that we experience at all.”</p>	<p>“How do students experience their own ‘presence’ in online classes? How do they constitute notions of "being there" or "participating" in virtual contexts when these things are so critically defined by the existence of a body in a classroom? Do they experience it in terms of the freedom of anonymity, as has frequently been assumed (Turkic)? Or does it manifest in them as an anxiety to make themselves present? One possible question raised, then, is how we experience our own bodies when they are physically attenuated, abstracted, and/or anonymous?” (p. 61)</p>
<p>Lived time—temporality “Temporality refers to subjective time as opposed to clock time or objective time—our experience not of the ticking clock, but of time slowing down or time flying,</p>	<p>“How fast or slow does time pass when the user is involved with online educational technology? Is this different from the temporal experiences of traditional classroom learning? Can the way that time drags on or flies by during a dull or interesting lecture be perfectly translated to online education? How is time linked to pleasure in the student's experience? What happens to the illicit pleasure one experiences in skipping class, or the sense of liberation</p>

<p>of killing time or having the time of one's life.”</p>	<p>resultant from waking up to a snowstorm knowing that classes will be cancelled? What about the dread that comes with facing a time consuming commute from home to campus?” (p. 62)</p>
<p>Lived other—relationality “...another critical aspect of our basic experience is that we share the world with others, who are also beings in the world. The final existential, then, involves the experience of interrelation, ‘the lived relation we maintain with others in the interpersonal space we share with them’ (van Manen 105)”</p>	<p>“The challenges of attaining "presence" online in the absence of the body is exacerbated when we think of the challenges of negotiating and maintaining relationships. How do we experience our interpersonal relations with others when there is "no body" present? How does one get a sense of others as ‘presences’ online? How is online interaction experienced? On another level, if someone commends your work might you be inclined to attach specific physical features to that name? What if someone is critical of your work? Is it a natural assumption to project negative physical traits to only a name?” (p. 63)</p>

The foundational work by Moore (1997) on transactional distance theory gives us a better understanding of the struggles associated with distance education, as Moore (1997) breaks up distance education into three different arenas: dialogue, structure, and learner autonomy. The proper implementation of these three elements can create a higher or lower space between the learner and instructor within a distant education platform. This established model of thinking and discussing online learning becomes even more artful when we bring in phenomenological research as it brings forth to the discussion the idea of ontology.

While transactional distance theory is bent on exploring the complexities of the roles of an instructor and a student in an online setting that still centers around the assumption that the only exchange occurs at the epistemological level, phenomenology requires the acknowledgement of the ontological. Both student and teacher bring a pre-formed level of being to the online environment that affects the exchange of knowledge whether it contains high or low level of transaction. These ideas fall in line with John Dewey’s (1916) work whereby he suggests the process of education relies on cognitive and sociological features, and neither should be prioritized over the other, or it would be detrimental to the whole. Again, we see the acknowledgement of the complexities of the creation of knowledge creation, and to two important thinkers struggling with coming to terms with how humans construct learning. This of course leads back to phenomenological research as it takes into account factors that may have been overlooked by previous research methods which focus on the epistemological importance of their work.

In trying to reduce the distance between learner and instructor found in online learning environments, researchers must delve into and become comfortable with producing more questions than when they started. A huge question that is at the forefront of online researcher is the learner’s experience in online environments. As Veletsianos (2020) expresses:

The elusive nature of online learners’ experiences is a problem because it prevents us from doing better: from designing more effective online courses, from making evidence informed decisions about online education, and from coming to our work with the full sense of empathy that our students deserve. (p. 6)

Understanding the learner's experience will go a long way to establish best practices associated with online learning. But, simply encapsulating a learner's experience through quantitative means will not capture the complexities found within a learner's experience, as online learning is not merely an epistemological download, but a fully embodied experience filled with a multiplicity of experiences. , Capturing the differing lived experience is the direction needed to be taken in order to contribute significant changes to the learning environment.

Ultimately, the power of phenomenological work is not just its focus on ontology as an imbedding truth separate from epistemological gains, but its ability to cause researchers to consider a student and instructor's being a major contributing factor to how learning is conducted. Using this type of method allows for a deeper understanding of the overall learning experience, and a closing of the distance between learner and teacher.

Declarations

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

The authors declared that they received no financial support for the research, authorship, and/or publication of this article.

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A Case Study Approach to Exploring Resilient Pedagogy During Times of Crisis

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Abstract

In response to the COVID-19 pandemic of 2020 and the ensuing public health crisis, thousands of higher education institutions (HEIs) worldwide have had to grapple with rapid pivots to emergency remote online learning modalities with relatively little time to prepare, and the need to maintain these modalities continues to extend longer than most institutions anticipated. However, this is not the first time HEIs have had to enact an emergency switch to online learning in a time of crisis, and there is perhaps much to be learned from examining the experiences of institutions that have been through this before. Resilient pedagogy is an emerging field in education, but it is intrinsically tied to online learning in a crisis insofar as it describes the ability to intentionally and effectively shift instructional tactics given a change in environment or context. Using a case study approach, this paper explores indicators of resilient pedagogy in emergency pivots to online learning following crisis situations—including the COVID-19 pandemic—in the United States, New Zealand, and South Africa. The data informing this research are qualitative, derived from interviews with faculty members and students in each higher education context.

Keywords: Resilient pedagogy, emergency remote teaching, online teaching, higher education, COVID-19 pandemic

Clum, K., Ebersole, L., Wicks, D., & Shea, M. (2022). A case study approach to resilient pedagogy during times of crisis. *Online Learning*, 26(2), 323-342.

As with so many other areas of human society, COVID-19 has redefined teaching and learning to such a degree that the highly significant differences between the pre- and post-pandemic educational environment must be acknowledged. World events are such that “business as usual” has been irrevocably disrupted, and it is difficult to imagine a full return to “normal” in any sphere. To respond to the COVID-19 pandemic and the ensuing public health crisis, thousands of higher education institutions (HEIs) worldwide have had to grapple with rapid pivots to emergency remote online teaching modalities with relatively little time to prepare, and the need to maintain these modalities continues to extend beyond what most institutions anticipated. In March of 2020, UNESCO estimated that 850 million individuals worldwide had transitioned to alternative forms of teaching and learning in a two-month span (UNESCO, 2020). In addition to the pandemic, throughout the United States, and indeed elsewhere in the world, issues of racial tension and injustice contributed to the stress experienced by students and staff at HEIs. The world of higher education—and certainly education at large—is experiencing an unprecedented shift in learning that leaves many HEIs struggling to cope. This includes issues of curriculum and pedagogy as well as institutional infrastructure and management.

This current moment, however, is not the first time HEIs have had to navigate an emergency switch to online learning in a time of crisis, and there is perhaps much to be learned from reflecting on the previous experiences of institutions (Johnson et al., 2020). Using a case study approach, this paper explores indicators of resilient pedagogy in emergency pivots to online learning following crisis situations—including the COVID-19 pandemic—in the United States, New Zealand, and South Africa. The data informing this research are primarily qualitative data derived from interviews with faculty members and students in each higher education context.

Review of Related Literature

The growth of online learning in the 21st century and especially after the COVID-19 pandemic has altered how HEIs are able to respond to crisis. Difficult circumstances such as political unrest, natural disasters, and pandemics have impacted HEIs’ ability to offer traditional on-campus courses. The advent of online learning provided a way for HEIs to regroup and redeploy learning in a different format after a crisis, hopefully with minimal disruption. Online learning can be defined as learning through the internet in an asynchronous or synchronous web-based environment where students engage with instructors, other students, and content with time and place agency (Singh & Thurman, 2019). Anderson (2008) proposed a theory of online learning based on the How People Learn framework (Bransford et al., 1999). Anderson’s online learning theory examines how current and future internet-based technologies impact effective learning through four overlapping lenses: community-centered, knowledge-centered, learner-centered, and assessment-centered. Each lens provides insight into affordances of the internet that can be used to make learning effective. For example, online learning can use synchronous and asynchronous communication technologies to address community-centered learning online. Resilient pedagogy is an emerging field in education that is intrinsically tied to online learning in a crisis. During earlier crises, HEIs did their best to pivot to online learning. With resilient pedagogy, faculty have an opportunity to be prepared for online teaching prior to the crisis

Emergency Remote Teaching vs. Online Teaching

It is important to first address the terms “emergency remote teaching” and “online teaching” as they will be used in this paper, as there is a distinction to be made between them,

and how they apply to the various types of educational experiences presented in the case studies that will be examined. Emergency remote teaching (ERT) can be defined as a transitory move to an alternative instructional delivery format due to a crisis (Hodges et al., 2020). ERT is meant to take the place of face-to-face instruction for a brief period, and is not necessarily concerned with recreating a robust learning ecosystem in an online environment (Hodges et al., 2020). ERT is meant to be quickly implemented and widely accessible, but with short-term scope (Colton & Phillips, 2021). Understandably, it has been the mode of instruction that has most commonly been used during the COVID-19 pandemic. This stands in contrast to true online teaching. Effective online teaching experiences are pre-planned and designed with evidence-based instructional methods. Online teaching is comprehensive and sustainable, providing formal, informal, and social resources to the students and faculty members involved (Hodges et al., 2020). Online teaching is more than a mode of delivery, and the design of an online course (whether synchronous or asynchronous, blended or fully online) must be carefully considered. In this type of learning environment, instructors will use specific strategies for student engagement, assessment, and support that are specifically designed for teaching online (Bates, 2020).

In short, although ERT has been a necessary tool for countless educators in moments of crisis, it is an insufficient view of what can/should be achieved in any kind of meaningful, sustainable shift to online teaching. This is where we turn to resilient pedagogy to help frame further ideas about effective shifts to online teaching and learning.

Resilient Pedagogy

Resilient pedagogy is an emerging field of study intrinsically tied to online learning in a crisis insofar as it describes the ability to intentionally and effectively shift instructional tactics given a change in the environment or context. Resilient pedagogy can be defined as “the ability to facilitate learning experiences that are designed to be adaptable to fluctuating conditions and disruptions” and resilient teaching as an approach that “take[s] into account how a dynamic learning context may require new forms of interactions between teachers, students, content, and tools” (Quintana & DeVaney, 2020, para. 8). Those who practice resilient pedagogy have the capacity to rethink the design of learning experiences based on a nuanced understanding of context (Quintana & DeVaney, 2020). Resilient pedagogy will have an influence on both the content of a course and its structure or mode of delivery, ultimately focusing on the types of interactions taking place between and among teachers and students. Furthermore, resilient pedagogy makes room for fluctuating student needs throughout a course of study and ensures instructor expectations will flex accordingly.

Chow et al. (2020) refer to this instructional approach as Crisis Resilience Pedagogy (CRP). In CRP, educators develop a method for teaching and learning that can be rapidly and creatively delivered without concern for the availability of physical space. CRP enables instructors and students to adapt within a crisis while engaging in courses that have been strategically designed to resist disruption. Crisis situations which impact the educational enterprise may include natural disasters, global health crises, social unrest, civil war, or perhaps a combination of these. CRP seeks to address obstacles that arise in times of crisis, including loss of infrastructure and a decrease in learning motivation due to the crisis (Chow et al., 2020). According to Chow et al. (2020), CRP consists of five key attributes: adaptability, creativity, connectivity, diversity, and endurance.

Schwarzman (2020) also makes a case for resilient teaching practices during a crisis, calling on many of the same attributes and themes (creativity, adaptability, and endurance) as

Chow et al. (2020). Schwarzman (2020) names *pivot pedagogy* as the act of preparing a course to be delivered in a variety of modalities in unforeseen circumstances (Schwarzman, 2020). Regardless of the chosen name, there is clear acknowledgement in the academic community that teaching and learning in the midst of a crisis—regardless of the discipline—requires specific attention and pedagogical considerations, and “resilience” seems to be at the center of it.

Resilient pedagogy, however, is not limited to individual instructors and their classrooms; it must also be practiced at the institutional level to the extent that impacted institutions practice creative problem solving in moments of crisis and obtain access to resources beyond what is normally available (SchWeber, 2008). Developing resilience at the institutional level allows HEIs to provide the resources necessary for resilience in the people they serve. Resilience begets resilience. In the aftermath of the 2018 Camp Fire in California, resuming school operations proved critical to providing stability for students in response to a traumatic event (Schulze et al., 2020).

Institutional resilience may take the form of institution-wide policy changes. In a recent, unprecedented example of resilient pedagogy at the institutional level, a large majority of HEIs across the United States switched their spring 2020 courses to a pass/no credit grading model—most of them in the middle of the academic term—in order to support students and faculty members struggling with the massive changes in learning modalities, as well as the traumatic nationwide protests and civil unrest (Grajek, 2020). As each of the following case studies will suggest, resilient pedagogy, both in the classroom and throughout the institution at large, is a significant contributing factor to the relative success of an online learning experience in a crisis.

Principles of Resilient Pedagogy

While Chow et al. (2020) and Schwarzman (2020) describe some key attributes of resilient instruction, Quintana (2020) proposes a more robust three-principle framework for resilient pedagogy which serves as a practical guide for course design and offers some clearer indicators by which we can more effectively analyze the presence of resilient pedagogy in an online learning environment. It should be noted, though, that the five attributes of CRP are largely embedded within Quintana’s three-principle framework. The three-principle framework includes designing for **extensibility**, designing for **flexibility**, and designing for **redundancy**.

A system is designed for **extensibility** if it allows the addition of new capabilities or functionality (Quintana, 2020). To design for extensibility in a course, instructors must first construct the most basic format which still allows it to achieve its objective or purpose. Then, the instructor may expand and extend the course format and tools to address additional needs, always keeping the primary goal or purpose of the course in mind (Quintana, 2020). Consider the metaphor of a vacuum designed to work with several different attachments. When using a vacuum with different attachment heads, the overall purpose of removing dust and dirt remains the same but using various attachments allows the vacuum to work differently and more effectively on varied surfaces. Designing for extensibility may be present in an individual course, or it may be present on a larger institutional level where the goal is to continue the educational enterprise during a crisis. For example, a university may have been using the learning management system (LMS) primarily for sharing course documents with students in a face-to-face course with lectures being delivered during class. However, if a crisis requires courses to meet remotely, instructors can pivot and use a streaming video add-in within the LMS to record and share lectures asynchronously. The authors consider extensibility as a means to address

macro-level issues for a system design, whereas the flexibility principle addresses specific stakeholder learning needs within the system.

Designing for **flexibility** involves anticipating and responding to potential changes in a learning environment (Quintana, 2020). Effective online learning experiences must be designed for learner variability, even in advance of meeting specific students in a given course. The principle of flexibility has much in common with the Universal Design for Learning (UDL) framework which originally came to prominence in the 1990s. UDL is a student-centered instructional design framework which prioritizes inclusive and equitable teaching practices using multiple methods of content representation, multiple means of student action and expression, and multiple modes of student engagement (CAST, 2018). As with UDL, instructors who design for flexibility will be prepared to meet the needs of a wide variety of students and will be prepared to respond to changes in the learning environment in real time. Designing for flexibility provides for multiple means of engagement with a range of circumstances in mind, including class size and modality (Quintana, 2020). Consider the metaphor of a tailor constructing a suit. The tailor follows a pattern and makes cuts to construct a suit ahead of time but makes sure to include enough extra fabric and loose stitching in the initial construction to be able to adjust the suit to fit the individual needs of the person who will be wearing it in the future. One way that instructors may demonstrate flexibility is by including additional learning activities in their courses for students who need to review or learn concepts that they were already expected to understand. These activities would not be required for students who already demonstrate proficiency in this content. Once again, designing for flexibility may be achieved on a smaller scale by individual instructors and their courses, or by an institution as it seeks to meet the individual needs of students, faculty, and staff participating in online learning.

Finally, designing for **redundancy** involves analyzing a course or system design to identify and address points of system failure. Designing for redundancy in a course allows an instructor to facilitate the same types of interactions using a variety of different methods depending on the needs of the moment or the demands of the modality (Quintana, 2020). Higher education faculty, staff, and administrators who design for redundancy always have at least one back-up plan so that they are ready for disruptions to the original plan. They also minimize dependence on any one tool, resource, or learning modality (Quintana, 2020). Instructors who practice redundancy make sure their materials and methods are diversified and provide students with a variety of options to demonstrate their learning (Quintana, 2020). In this instance, a metaphor for redundancy might be the act of having a backup generator, a flashlight, *and* candles on hand in case the lights go out. HEIs often have a contingency plan in place for their institutional operations in case of emergency, but this level of foresight does not necessarily trickle down to instructors as they design their courses. An example of redundancy would be providing alternative formats for lectures that were presented in person or synchronously through web conferencing software. Digital lecture recordings could be used by students who were unable to attend a real-time meeting. Providing multiple alternatives allows students to engage with the best-fit option for them and offers multiple access points to the material should one part of the system fail.

In summary, resilient pedagogy is present to the extent that stake holders can adjust, edit, add, remove, or exchange elements as needed along the way to still fulfill the original goals and purposes of an academic course, program, or, perhaps, the institution at large. In this research, the three principles just described were not considered mutually exclusive criteria, but rather

complementary to one another and able to mutually inform within the resilient pedagogy framework.

Research Questions

1. What indicators of resilient pedagogy can be found at the institutional level in case studies in which HEIs have had to pivot to online learning in response to a crisis?
2. What indicators of resilient pedagogy can be found at the instructional level in case studies in which HEIs have had to pivot to online learning in response to a crisis?
3. How can the principles of resilient pedagogy inform HEIs' current and future pivots to online learning in crisis situations?

Methods

Research Design

A descriptive case study approach was used in the present research. Case studies allow researchers to explore and examine individuals, relationships, communities, organizations, or programs within their real-life contexts, and they support the deconstruction and reconstruction of various phenomena (Yin, 2017). By examining multiple sources of evidence, including but not limited to, archival records, documents, interviews, and direct observation (Yin, 2017, pp. 126-130), the present study sought to explore the “how” and “why” questions—how HEIs and instructors therein pivoted and practiced ERT during a time of crisis and why certain strategies were effective—with the intent to uncover multiple interpretations of resilient pedagogy.

Selection of Cases and Data Collection

The selection rationale for the included case studies is twofold: 1) the relative availability of literature and research reflecting upon emergency online learning implementation in these instances, and 2) the relationship in crisis situations and their relevance to challenges being faced in 2020, including more unified responses to “external” trauma (i.e., natural disasters or a public health crisis) and morally complex “internal” trauma that involves socio-political upheaval (i.e., protests and civil disobedience).

Considering our research purpose and questions, the following inclusion and exclusion criteria were also established:

1. All case studies must take place in one or more higher education institutions.
2. All case studies must involve an emergency pivot to online teaching and learning in a moment of crisis.
3. In each case study, the crisis might include “external” trauma (i.e., natural disasters or a public health crisis) and/or morally complex “internal” trauma (i.e., socio-political upheaval, protests, and civil disobedience), but the crisis must have impacted normal campus operations such that an emergency pivot to online teaching and learning was required.
4. The case study must have taken place in a time where enough technological infrastructure existed to warrant a move to online learning.

5. The authors intentionally included case studies from international institutions and HEIs of differing types/sizes to search for indicators of resilient pedagogy in varied contexts.

Following the recommended case study protocols (e.g., Merriam, 1998; Yin, 2017), we analyzed both quantitative and qualitative evidence from documents, archival records, and interviews. Details of the case characteristics—the quantitative and qualitative data sources examined in this study—are summarized in Table 1.

Table 1

Case Characteristics and Types of Data Analyzed

Case	Event & Location	Timeline	Institution Type	Qualitative Data	Quantitative Data
1	Hurricane Katrina, United States	2005	Wide variety impacted and wide variety participated in offering classes: 135 institutions from 36 states	Interviews with students and instructors, email records*	SREB electronic campus catalog (e.g., registration numbers)
2	Earthquakes, New Zealand	2010-2011	Large Public University	Reflective narratives from five instructors	LMS (e.g., timeline, type of educational activities)
3	Student Protests, South Africa	2015-2017	Large Public University	Interviews with 16 instructors	None
4	COVID-19 pandemic and Socio-Political Unrest, United States	2020	Small Private Liberal Arts University	Interviews with 20 instructors	None

*Note: Exact numbers of interviewees were not provided by Lorenzo (2008).

Data Analysis

We approached qualitative coding of the data using thematic analysis to identify and describe commonly occurring ideas, topics, or patterns (Braun & Clarke, 2006). The analytic strategies and techniques used are consistent with what qualitative researchers have recommended for analyzing case study evidence, specifically in its reliance on theoretical propositions, pattern matching, explanation building, and cross-case synthesis (Yin, 2017, pp. 168-198). Because of our theoretical interest in the topic of resilient pedagogy, we followed a more theoretical and analyst-driven thematic analysis approach as opposed to a more inductive approach (Braun & Clarke, 2006). Two coders (the first and second authors), working independently, read and re-read interview transcripts and archival documents to identify any themes related to the three elements of resilient pedagogy, and then discussed convergent and divergent themes. The analytic process then progressed from a more semantic-level description (e.g., surface meaning of data) to a latent-level interpretation with the significance of the themes and implications for practice considered in relation to previous literature and our research questions (the “how” and “why” of resilient pedagogy during a time of crisis).

Several strategies were used to ensure data credibility and reliability (Merriam, 1998; Yin, 2017). First, the authors followed the recommended protocols to conduct the literature review, developed theory-informed research questions, and selected cases through purposive sampling (see inclusion/exclusion criteria above). Second, the notion of triangulation was evident throughout the research process including the selection of multiple data sources (e.g., review of published articles, archival records, and personal interviews), a multi-informant approach (e.g., interview with students and instructors). Third, researcher reflexivity was examined (see coders' disclosure of bias in the appendix). Finally, ecological generalizability was enhanced by selecting multiple higher education sites, both domestically and internationally.

Findings

Case Study No. 1, New Orleans, Louisiana and the Sloan Semester, United States of America

The first case study under consideration took place in New Orleans, Louisiana, and the surrounding areas of the gulf coast of the United States after Hurricane Katrina in late August of 2005. After the hurricane, the city of New Orleans was devastated, and thousands of university students—many of whom had just started fall semester—were displaced and unable to return to their college campuses or resume their studies in-person. The Sloan Consortium (funded by the Alfred P. Sloan Foundation) partnered with the Southern Regional Educational Board (SREB) to offer displaced students the opportunity to continue their studies in an online format while their universities recovered. In what came to be known as “The Sloan Semester,” 1,700 students registered in 1,345 courses offered free (online) by 136 higher education institutions across 36 states (Lorenzo, 2008). The Sloan Consortium is now called the Online Learning Consortium.

The initial efforts for the Sloan Semester were spearheaded by Consortium members Burks Oakley and Ray Schroeder. Having previously discussed a need to develop an emergency plan for online course delivery (citing the 2003 SARS epidemic in Hong Kong as an example), Oakley and Schroeder, both of whom were employed at the University of Illinois at the time, had already been working on contingency plans that would allow their residential university to continue courses in the event of an emergency (Lorenzo, 2008). After Hurricane Katrina, they channeled their energies and prior research into an emergency response for students in New Orleans (Lorenzo, 2008). It is undeniable that the foresight and preemptive efforts made by Schroeder and Oakley were pivotal in the overall success of the Sloan Semester and the rapid changes enacted at the institutional level by many universities in a very short amount of time. Using the “Sloan Semester” case study presented by Lorenzo (2008), several indicators of resilient pedagogy may be found:

Indicators of Resilient Pedagogy

Extensibility. Because instructor participation in the Sloan Semester was largely voluntary and offered by instructors outside of the hurricane-impacted region, many if not most of those participating already had experience with online instruction and/or had at least a brief preparation window to adapt their courses for a virtual environment. Some level of advanced preparation meant that most online courses were thoughtfully constructed and were meaningful extensions of courses that might otherwise be taught in person.

Registration and participation policies from host university student information systems (SISs) and LMSs were extended to allow receiving students to register and participate in courses without conforming to policies that may have delayed or prevented their participation.

Participating faculty members adjusted courses designed for students at a single university so these courses could be taken by students from multiple universities. For example, permissions for documents that may have only been accessible to students at a participating instructor's university were altered to allow access for students from other institutions.

Flexibility. Student and faculty reflections revealed that student-to-student interactions and class discussion created an opportunity for students to mutually give and receive emotional support; this was important for student well-being as they dealt with the aftermath of the disaster. Regarding the social dynamic of her online class, one Sloan Semester student noted that “there was a lot of open communication between students and the teacher. Everyone’s personalities showed through online.” (p. 26)

Participating faculty members intentionally designed courses to meet the needs of their students. This included condensing longer courses to fit into shorter sequences, adjusting curriculum and discussion boards to increase opportunities for students to connect course content to their current lives and circumstances, and even pivoting teaching strategies midway through to give students the maximum amount of flexibility when it came to pacing and due dates, knowing that for most impacted students, life outside of school was far from business as usual.

Support from the Sloan Foundation significantly subsidized the cost of the credits taken in the Sloan Semester. In most cases, students could take courses at no cost. The Sloan Semester made extensive use of academic advisors to help support participating students in the process of choosing and signing up for classes. Since students no longer had access to services that had previously been provided on campus, many benefited from the guidance, clarity and support offered in direct partnership with the Sloan Semester advisors. Student services are critical and must be considered as part of a healthy academic ecosystem, regardless of the medium of instruction.

Redundancy. Sloan Semester courses were offered by faculty members from a wide variety of institutions across 36 states. Due to the efforts of the Sloan Consortium, 136 universities across the United States matriculated students as providers in the Sloan Semester distance learning program, avoiding overreliance on any one institution or pool of instructors.

One of the most important factors contributing to the Sloan Semester’s success was the foresight of Oakley and Schroeder, who had already been drawing a blueprint for the use of online learning in an emergency that eliminated the use of physical classrooms. The value of emergency preparedness in this situation cannot be overstated.

Xavier University, a hurricane-impacted university, fared better than some of its counterparts because it had a pre-existing emergency website and institutional data backed up offsite, ultimately allowing them to continue communications and maintain student records without significant setbacks (SchWeber, 2008).

Although the Sloan Semester was considered a success on many fronts, one identifiable weakness was the immense amount of “outsourcing” which took place, making it difficult for impacted institutions to replicate the Sloan Semester approach on their own campuses. This in

turn slowed their ability to recover students and lost tuition dollars, as well as participate in more localized recovery efforts (resilience begets resilience). Lorenzo (2008) reported that some of these impacted institutions did not support credit transfer policies, resulting in many Sloan Semester students dropping out of courses. With respect to methodology, this case study was written in a “journalists/case-study style” with less formalized attention to traditional data collection techniques and documentation. Additionally, the author was a member of the Sloan Consortium, and thus may be subject to a biased representation of the overall efficacy of the Sloan Semester.

Case Study No. 2, Canterbury, New Zealand

A second case study examines the use of blended learning following a series of major earthquakes in the Canterbury region of New Zealand in September 2010 and February 2011. Then, a series of aftershocks destabilized the Canterbury region for many months. The February earthquake resulted in 185 fatalities, large-scale destruction, and a prolonged state of civil emergency (Mackey et al., 2012). In response to this crisis, faculty members at the University of Canterbury in New Zealand adopted technologically enhanced teaching practices that they referred to as “resilient blended learning”; these teaching practices ensured that teaching could proceed despite significant disruption and displacement (Mackey et al., 2012). The University of Canterbury remained closed for many weeks to ensure that the necessary safety assessments were completed, but even when campus reopened, physical classroom spaces were in short supply (Mackey et al., 2012). Reflecting upon resilient pedagogy as it was called for in this situation, Mackey et al. (2012) asserted that “[c]reative and innovative solutions are required if a sound academic program is to be maintained when faced with a lack of space and physical resources, interrupted schedules, dispersed students, and an extended period of civil emergency” (p. 130). Using indicators provided in the descriptive case study conducted by Mackey et al. (2012), several observations can be made about the use of resilient pedagogy in a crisis:

Indicators of Resilient Pedagogy

Extensibility. In the effort to redesign courses for online modality in an abbreviated time frame, some faculty members focused on reducing the amount of information exchanged in each class session, replacing lectures with practical application activities; in some instances, lectures became self-directed learning experiences.

The case study authors reported that they “adopted an inverted or ‘flipped-classroom’ model requiring students to take greater responsibility for their own learning.... Precious face-to-face time was reserved for workshops, hands-on activities, and discussions to explore what had been presented online.” The online environment was leveraged as a platform for course content “supported by new multi-modal resources including podcasts and video demonstrations.” (p. 128).

Faculty/staff established informal support networks to exchange ideas and better equip one another to work with new platforms and teaching modalities. Collaboration among colleagues was instrumental in improving the student and faculty experience. After the initial crisis, time/energy was spent reviewing and reflecting upon the experience to better prepare for future incidents, including sustainable changes in current course delivery models.

Flexibility. The semester was condensed to one that was shorter than planned, with teaching and assessments adjusted accordingly to meet student needs. Instructors recognized the need to be accessible and visible in a virtual space and responded quickly to students' questions and concerns. They also "identified practical strategies for supporting students, including streamlining and simplifying online course sites, revising course maps and outlines, highlighting course changes, providing additional resources...adjusting assessment tasks and assessment dates..." (p. 129).

Faculty members adopted a relaxed approach to attendance, encouraging students to manage their own blended learning experience and to opt-in to online or on campus course offerings according to what best suited their needs. Also, continued aftershocks in the spring prompted a university-wide move to replace exams and tests with take-home or online tests/assignments to avoid having large numbers of students sitting in lecture halls.

Redundancy. In the early days of the February earthquake, communications to staff/students were made available through the school website, email, social media, and the LMS in an effort to connect with students through at least one medium or platform. The university library was able to pivot quickly and provide many academic resources and readings in an alternate, virtual format. To ensure multiple points of entry and communicate equally with all students, some faculty members personally followed up with individuals in their courses who had not yet accessed relevant online course materials/sites to ensure students' ability to participate.

Increased collaboration among colleagues was a notable benefit in this case study. Mackey et al. (2012) noted that innovative teaching activities and course redesigns were results of a "grassroots" effort from instructors, with seemingly little assistance from the university's internal infrastructure (e.g., a center for teaching and learning or educational technology department). This certainly placed a greater burden on individual faculty members during the crisis, and it suggests that instructors might have benefited from more unified support efforts and guidance from within the university. Regarding methods, a limitation of this study was the small sample size of participating faculty members. In order to conduct "quick-response research" in the midst of the crisis, the study depended on documenting the lived experiences of five instructors from the impacted institution, and thus the data collection process was decidedly less traditional in scope (Mackey et al., 2012).

Case Study No. 3, Cape Town and Johannesburg, South Africa

The third case study occurred more recently in the country of South Africa. South African student demonstrations began at the University of Witwatersrand in Johannesburg in October of 2015. Students were effectively on strike in response to significant and prohibitive tuition hikes (over 10% from the previous year). Mass protests spread to the largest HEIs across South Africa, and students at the picket lines argued that the proposed hikes would financially exclude mainly black and poor students (Onishi, 2015). Because the cost of tuition was directly tied to government funding (or lack thereof), the protests became a nationwide political issue. Institutionally, the disruptions impacted all aspects of operations including course content and delivery (namely, the inability to hold classes in-person), tuition costs, and students' ability to prepare for end-of-year exams which determine their ability to pass or even graduate (Czerniewicz et al., 2019). South African higher education faculty members had little time to consider their options for moving their teaching online since "the circumstances in which this

was thrust upon them were unstable, unplanned and uncoordinated” (Czerniewicz et al., 2019, para. 17). Using the University of Cape Town case study from Czerniewicz et al. (2019), several observations can be made about the course offerings provided during the student protests in South Africa between 2015 and 2017:

Indicators of Resilient Pedagogy

Extensibility. The University of Cape Town instituted compulsory adaptations of blended learning techniques to allow teaching/learning to continue in a virtual format. Using the campus LMS, some instructors had already incorporated some amount of blended learning into their courses such that when the formal directive was given, moving courses online was not necessarily a prohibitive shift for the faculty or the students. Course timelines were adjusted in anticipation of current/future disruptions. One respondent noted that they strategically managed student engagement with material earlier on in the course “so that students wouldn’t require any face-to-face engagement after a certain date.” (p.10)

Flexibility. Instructors were not left entirely to their own devices. At the University of Cape Town, support staff showed instructors how to develop blended learning opportunities through the LMS, including making their courses less bandwidth-intensive and easier to interact with on mobile phones. Many instructors were sympathetic to the cause of the protests and the socio-economic/socio-political environment that resulted; this context was acknowledged in many classrooms, and it informed the way many instructors interacted with students in their courses as well as practical decisions around course design, curriculum, and the postponement of due dates.

Redundancy. Efforts were made to make online instructional materials accessible to students using phones as well as laptops. Department heads communicated to faculty members that they must make plans to move courses online because they needed a curricular backup plan to finish the school year.

Although this case study contained clear indicators of resilient pedagogy, Czerniewicz et al. (2019) noted that many (if not most) of the instructors interviewed ultimately viewed online teaching and learning as inferior to face-to-face instruction. Consequently, instructors’ willingness to fully engage in the pivot to online teaching was often tepid, looking more like emergency remote instruction and “putting materials up online” rather than true resilient pedagogy (Czerniewicz et al., 2019). Significant weaknesses in this study seem to have revolved around lasting stigmas about the efficacy of online teaching and learning, combined with a lack of meaningful professional development for instructors prior to, and throughout, the crisis. Like the previous case studies mentioned, data collection methods in this case study were impacted by the crisis such that access to willing faculty participants was limited and the sample size of those interviewed—as compared with those invited to participate—was relatively small. Those who received interview requests were still trying to navigate the ongoing impacts of the crisis themselves (Czerniewicz et al., 2019).

Case Study No. 4, Pacific Northwest Region, United States

The fourth and most recent case study took place at a small, private liberal arts university in the Pacific Northwest region of the United States. In response to the COVID-19 pandemic, this institution, like most HEIs in the US, shifted to a comprehensive, emergency remote online learning environment during the 2020 spring term. With relatively little time to make this switch, the university delayed the start of the term by two weeks to give instructors time to redesign their

courses for an online format. This also resulted in a truncated term, which comprised eight weeks instead of the usual 10 weeks. As online courses continued to be offered in summer 2020, instructors and students were also navigating the social unrest that occurred nationwide in response to racial tensions and injustices. Using resilient pedagogy as a conceptual framework, an examination of findings from the qualitative interviews conducted by the second author as part of a larger study allowed the researchers to explore indicators of resilient teaching practices.

Indicators of Resilient Pedagogy

Extensibility. For fall 2020, some courses that could not easily be reproduced in an online format remained face-to-face (e.g., lab classes) with appropriate social distance measures in place, while those that could be accomplished online were moved completely online.

Faculty members received support for adjusting course design and infrastructure from the educational technology department. Instructors reformatted lectures into asynchronous learning experiences, so that synchronous online sessions could be spent checking for learning and answering questions. One respondent described how they modified their course: “I really moved away from the idea that we have to meet like two or three times a week. So, I broke up my prerecorded lectures into a series of mini lectures” (Instructor 5). Instructors began to think about future planning for different teaching scenarios. One respondent reflected on how they worked to create a sustainable model for resilient teaching: “I had an eye to long term planning both for online teaching in the future and also to build the kind of resources and templates and that sort of thing that I could use should we ever go back to in-person teaching” (Instructor 5)

Flexibility. The university adjusted the start and end date of the academic quarters in response to the pandemic trajectory.

The institution implemented an undergraduate tuition reduction, effective autumn 2021. While the expectations and workload for faculty service remained largely the same, department and committee chairs were given the option to meet less often, thereby giving faculty members more dedicated time to adjust their courses and other work.

Instructors adjusted their expectations for student input (e.g., class participation) and output (e.g., performance). Instructors adjusted the time spent on learning activities in response to not having access to campus and to not having a full 10-week term. One respondent reflected on choices they made in response to the shorter timeframe: “I know that I made choices about what I would do and what I wouldn't do in the online class. I expected less output from the students. I assigned less and I gave up the final exam” (Instructor 10).

Instructors varied the types of asynchronous/synchronous learning activities for maximum learner engagement. One respondent described how they adjusted a course that had a lab component: “I left the online live portion of lab for when I wanted them to work in groups...and then everything that could be done individually they would do (asynchronously) outside of that one hour” (Instructor 4).

Redundancy. The institution adopted Panopto software for instructors to use for streaming video, which provided backup for Zoom meetings, including both audio and transcript versions of all recorded sessions.

Several instructors noted that they needed to be “creative” and adjusted course materials/equipment in response to not having access to on-campus resources. “I have specialized equipment in our lab that we would have used, but I adapted to like use paperclips

and stuff at home and be creative” (Instructor 1). Another respondent described using data sets generated from classes in years past to frame lab tasks during COVID (Instructor 18).

Instructors used technology to recreate social-emotional experiences that had been a part of the on-campus experience. One respondent described how they preserved an important interpersonal practice: “One of the things...I kind of missed out on was the before-and-after class conversations....I tried to create that by logging online 10 minutes early just to see who was there and ready online. There were always a few...” (Instructor 15).

A strength of this study was the relatively large sample size of 20 instructors for a qualitative study. Moreover, the participants represented a wide range of academic disciplines in both undergraduate and graduate levels. Although 65% of the instructors interviewed had not taught an online course prior to spring 2020, they demonstrated flexibility and willingness to adapt to the emergency remote online teaching environment and to reflect on the long-term implications of the modifications they made. A potential limitation of this study was that it took place at a small, urban, private, faith-based HEI, which may limit the generalizability of findings to other HEI.

Discussion

ERT is a modality that can be used in crisis situations for a brief period but it is not an end goal. Sustainability is the next step in education offerings and must shape the end goals in any situation where an emergency remote response is required. Strategies implemented now can be built upon and can increase institutional resilience in the future (Johnson et al., 2020). Especially considering the ongoing effects of the COVID-19 pandemic, HEIs worldwide are finding a need to develop comprehensive, sustainable, and resilient educational plans that can withstand the challenges and unknowns of what is yet to come (Johnson et al., 2020).

Successful implementation of ERT will look more like true online learning and embody attributes of resilient pedagogy, including institutional and pedagogical extensibility, flexibility, and redundancy. The authors found indicators of resilient pedagogy in each of the included case studies. It should be noted once again that in this study, the three principles were not considered mutually exclusive criteria. Rather, they were considered complementary to one another, at times overlapping within the resilient pedagogy framework. For example, some indicators might be considered examples of both extensibility and flexibility; in these cases, the authors coded the indicators according to their understanding of the best-fit principle.

Within the resilient pedagogy framework, extensibility refers to an institution or instructor having a plan for each course that goes beyond one format or relies on one set of tools (Quintana, 2020). In this study, a common challenge faced by the institutions was how to accommodate for the loss of instructional time, deciding which technologies could be used to best meet learning needs, and making sure that instructors and students had access to the technologies required for learning. The authors found that institutions showed extensibility by supporting macro-level changes in learning modalities. Resilient institutions provided the guidance, leadership, and practical support needed to help instructors move to blended or fully online formats, sometimes implementing policies in support of these changes. Institutional potential for extensibility was usually enhanced by the presence of pre-existing emergency plans for remote instruction and/or the effective use of the institution’s LMS. Instructors showed extensibility by modifying their course structure to fit new timeframes, using blended learning

strategies (e.g., flipped classroom), and by making use of new technologies to sustain learning activities.

Flexibility refers to the ability of an institution or instructor to anticipate and quickly respond to changes in the learning environment to best meet the individual needs of the stakeholders involved (Quintana, 2020). In this study, institutions demonstrated flexibility by adjusting tuition costs (when possible), implementing changes to the academic calendar, and reducing committee responsibilities for faculty members scrambling to change their course modalities. Furthermore, instructors showed flexibility by recognizing and responding with agility to the myriad social-emotional, cognitive, and physical needs that their students presented with because of each unique crisis. Examples included relaxed attendance policies and flexible course design which impacted how students consumed course content and demonstrated their learning. Other examples included leveraging the use of institutional services (e.g., academic advisors and library resources) to help instructors and students navigate the new learning environment.

Redundancy refers to an institution or instructor analyzing systems, including course design, for possible points of failure, always having a back-up plan and avoiding overreliance on any one aspect of the system. In this study, institutions showed redundancy by making sure information systems were sufficiently backed-up, using multiple platforms and methods to communicate with instructors, staff, and students, making sure materials were accessible on multiple device-types, and collaborating with other organizations/institutions. Instructors showed redundancy by checking in and following up with students to identify possible failures in the system, implementing a back-up plan that accounted for not having access to on-campus resources, and using multiple modalities to provide content and receive evidence of student learning.

These examples support existing research on resilient pedagogy by demonstrating the effectiveness of applying the three principles of extensibility, flexibility, and redundancy in a pivot to online learning in a crisis. All four case studies showed that HEIs and the instructors therein engaged in actions that align with the principles of resilient pedagogy because they felt that those actions were necessary to best serve their students. Although we may never be able to take the “emergency” out of a response to a crisis, the application of resilient pedagogy can help to make the transition to online learning during a crisis less traumatic for all involved. Furthermore, the principles of resilient pedagogy enhance course design and student experience in any context, regardless of a crisis, ensuring that instructors offer meaningful, varied, student-centered learning experiences in all circumstances.

Key Findings and Implications for Future Practice

The authors propose the following recommendations for future practice, based on the principles of resilient pedagogy and the case studies reviewed in this paper, in support of a successful pivot to online learning in a time of crisis:

Pre-existing emergency plans for instruction. Comprehensive emergency plans for online learning need to be the norm at the institutional level. In the New Orleans case study, a blueprint for emergency remote instruction already existed, allowing the Sloan Consortium and its partners to mobilize quickly. Emergency plans must address issues of technology access and campus infrastructure as well as course design, and these plans must be curated well in advance of a crisis. This will require significant effort, time, and resources on the part of an institution,

especially when it comes to training instructors and providing proper technological and pedagogical support.

Institutional support. Institutional support includes—but is not limited to—professional development, training, and technical support for online learning, adequate support staff for students and faculty that can still be accessed in a virtual format, attention to resources for students who might not otherwise be able to participate in online learning, and possible adjustments to tuition. This is an issue of equity. In three of the case studies, student access to the internet and needed devices proved to be a barrier to participation in online learning, and these needs were not always adequately addressed. Equitable learning should also translate to resilient classroom teaching practices in which instructors are able to flex and change their course requirements, curriculum content, and due dates according to student needs. This is especially needed in moments of crisis and trauma.

Digital literacy. As seen with the faculty members interviewed in the South Africa case study, it cannot be assumed that instructors will be willing/ready to engage in online teaching if the need arises. Training faculty members to engage in online instruction is an inevitability; perhaps it is time that a certain level of digital literacy is non-negotiable for current HEI faculty/staff and future faculty hires. Professional development opportunities that support the use of new digital tools and platforms, best practices in online teaching, and department-level collaboration must be a priority. In the South Africa case study, the professors most accustomed to using the LMS for some level of blended instruction prior to the crisis had the easiest time making the adjustment to teaching fully online when the situation demanded it. Even for residential universities that house students on campus and primarily conduct in-person classes, the COVID-19 pandemic has proven that no university is exempt from needing to think about dynamic learning options to best serve their students.

Limitations

These case studies were drawn from a search of the available published literature and therefore represents only those cases that were documented in this way. Furthermore, any potential limitations in those studies (e.g., small sample size; no control for subjective bias) could be considered limitations of this study as well.

A second limitation pertains to researcher's bias. While the two coders reflected on their assumptions and preconceptions and how these might affect their data analysis, and while all the authors regularly conferenced to cross-check bias, it is still important to acknowledge that the results and discussion in this study reflect the choices for inclusion and perspectives of the researchers and could be subject to other interpretations.

A third limitation is that the results gathered from the case studies included in this study represent scenarios and responses that are particular to the context of each case study (e.g., private, faith-based HEI in case 4). While the results may not be generalizable to other contexts, it is possible that HEIs in a different context (e.g., a minority-serving institution) can still identify with the ERT experience and benefit from learning about the principles of resilient pedagogy. They can extend or adapt the application of specific resilient pedagogical strategies identified in this study in their relevant contexts, thereby contributing to a richer understanding of the phenomenon of ERT.

Finally, resilient pedagogy is a relatively new topic of study in the field of education and therefore research on this topic is sparse. To the best of our knowledge, no validated instruments for resilient pedagogy have been published. This could be an area for further research.

Suggestions for Further Research

The principles of resilient pedagogy were used to analyze each of the four cases in this study and to devise the recommendations above. Three of the four cases examined in this study involved crises that occurred prior to the COVID-19 pandemic. It would be interesting to see whether the institutions in these cases fared better than others in their response to the COVID-19 pandemic because of their prior experience, and whether indicators of resilient pedagogy can be found in their response. Future research could involve longitudinal studies of institutional response, using the principles of resilient pedagogy as a measurement.

Regarding measurement of the principles of resilient pedagogy, there is a need for the development of measurement tools that can be used to gather both quantitative and qualitative data. The researchers in this study used a case study approach and a top-down thematic coding approach based on the definitions of three principles provided by Quintana (2020). Future research could involve further refinement of the principles and the development and validation of a survey instrument.

Finally, we would like to suggest that a fourth principle may need to be added that addresses the social-emotional aspect of resilience in terms of how to build resilience in educators so that they are able to employ the other three principles of resilient pedagogy. Aguilar (2020) describes resilience as “a way of being” that is possible only through the challenging work of building self-awareness. Educators can build resilience by focusing on positive emotions (hope, purpose, curiosity, and empathy) and on elements in their teaching practice that they are able to influence and control (Aguilar, 2020). A traumatic event or crisis affects all spheres of life and educators may feel isolated and overwhelmed by their personal experience of the event, while simultaneously feeling unprepared to meet the needs of their students in an emergency remote learning context. Resilience does not come naturally to all and the capacity for resilience must be built before we experience trauma or crisis. We must equip educators with the habits of mind that lead to a resilient response to any change in the learning environment. Recognizing this, HEIs’ contingency plans must include social-emotional support for faculty and staff. Furthermore, HEIs should include opportunities for building resilience in their continuous professional development plans. This is an important way that HEIs can demonstrate resilient pedagogy at the institutional level. Essentially, the key to resilient teaching is a resilient teacher, and the work of continuously building resilience in all faculty and staff must be a primary goal of HEIs moving forward. It may be that this fourth principle exists on the periphery of the construct, in much the same way that “context” exists on the periphery of other frameworks. Future research could investigate how to incorporate this essential aspect of resilience.

Conclusion

As previously noted, the need for HEIs to be prepared to respond to a crisis is not new; however, the COVID-19 pandemic has had an unprecedented global impact, requiring HEIs worldwide to make rapid shifts to online learning and maintain remote teaching modalities for much longer than anticipated. As institutions and instructors continue to navigate this crisis,

much can be learned from the principles of resilient pedagogy, including examples drawn from HEIs that have demonstrated resilience in the face of a crisis in the past.

Key findings indicate that pre-existing emergency plans for instruction and robust institutional support systems (including academic support staff, tech support, and centers for teaching and learning) will significantly impact institutional and individual capacity to practice resilience. As HEIs continue to navigate the COVID-19 pandemic worldwide they would be wise to focus attention on faculty professional development in resilience pedagogy, technology training and infrastructure, and resource equity for students. Institutional and instructional resilience will not only help HEIs more effectively pivot to online teaching in the face of a crisis in the future but improve the instructional design and delivery of online courses in all circumstances, leading to meaningful and sustainable online teaching in the present.

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 from the ethics review board (IRB) at Seattle Pacific University, USA was given for this study.

The authors declared that they received no financial support for the research, authorship, and/or publication of this article.

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Book Review: *Leading the eLearning Transformation of Higher Education: Leadership Strategies for the New Generation, 2nd ed.*
Gary E. Miller and Kathleen S. Ives (Eds.)

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Olcott, D. J. (2022). Book Review: *Leading the eLearning transformation of higher education: Leadership strategies for the new generation, 2nd ed.* Gary E. Miller and Kathleen S. Ives (Eds.). *Online Learning*, 26(2), 343-349.

Indeed, leadership may be the most enigmatic pursuit of any organization in the 21st century. We know poor leadership when we see it (and feel it) and yet defining transformative leadership is often challenging even when it is visionary and right in front of us. We often revert to trait theory of great leaders or ascribe to new revisionist essays on leadership theory. In 2021, and despite having more information, knowledge, and resources at our fingertips than at any time in human history, unlocking the keys to the leadership kingdom remains at times, elusive. In their latest edition of *Leading the eLearning transformation of higher education: Leadership strategies for the new generation*, Miller and Ives (2020) have provided a timely reminder that empowering leadership is essential for the future of higher education and online learning.

The lessons of leadership are often harsh and yet enlightening teachers. Leadership during the pandemic has demonstrated that women can be great leaders during major crises and can succeed in transforming their organizations. We have learned that charisma is no guarantee of sustainable success and decision-making is not synonymous with sound judgment.

Culture and context matter yet many leaders ignore both. Leaders talk transformative change but soon learn that eloquent sound bites and a written plan are not the same as implementation (leading) and shifting and embedding core values and cultural norms in a modern university. Many leaders even convince themselves they coach and mentor when, in fact, they micro-manage key staff right out the door—the death of leadership.

The timeliness of this book is evident from the outset and comes at an unprecedented time in global higher education. The opening Foreword written by esteemed global professor, leader, educator, and editor of *The American Journal of Distance Education*, Dr. Michael Moore, asserts higher education is at a critical crossroads. He highlights that the intersection of leadership, online learning, and navigating through a global Covid -19 pandemic demands a renewed assessment and analysis of leadership.

This book is focused on online learning in American higher education. This fact, in and of itself, is not a limitation given that many of the topics and concepts have adaptive and replicable transfer potential to global contexts. This will be addressed in more detail later in the review summary.

The editors use the Preface to introduce the reader to the book's roadmap and chapters. The book is divided into three parts: Part I (4 chapters) covers the leadership context; Part II (7 chapters) examines operational effectiveness of institutions; and Part III (4 chapters) focus on sustaining the innovation. The reader should note that the editors of the book use the term eLearning as synonymous with online learning. This is not evident until early in the book and is important given this profession's predilection for conflicting terminology.

Chapter 1 opens Part I with Gary Miller providing an excellent overview of the higher education transformative environment. A succinct yet valuable historical overview of distance education is provided accentuating societal transformations serving as the catalysts for technology in education. Miller then outlined Sloan's Five Pillars of Quality in concert with the APLU's seven key components of online learning. Lastly, Miller highlights some emerging issues such as a potential trend towards K-14, OERs, micro-credentials, and greater collaboration-partnerships.

Eric Fredericksen provided a data rich chapter highlighting many key research findings from two major studies. The first study looked at university online leaders (2016) and the second community college online leaders (2017). The studies examined institutional and leader characteristics. Fredericksen provides an excellent summary in Table 2.1 of university-community college similarities and differences related to online leadership.

Three key similarities between universities and community colleges engaged in online learning are 1) it is used for organizational transformation; 2) faculty development and training are a priority; and 3) reporting for online learning leaders is through the chief academic officer. The author's data make a salient point of the immense challenges and difficulties of being an online-distance education leader in higher education.

The online learning organization is a service organization, not an academic unit, despite needing the academic reporting line for support and credibility. Indeed, in 2021, we see more senior level online leadership positions, but the informal academic culture of the university still echoes—content resides in the Colleges.

In Chapter 3, Gary Miller discusses leading online learning from the mainstream – in other words with less difficulty advocating and obtaining support for distance education than he or the reviewer (and some of the authors) had to overcome during an earlier era. This chapter gives the reader a solid sense of the key elements of change and just how difficult and complex sustainable change for online learning can be in organizations driven by a long historical mission, culture, and core values. Miller outlines the basics of ethical realism towards fostering this level of change. A key observation presented by Miller is that leading from the mainstream treats the university as a social organization rather than a business organization.

Cristi Ford and Kathleen Ives close Part I with a brilliant and sensitive discussion of leadership and diversity. The authors rightly point out that equity and equality are not synonymous. Equity means people will travel different paths to advancement; equality means everyone will have equal opportunity for advancement. Despite these considerations and the fact that the data in higher education often reflect the broader society, the numbers are disconcerting.

Only 26% of American institutions are led by women despite those same institutions serving 59% women. Moreover, it comes as no surprise that under-represented and marginalized minority groups are affected more adversely. Mentoring and empowerment activities need to be increased and most importantly senior leadership sets the tone for diversity for the entire institution. Interestingly, the authors cite data that suggest by 2050, nearly 48% of the overall workforce will be women and that there will be no clear ethnic majority.

We need to focus our training and leadership programs more closely on leading diverse workforces that include broad diversity in gender, age, race, experience, disabilities, and sexual orientation. The term that has emerged for this is called *cultural agility*—the capacity of a leader to lead across diversity has also been applied to leaders taking posts outside their countries and having to lead these diverse multi-national organizations.

The author diversity in this book is disappointing overall. Given the intensity and magnitude of these issues have been accentuated in American society and higher education the past five years; and the fact this is the second edition of this book, a better author balance by the editors could have reflected the ethnic diversity of American college and university online leaders. Future editions of this book should be more cognizant of these diversity considerations.

Chapters 5 and 6 are written by Peter Shea and Karen Swan. Chapter 5 examines online learning and distance education effectiveness in general. These authors provide a consummate reference list to tell us there are no real significant differences between face-to-face (f2f) and online teaching. The reader is reminded that in recent years the SMART classrooms on campus are using digital tools which are often termed *blended* yet are likely closer to online courses than our traditional f2f courses.

The authors cover Community of Inquiry theory-survey <https://coi.athabasca.ca/coi-model/coi-survey/> and the role of teacher, social and cognitive presences as well as interaction theory, design, and contributions to critical thinking. The authors cover the various online learning outcomes and note that learning effectiveness in online is supported by faculty development, faculty-student support services, and the affordances of the digital arsenal.

Chapter 6 extends the focus on what leaders should know about online teaching per se, emphasizing various theoretical learning frameworks—constructivism, connectivism, andragogy, and heutagogy. The authors close by offering insightful observations around Community of Inquiry theory, MOOCs, competency-based education, and the emerging uses of Artificial Intelligence (AI). The reference list in each chapter is superb and the reader is encouraged to review these as part of their own leadership portfolio.

In Chapter 7, Larry Ragan, Thomas Cavanaugh, Ray Schroeder, and Kelvin Thompson provide a poignant discussion of the critical need to offer quality faculty support services. These include preparing online teachers, assessing how leaders can use adjunct faculty, and suggestions for professional development. The authors provide an excellent list of ten competencies for online faculty members which is the heart of this chapter and invaluable for the reader. This chapter reminded the reviewer that initial online training programs for faculty members should be online—and use the technology to teach about teaching with technology.

Chapter 8 examines student support services in online learning. The authors, Meg Benke, Victoria Brown, and Joston Strigle, outline how support services can engage students, reduce attrition and related transactional distance issues, identify high risk students, and help students feel more connected to the program and the institution. The authors further noted rightly that given online learning leaders tend to report to the Academic VP or Provost (70%+), the online leader will need to foster and build alliances with the student services VP and staff across the institution. The chapter also includes practical, mini case studies.

How do we mainstream technology into the institution? In Chapter 9, David Andrews, Colin Marlaie, and Andrew Shean provide a succinct overview of the evolution of the classroom from traditional f2f to online. The emerging view that students are behaving like customers of other goods and services—in this case the service or product is education—is discussed. The issue of faculty as guides is also considered.

The authors leave the reader with emerging models to consider such as skills development, self-directed or self-determined learning, learning analytics, and questions about costs, efficiencies, and regulatory elements affecting mainstream technology adoption.

Cyndi Rowland and Kelly Hermann provide an excellent overview of accessibility issues related to online learning and leadership in Chapter 10. The authors highlight key issues around instructor training, legal requirements, tech standards, and course design elements for serving those with disabilities. Moreover, the authors assert that online leaders must take their leadership responsibility seriously to ensure that the online continuum provides equitable and readily accessible services in support of students with special needs.

In Chapter 11, Ray Schroeder took us on delightful road trip encompassing operational leadership in the strategic context. Using the UPCEA Hallmarks of Excellence in Online Learning (2019), he provides a detailed and practical discussion of the key success factors for online leadership: internal advocacy, entrepreneurialism, faculty support, student support, digital technologies, external advocacy, professionalism, and vision making. Experienced leaders in higher education and distance education will embrace this chapter embedded in deep experience and practice of managing any sub-unit in the modern university.

What does quality mean in the context of the online organization and the leader at the helm? In Chapter 12, Jennifer Mathes and Kay Shelton provided an instructive snapshot of quality factors to consider in the online enterprise. They emphasize the importance of program evaluation and distinguish between course and program evaluation. The authors focus on the OLC Quality Scorecard and how online leaders can use this to assess their own organization (<https://onlinelearningconsortium.org/consult/olc-quality-scorecard-suite/>).

In Chapter 13, Meg Benke and Mary Niemiec discussed leading beyond the organization which refers to how leaders can engage in outside organizations, agencies, partnerships, government policy development, and activities related to the field of online learning. The authors provide a good summary of various academic boards, professional associations such as OLC, WCET, UPCEC, accrediting associations, and agencies. This is an excellent resource chapter for new online leaders exploring online partnership options and engagement with diverse external organizations.

Chapter, 14, *Preparing to Lead the eLearning Transformation*, written by Kathleen Ives, Devon Cancilla, and Larry Ragan, begins with a discussion of the three generational phases of online leadership. The authors argue that the third phase of the future of online leadership is still evolving. This is critical given the current pandemic has not defined a clear *new normal* and the assumption that the entire world has adopted online learning for the long-term may be premature

The authors spend considerable narrative describing the background and rationale for creating the Institute for Emerging Leadership in Online Learning (IELOL, <https://onlinelearningconsortium.org/learn/ielol/>) founded by Penn State in 2009 and now managed under OLC. Despite the authors suggesting that this program was created to fill a non-existent professional development void, in fact, the Western Cooperative for Educational Telecommunications (WCET) had created the Institute for the Management of Distance Education (MDE) in 1995 and this ran for 11 years. It brought together 80–100 managers, directors, support personnel, and faculty members from across the country for a week-long institute. The faculty included 15 of the top distance education and emerging online learning professionals during this period.

Leadership in online learning, as the authors note, was different from 1995–2006 for MDE, which is exactly why the IELOL was created at the right time for the right reasons for the emerging new leadership. The International Council of Open and Distance Learning (ICDE) also holds an annual President's Summit, formerly called the Standing Conference for Presidents (SCOP) which from the mid-1980s right up to the present focuses on emerging leadership and trends in distance learning. University presidents and senior leadership come together for three days to discuss strategic leadership of distance and online learning at their institutions and in their respective regions of the world.

The authors conclude their chapter with an excellent summary of key competency domains for online learning drawn from the multitude of professional development programs, practice, and collaborations since 1995. These include strategic visioning, digital leadership, budgeting, leading change, shared governance, and partnerships. A brief discussion of future trends concludes the chapter.

Indeed, I highly recommend this book to any existing and emerging American online leaders in higher education, including online learning leaders in business, government, healthcare, and other sectors. What is delightfully deceptive about this book is that nearly all the chapters are enjoyable reads and yet they are all indelibly immersed in a conclave of scholarly research and written by very experienced leaders in the online learning field. The reference lists alone and their quality are an invaluable resource in this book.

A great book does not have to answer all the questions; sometimes revealing new vantage points about critical questions in which we collectively must pursue in our quest for

progress is valuable. One of the most important lessons from this book is the reminder that online leadership in 1995, in 2005, and in 2015 were very different. More importantly, online leadership post-pandemic will also look very different. We certainly should not be surprised by this fact on the road to 2030. Our operational context of leadership changes and hence, how we envision the leadership continuum must evolve within the context and culture of online education.

At the end of the day, this book should be on your shelf because it is not only written with a sense of optimism and realism from where we have evolved in online leadership during the past twenty-five years; it has ironically reminded us of Will Rogers' famous quote "Good judgment comes from experience and a lot of that comes from poor judgment." We have learned many of those harsh lessons I mentioned at the outset over the past twenty-five years.

Are there limitations and critiques that deserve mention? Yes. I would suggest, however, that the reader view these as delimitations—choices made by the editors that recognize one cannot cover everything and make everyone happy. Let's look at these objectively.

As already mentioned, the book is focused on American online higher education to the extent the title should probably be *Leading the eLearning Transformation in American Higher Education* when the 3rd edition is published. This is by no means suggesting that many elements and strategies from this book cannot be adapted and replicated in other countries by other institutions. Nonetheless, to do this one must understand the global landscape, culture, and the parameters of cultural agility—leading across diverse organizations in other global markets and countries. Moreover, this book reflects norms of a developed country in term of resources and technology, and these simply do not exist in most developing nations.

Without question, this book would be strengthened with an in-depth chapter or two on global online learning by experienced professionals who traverse U.S. and global higher education leadership. Such a chapter would give the reader a comparative sense of how online development is evolving (or foundering) with its opportunities, challenges, and issues globally in developing and developed countries. I would still strongly recommend this book to distance and online professionals outside the U.S. given that the adaptive potential of the scholarship, strategies, theoretical frameworks, and best practices for global distance and online learning sectors are excellent.

Are there any critical topics missing from this book? Within the context of delimitations, this is more preference than critique. A few topics might be given more attention in the future including leading change, empathy, common sense, judgment, finance, calm under fire, and global cultural diversity.

This book makes a valuable contribution to the research and to online learning leadership in the U.S. I recommend this book without reservation, and I applaud the editors and the authors in bringing together this resource for present and future online learning leaders.

Declarations

The author has no conflict of interest to disclose.

The author has declared no funding for this work.

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Miller, G. E. & Ives, K. S. (Eds.) (2020). *Leading the eLearning transformation of higher education: Leadership strategies for the new generation, 2nd ed.* Stylus Press.

Community of Inquiry Framework: Research Trends Between 2000-2020

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Abstract

The current study aimed to understand the trend in the community of inquiry that many researchers have been working on for over 20 years. Within the scope of this aim, 102 studies were reviewed with regards to some variables: most preferred keywords and words in abstract, year of publication, authors, journals, geographical distribution, academic disciplines, research methods, course delivery methods, participant type, and references. The findings demonstrate that the articles reviewed were from 216 authors in 20 countries. Most of the studies were from the Social Sciences field, and the continent with the most studies was North America. Quantitative research methods were mostly preferred in the studies, and the study group of a great of majority the studies were higher education students. Finally, various recommendations were made for future research after determining gaps that exist in the current literature.

Keywords: Community of Inquiry, systematic review, bibliometric mapping analysis

Olpak, Y. Z. (2022). Community of Inquiry framework: Research trends between 2000-2020. *Online Learning*, 26(1), 350-368.

The community of inquiry (CoI) framework was developed by a group of researchers between 1997-2001 (CoI, 2020) and has since attracted significant international attention (CoI, 2020; Garrison & Arbaugh, 2007). The CoI model, which has been verified many times by structurally different studies (e.g., Caskurlu, 2018), suggests that learning can occur via the interaction of three basic elements in the community: social presence (SP), cognitive presence (CP), and teaching presence (TP) (Garrison et al., 2000). Moreover, Garrison et al. concluded that these basic components of CoI can increase or decrease the quality of learning outcomes and educational experience.

Different definitions have been put forward by some researchers (e.g., Gunawardena & Zittle, 1997) for SP that may also be used to investigate the quality of social interaction within online learning environments (Kim et al., 2011), and which has become one of the primary concepts in online learning (Lowenthal & Dunlap, 2010). In the context of CoI, SP can be defined as “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 way of projecting their individual personalities” (Garrison, 2009, p. 352).

CP was operationalized through the practical inquiry model (Garrison, Anderson, & Archer, 2001) and defined by Garrison (2006) as the process of creating meaning with the collaborative inquiry. From the perspective of the practical inquiry model, CP can be defined as a research process that involves determining/defining an issue, dilemma, or problem (triggering event), then conducting a detailed investigation on information related to this issue (exploration), combining ideas to develop a meaningful structure or for obtaining a solution (integration), and then testing indirectly or directly the usefulness or validity of the solution (resolution) (Garrison, 2006; Garrison et al., 2001).

Finally, TP has been 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). This begins prior to the start of a course (e.g., in the preparation and planning by an instructor of a subject related to a course) and continues throughout the course (e.g., an instructor facilitating discussions) (Anderson et al., 2001; Ke, 2010).

In the study by Castellanos-Reyes (2020), 20 years of the CoI framework was divided into two decades, with the conclusion that CoI was one of the most widely preferred frameworks in online education. In this context, the current study aims to reveal trends associated with CoI research. When the literature is examined, certain review studies stand out related to CoI (e.g., Kim & Gurvitch, 2020; Kozan & Caskurlu, 2018; Stenbom, 2018).

In the study conducted by Kozan and Caskurlu (2018), studies were reviewed in order to reveal the factors or new presence types suggested as further contributions to the framework of CoI. For this purpose, the researchers searched for studies across different platforms (e.g., Web of Science [WOS], PsycINFO, ERIC, and Google Scholar) published in the English language between 1996 and March 2017. As a result, of the 23 studies that matched the inclusion criteria and were reviewed in their research, 12 recommended a fourth presence to the framework of CoI. In addition, 11 of the studies expanded on the existing presences by suggesting a new dimension. In another study, Stenbom (2018) reviewed 103 articles from the Scopus, WOS, and ERIC databases published between 2008 and 2017, and applied the CoI data collection tool developed by Arbaugh et al. (2008). Finally, Kim and Gurvitch (2020) provided a systematic review of issues and trends in online learning and teaching in higher education. As such, articles published between 2009 and 2019 related to

the CoI were identified from four different sources. In total, 23 articles matched all inclusion criteria, which were then classified according to education level, course setting, research method, types of CoI component, discipline orientation, learning outcome, and instructional strategy. The current study, unlike previous research, aimed to reveal recent trends regarding CoI research over a 20 year period. To accomplish this, searches were performed against the WOS Core Collection database for articles or reviews having one of the following expressions included in the title: “CoI,” “coi,” “COI,” “Community of Inquiry,” “community of inquiry,” “Communities of Inquiry,” or “communities of inquiry,” published in the English language between 2000-2020, and a journal indexed in SSCI. The study has five research questions indicated below:

1. What were the most preferred keywords, and words in the abstract?
2. When, by whom, and where were the studies published?
3. What kinds of distribution were presented in terms of continents, countries, academic discipline, and research methods used?
4. What types of participants and course delivery methods were selected?
5. Which were the top 10 most referenced articles in the reviewed studies?

Method

In this study, besides the systematic review, bibliometric mapping analysis (BMA) was used for the most commonly preferred keywords and words in the abstract sections. A systematic review is a special type of literature review that tries to bring together all the empirical evidence that meets pre-established conformity criteria to answer certain research questions (Liberati et al., 2009) and is characterized by being methodical, transparent, comprehensive, and replicable (Siddaway, Wood, & Hedges, 2019). On the other hand, BMA is largely related to computer algorithms and visualization techniques based on available data generates quantitative information by summarizing publications, and gives objective and reliable results compared to the other techniques (Aria & Cuccurullo, 2017; Heersmink et al., 2011; Hung & Zhang, 2012).

Data Collection

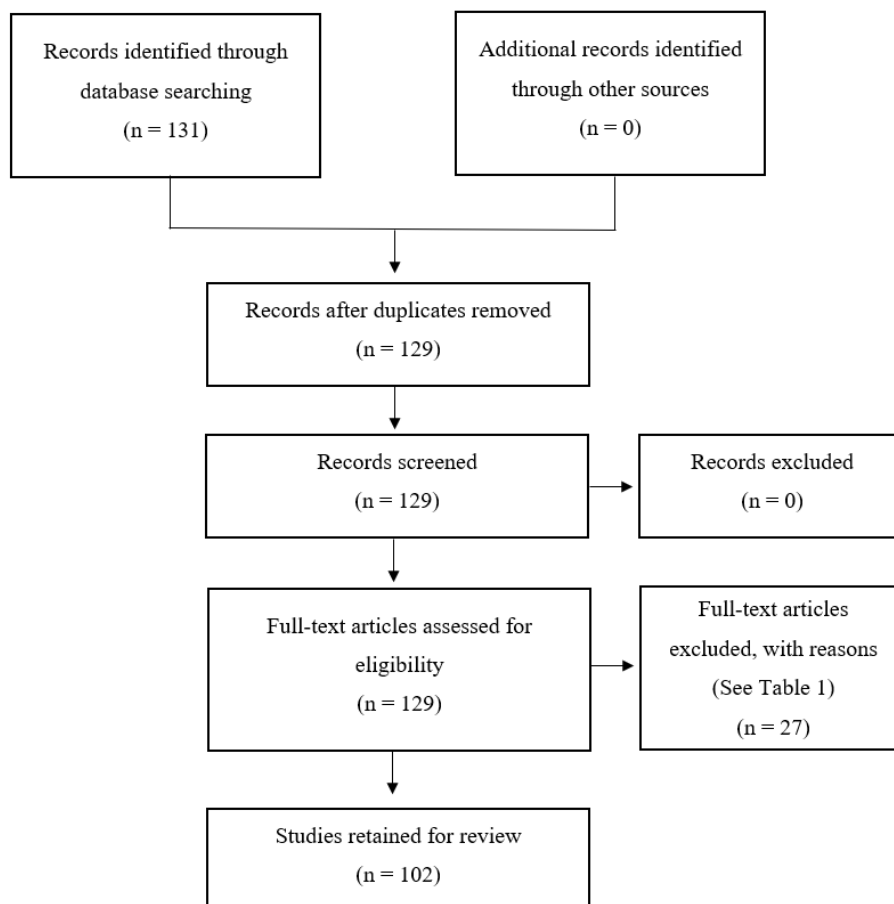
In research proposing to reveal trends within a particular research area, certain criteria such as articles published in certain journals (e.g., Bozkurt et al., 2015), impact factors of the journals (e.g., Gaudino et al., 2020), or articles published in various scientific databases (e.g., Kim & Gurvitch, 2020), may be taken into consideration in the determination of researches published within a specified time interval. In the current study, articles were examined that were published in journals indexed in SSCI, which is considered one of the most prestigious indexes in the WOS and has been used as a source for several review studies (e.g., Akçayır & Akçayır, 2018). Furthermore, with a pioneering study on the CoI (Garrison et al., 2000) the time interval for searches applied in the current study was determined as starting from 2000 through to 2020. Only English language publications were included since most major journals accept English language articles and it is one of the most widely used languages worldwide in the circulation of scientific information (Ammon, 2011; González-Alcaide et al., 2012; Hamel, 2007).

The specific search terms were used in the WOS database on January 10th, 2021 (TI = “CoI” or TI = “Community of Inquiry” or TI = “Communities of Inquiry,” Document Type = Article or Review, Language = English, Indexes = SSCI, and Timespan = 2000-2020). This search showed that a total of 131 studies were identified that had “CoI,” “coi,” “Community of Inquiry,” “community of inquiry,” “Communities of Inquiry,” or “communities of inquiry” in the title, were published in an SSCI-indexed journal, were prepared in English, and were published between 2000 and 2020. The identified articles were downloaded as full texts to a computer in electronic format. When examined in detail in terms of their suitability for the research (see Table 1), it was determined that 102 articles were indeed related to the purpose of the current study (see Figure 1).

Table 1
Exclusion and Inclusion Criteria

Exclusion Criteria	Inclusion Criteria
Editorial studies or article reviews.	Articles include specific search terms.
Studies with missing or inconsistent WOS data.	The main content focuses on CoI.
Articles in various contexts in spite of meeting search term.	Articles are prepared in English and indexed in SSCI.

Figure 1
Article Selection Process



Data Analysis

VOSviewer software tool was used for BMA of the reviewed articles. In addition, the publication classification form (PCF) as seen in Table 2 was designed by the researcher, taking into consideration the forms used in previous similar studies (e.g., Akçayır & Akçayır, 2017; Tsai & Chiang, 2013) and descriptive statistics were used to present the results. Short notes were also created regarding certain information about each article (e.g., whether the CoI survey instrument was used in the study; what instrument was used, etc.).

Table 2

Publication Classification Form

Column heading	Description and/or example	
Academic discipline	Discipline in which the research was conducted. The Frascati manual (prepared by OECD experts) was used for academic discipline classification.	<ul style="list-style-type: none"> ▪ Natural Sciences ▪ Engineering & Technology ▪ Medical & Health Sciences ▪ Agricultural Sciences ▪ Social Sciences ▪ Humanities ▪ Mixed (studies that bring together multiple academic disciplines) ▪ Unspecified (studies with no specified academic discipline or cannot be determined)
Authors' country	According to the address information declared by the author(s).	Turkey Note: separate columns were to record this information for each author.
Cited references	References cited in the reviewed articles.	
Countries of study	Country/ies where the research was conducted.	USA
Delivery method	Delivery method of the course within the scope of the research.	<ul style="list-style-type: none"> ▪ Blended ▪ Fully online ▪ Mixed (blended + online) ▪ Unspecified (studies with no delivery method or cannot be specified or determined)
Number of authors	Number of authors in the study.	2
Reference	Author (Year). The name of the study. <i>Name of the Journal</i> , Vol(Issue), Page ranges.	
Research method	Research method applied in the study.	<ul style="list-style-type: none"> ▪ Qualitative ▪ Quantitative ▪ Mixed (qualitative + quantitative) ▪ Other
Type of participant	Type of participants in the sample or target group of the study.	<ul style="list-style-type: none"> ▪ K-12 ▪ Higher Education (Associate, Bachelor's, Master's, Doctorate) ▪ Adult ▪ Teacher (K-12 teachers) ▪ Faculty member ▪ Mixed (studies with more than one participant type) ▪ Unspecified (studies with no participants, or no participant type specified, or cannot be determined)

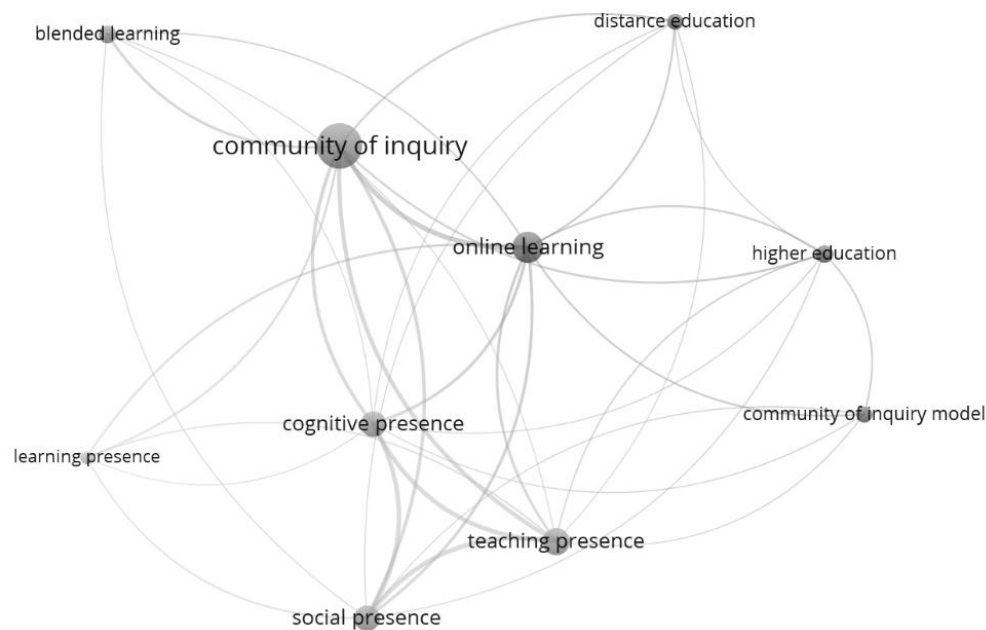
Results

Most Commonly Used Keywords

Since 13 of the 102 examined articles did not have keywords, these analyses were conducted based only on those articles in which keyword entries were present. The results indicated four clusters (see Figure 2), with “community of inquiry” ($f = 57$) as the most used keyword, followed by “online learning” ($f = 27$), “teaching presence” ($f = 21$), “cognitive presence” ($f = 18$), and “social presence” ($f = 18$).

Figure 2

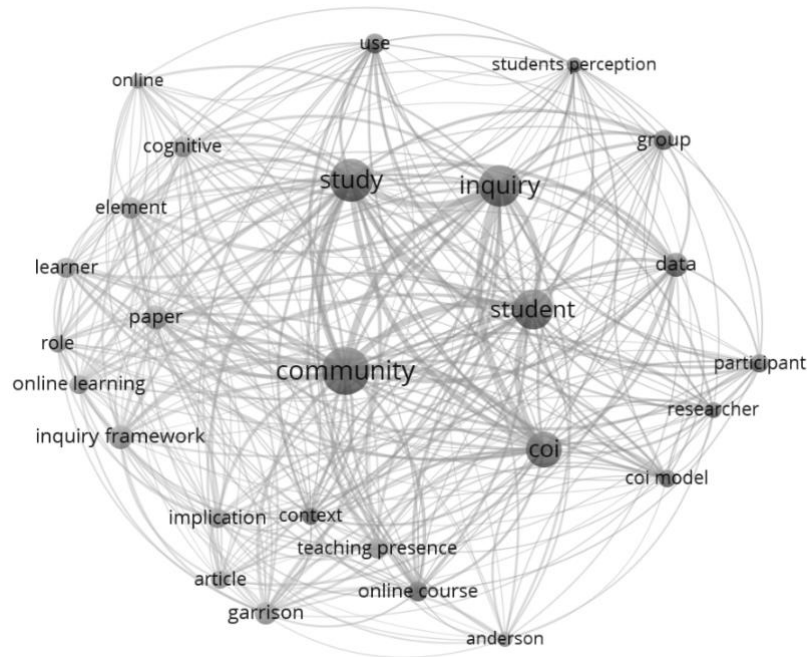
Most Preferred Keywords



Most Preferred Words in Abstract

33 of the 102 examined articles included copyright statements in the abstract section and after they were cleared, the analyses were conducted. As indicated in Figure 3, the results showed that there were two clusters, with the word “community” ($f = 98$) as the most used term in the abstract of the examined researches, followed by “study” ($f = 81$), “inquiry” ($f = 74$), and “student” ($f = 69$).

Figure 3
Most Preferred Words in Abstract



Author Details and Years of Publication

The 102 studies were produced by a total of 216 authors from 20 countries. The most productive authors in the reviewed articles were Peter Shea (10 articles), Randy Garrison (eight articles), and Temi Bidjerano (eight articles), respectively. As presented in Table 3, the highest number of studies were published in 2010 and 2018 ($n = 12$, [11.76%]), with the majority of the studies written by two authors ($n = 39$, [38.24%]), while the highest number of authors in a single study ($n = 11$) was for the article by Carlon et al. (2012). Although the search extended back to the year 2000, no articles that met the criteria were published between 2000 and 2007, while there has been uninterrupted publication since 2008 (13 years), with an annual publication average of 7.85.

Table 3
Publication Year and Authors

Publication year	Number of authors											Total
	1	2	3	4	5	6	7	8	9	10	11	
2008		1					1					2
2009	1	1	1									3
2010	2	2	4	3				1				12
2011	1	2	1		1							5
2012	1	2	1		1				1		1	7
2013	1	3	2									6
2014		3		1	1	1						6
2015	4	4	1		2							11
2016	1	6	1	2			1					11
2017	2	3	3			1						9
2018	3	7		1						1		12
2019		2	2	2					1			7
2020	3	3		4	1							11

Publication year	Number of authors											Total
	1	2	3	4	5	6	7	8	9	10	11	
Total	19	39	16	13	6	2	2	1	2	1	1	102

Journals

31 journals published 102 articles. Among them, 20 journals published only one article. The reviewed articles received a total of 3,282 citations according to WOS data dated January 10, 2021. Journals publishing more than one article are listed in Table 4, which indicates that the majority of the studies were published in *The Internet and Higher Education* (30 articles, 1,807 citations), followed by *International Review of Research in Open and Distributed Learning* (14 articles, 280 citations), *Computers & Education* (12 articles, 712 citations), and *Interactive Learning Environments* (five articles, 70 citations). Moreover, 56 articles (54.90% of 102) published in the three journals with the most publications received a total of 2,799 citations (85.28% of 3,282).

Table 4

Journals

Name of the Source	Article Count	% of Total	Citation Count	% of Total
The Internet and Higher Education	30	29.41	1,807	55.06
International Review of Research in Open and Distributed Learning	14	13.73	280	8.53
Computers & Education	12	11.76	712	21.69
Interactive Learning Environments	5	4.90	70	2.13
Australasian Journal of Educational Technology	4	3.92	22	0.67
British Journal of Educational Technology	4	3.92	197	6.00
Journal of Educational Computing Research	4	3.92	41	1.25
Distance Education	3	2.94	16	0.49
Journal of Computer Assisted Learning	2	1.96	6	0.18
Nurse Education in Practice	2	1.96	14	0.43
Quest	2	1.96	2	0.06

* Journals with same number of articles are listed in ascending alphabetical order of the journal name

Continents and Countries

The articles were carried out in 19 countries across six continents. Half of the researches were carried out in North America (n = 51, [50.00%]). At the national level, the US had the highest number of studies (n = 37, [36.27%]). Results with regards to continents and countries were presented in Table 5.

Table 5

Continents and Countries

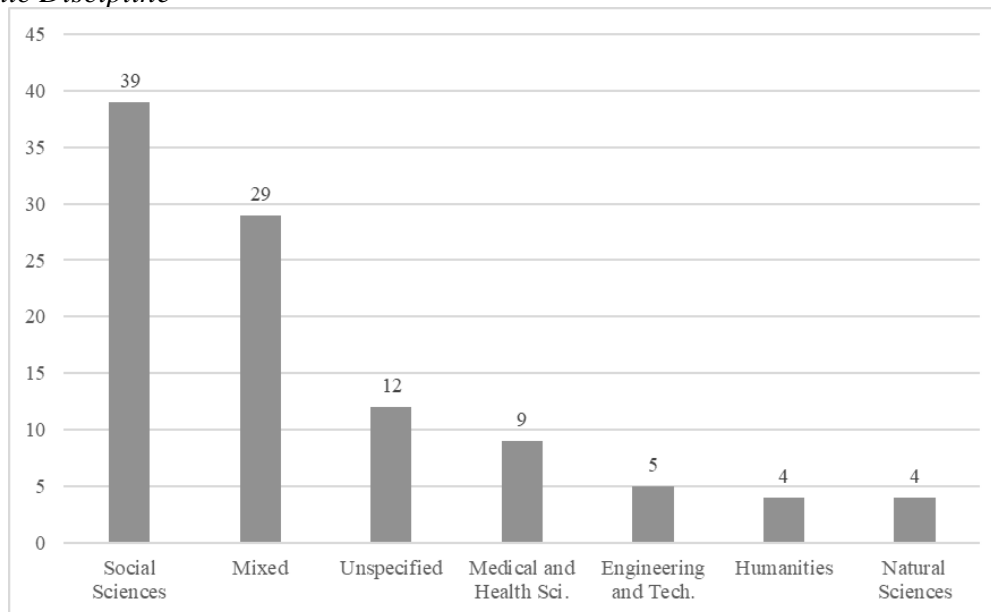
Continents	Countries
Africa (3)	South Africa (3) China (4)
Asia (24)	Malaysia (2) Singapore (3) South Korea (2)
Australia (6)	Taiwan (3) Turkey (7) Australia (6)

Europe (17)	Greece (4)	Spain (5)
	Netherlands (2)	Sweden (2)
	Romania (1)	UK (3)
North America (51)	Canada (14)	
	USA (37)	
South America (1)	Uruguay (1)	

Academic Discipline

The Frascati manual, which has been used by different researchers (e.g., Babić et al., 2016) and was prepared by experts for the Organisation for Economic Co-operation and Development (OECD, 2007), was used in the current study to determine the academic disciplines. The academic disciplines of the 102 examined articles were analyzed according to the aforementioned classification, and unspecified or undetermined academic disciplines were included in the “unspecified” category (see Figure 4). The largest number of research articles was produced in the Social Sciences field (n = 39, [38.24%]), followed by 29 articles termed as mixed studies that involved more than one identifiable academic discipline.

Figure 4
Academic Discipline



Research Method

In the current study, similar to Tsai and Chiang (2013), research methods were classified into four basic categories: quantitative, qualitative, mixed, and other. The results showed that quantitative studies (n = 45, [44.12%]) were frequently preferred. Then, mixed (n = 26, [25.49%]), qualitative (n = 19, [18.63%]), and other (n = 12, [11.76%]) were mostly used methods, respectively. The studies classified under the “other” category included literature review studies (e.g., Kim & Gurvitch, 2020), strategies that could be considered in course design to create a CoI for online courses (e.g., Fiock, 2020; Tan et al., 2020), new presence types or dimensions studies suggested to contribute to the CoI (Kozan & Caskurlu, 2018), and personal perspectives on the CoI or its core elements (e.g., Annand, 2011; Garrison et al., 2010).

Course Delivery Method

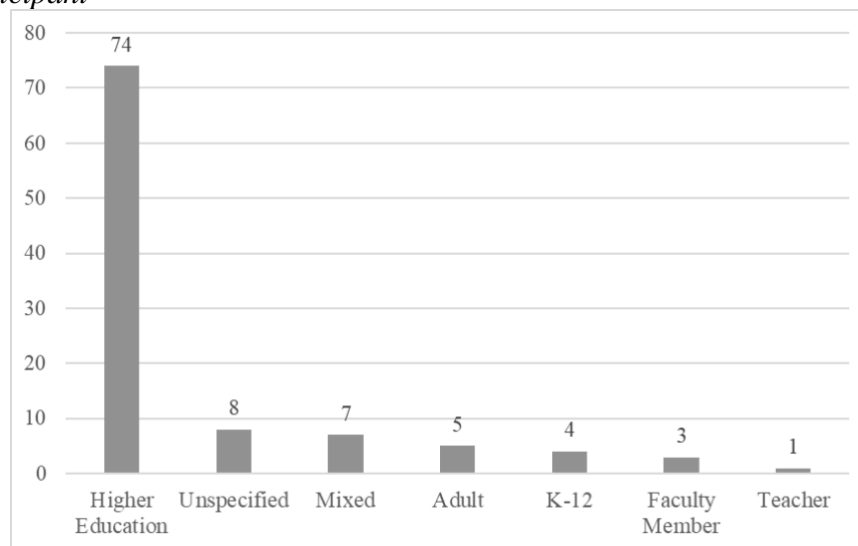
In the current study, course delivery methods were classified into four basic categories: online, blended, mixed, and unspecified. Since it was not possible to determine a course delivery method classification for some of the 102 examined articles (e.g., Kozan & Caskurlu, 2018), “unspecified” was included in the options while the “mixed” option was included for studies (e.g., Harrell & Wendt, 2019) that simultaneously employed both online and blended course delivery methods. The results showed that the most commonly used course delivery method was online ($n = 60$, [58.82%]), followed by blended ($n = 26$, [25.49%]), and then mixed ($n = 8$, [7.84%]).

Type of Participant

A great number of study participants were higher education students ($n = 74$, [72.55%]). Since it was not possible to classify participant type for some of the articles (e.g., Kovanović et al., 2019), “unspecified” was included as an option. For researches including multiple participant type (e.g., Cohen & Holstein, 2018), the “mixed” alternative was also included. These results were presented in Figure 5.

Figure 5

Type of Participant



References

Among the 102 reviewed studies, the 10 most cited studies were determined in the reviewed articles (see Table 6). According to Table 6, while the most cited ($n = 85$) article was Garrison et al. (2000), the most productive authors were D. Randy Garrison (nine articles), Terry Anderson (four articles), and Walter Archer (four articles). The article with the most references was Cooper, Forino, Kanjanabootra, & von Meding (2020) (number of references, $n = 124$), and the average number of references in the reviewed articles was 51.

Table 6*Top 10 References Among the 102 Reviewed Papers*

Top 10 references	Papers
Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. <i>The Internet and Higher Education</i> , 2(2-3), 87-105. https://doi.org/10.1016/S1096-7516(00)00016-6	85
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. <i>The Internet and Higher Education</i> , 11(3), 133-136. https://doi.org/10.1016/j.iheduc.2008.06.003	63
Garrison, D. R., & Arbaugh, J. B. (2007). Researching the community of inquiry framework: Review, issues, and future directions. <i>The Internet and Higher Education</i> , 10(3), 157-172. https://doi.org/10.1016/j.iheduc.2007.04.001	55
Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. <i>American Journal of Distance Education</i> , 15(1), 7-23. https://doi.org/10.1080/08923640109527071	52
Anderson, T., Rourke, L., Garrison, D. R., & Archer, W. (2001). Assessing teaching presence in a computer conferencing context. <i>Journal of Asynchronous Learning Networks</i> , 5(2), 1-17. http://dx.doi.org/10.24059/olj.v5i2.1875	47
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. <i>The Internet and Higher Education</i> , 13(1-2), 31-36. https://doi.org/10.1016/j.iheduc.2009.10.002	40
Shea, P., & Bidjerano, T. (2009). Community of inquiry as a theoretical framework to foster “epistemic engagement” and “cognitive presence” in online education. <i>Computers & Education</i> , 52(3), 543-553. https://doi.org/10.1016/j.compedu.2008.10.007	39
Garrison, D. R., Anderson, T., & Archer, W. (2010). The first decade of the community of inquiry framework: A retrospective. <i>The Internet and Higher Education</i> , 13(1-2), 5-9. https://doi.org/10.1016/j.iheduc.2009.10.003	38
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. <i>Journal of Asynchronous Learning Networks</i> , 12(3), 3-22. http://dx.doi.org/10.24059/olj.v12i3-4.1680	35
Swan, K. P., Richardson, J. C., Ice, P., Garrison, D. R., Cleveland-Innes, M., & Arbaugh, J. B. (2008). Validating a measurement tool of presence in online communities of inquiry. <i>E-Mentor</i> , 2(24), 1-12.	31

Discussion

The current study purposed to examine research trends related to the CoI over the past two decades, and involved analyses with both BMA and systematic review. The reviewed articles were analyzed using BMA with regards to most preferred keywords and words in abstract. Reviewed articles were also analyzed through systematic review in terms of their year of publication, authors, journal, geographical distribution, academic discipline/s, research method, course delivery method, participant type, and references.

The results showed that the most preferred keywords were: community of inquiry, online learning, teaching presence, cognitive presence, and social presence. Not surprisingly, the results imply that the reviewed studies relate mainly to online learning, the CoI, and its main elements. Considering that the CoI framework provides a collaborative-constructivist point of view to understanding the online learning experience (Arbaugh et al., 2008), it may be said that these keywords support the literature. The frequently preferred words in the articles' abstract were "community," "study," "inquiry," and "student," which also support these findings.

With regard to the publication year of each article (search range: 2000-2020), 61 studies (59.80%) were published since 2015, suggesting that the number of studies about CoI has increased recently. This situation may have resulted from recent technological developments and the increase in demand for online learning. Since all but 19 (18.63%) of the reviewed articles have multiple authors, this result indicates a tendency towards more collaborative study among authors. Furthermore, from the 102 articles reviewed in this study, Peter Shea, Randy Garrison, and Temi Bidjerano authored the most articles. These findings were also notably supported by other recent studies (e.g., Bozkurt et al., 2015; Stenbom, 2018). The findings showed that the most preferred journals were *The Internet and Higher Education*, *International Review of Research in Open and Distributed Learning*, and *Computers & Education*, with a total of 56 articles (54.90% of 102) published in these three journals, which were cited 2,799 times (85.28% of 3,282). These findings are supported by recent research (e.g., Stenbom, 2018) and are also in line with the journal's impact factors and the ranking and quartile level in the category provided by WOS.

Although the studies were mostly conducted in North America, which is where the CoI framework emerged (e.g., Anderson et al., 2001; Garrison et al., 2000, 2001), Table 5 illustrates global research interest in the CoI. As seen in Table 5, the two countries (US and Canada) where the most research was conducted are both English-speaking countries. The findings are in line with earlier systematic review reports (e.g., Stenbom, 2018) which stated that even though studies are conducted globally, more studies are conducted in some individual countries than conducted in some continents (Crompton & Burke, 2018). However, all of the studies were published in English, and researches prepared in other languages may have been carried out. Although Arbaugh et al. (2010) stated that the CoI might be more applicable for applied rather than pure disciplines, the findings of the current study have shown that most of the research was conducted in the field of Social Sciences (n = 39, [38.24%]), and that these results are in line with previous researches (e.g., Kim & Gurvitch, 2020). Also, the current study's results showed that, among the six subcategories in the FOS classification of the Frascati manual, no articles were found that had been published in the field of Agricultural Sciences. However, it should not be overlooked that articles classified under the mixed category (n = 29, [28.43%]) may have included an academic discipline related to Agricultural Sciences.

The quantitative research method was reported as the most frequently used that is in line with a previous systematic review research carried out by Kim and Gurvitch (2020). However, this result may not be that surprising because the CoI survey instruments, which allowed for quantitative data about the CoI to be collected, were used in 56 (54.90%) of the 102 articles examined in the current study. When the CoI survey instruments used in these 56 articles were examined, it could be seen that the majority of the survey instruments used were those developed by Arbaugh et al. (2008). In some studies, the instruments were used without any modifications (e.g., Watts, 2017), or with only minor changes (e.g., Hilliard & Stewart, 2019), while others had adapted them to different languages (e.g., Heilporn & Lakhali, 2020), and some researchers had developed new tools based on the CoI survey instrument (e.g., Choy & Quek, 2016). The study conducted by Stenbom (2018), a systematic review of the CoI survey developed by Arbaugh et al. (2008) was conducted, in which 103 articles were examined that had been published between 2008 and 2017, which proved that the CoI survey provides results that are both valid and reliable. Quantitative research methods might have been preferred more by researchers since it allows for working with relatively larger and broader samples, and is considered to increase the generalisability of the findings. Olpak and Kılıç Çakmak (2018) also supported this finding, and stated that the three main elements (cognitive, social, and teaching presence) in the model were being increasingly analysed together with the development of surveys which provide opportunities to determine perceptions of the CoI.

The results also showed that, among the delivery methods, the most preferred course delivery method was fully online ($n = 60$, [58.82%]). In this context, it can be said that these findings are consistent with the literature, as CoI is a framework for both blended and online courses (Akyol, Garrison, & Ozden, 2009; Wicks, Craft, Mason, Gritter, & Bolding, 2015; Zhang, 2020), and one of the most frequently used models for online learning in higher education (Boston et al., 2009; Harrell & Wendt, 2019). It was revealed that a large number of the participants were higher education students. This could be due to the CoI framework having been developed in a study conducted within higher education institutions, or from a researcher's preference for purposeful or convenient sampling methods. The results of the research studies conducted in order to identify trends in distance education research (Bozkurt et al., 2015), or systematic reviews (Kim & Gurvitch, 2020; Stenbom, 2018) are also consistent with these findings. Additionally, Harrell and Wendt (2019), noted that previous research findings had mainly focused on the higher education context.

Finally, when the references in the reviewed articles are examined, it is seen that the most citations were made to the study (Garrison et al., 2000) in which the CoI framework is set forth. Furthermore, not surprisingly, it also appeared that D. Randy Garrison participated in nine of the top 10 most referenced studies. In addition, it was determined that the top 10 most frequently referenced studies in the reviewed articles were related to 1) the CoI framework and its basic elements are revealed (e.g., Anderson et al., 2001; Garrison et al., 2000, 2001), 2) the development and validation of a data collection tool that attempts to operationalize the CoI framework (Arbaugh et al., 2008), and 3) evaluating of the literature and presenting projections for future studies (Garrison et al., 2010; Garrison & Arbaugh, 2007).

Limitations, Identified Gaps, and Future Studies

Since this systematic review was conducted by a single researcher, coefficients for the reliability of the analyses could not be calculated and agreement among independent observers could not be examined. Therefore, the method section explains in detail the approach taken within the scope of the current research. Also, the current study may be

considered limited by the potential for author misinterpretation of the information contained in the reviewed articles. Moreover, while the current study examined articles prepared in English and involved in journals which are indexed in SSCI, further researches may examine different types of documents (e.g., conference papers), indexed in various sources (e.g., ProQuest), or prepared in different languages.

The results obtained from the current review have certain gaps which should be considered. For instance, 62.75% of the examined studies used qualitative or quantitative research methods. Further studies could therefore focus on the mixed-method research design in order to reveal different views and understandings that may have been overlooked in studies which used only a single research method, since mixed-method studies are considered suitable for answering large and complex research questions (Johnson & Onwuegbuzie, 2004).

Although the current study's results revealed that research on the CoI has been predominantly concentrated in North America, other countries (e.g., Turkey) are conducting more research, and that researchers often work collaboratively in such studies. It may be beneficial, therefore, for researchers to plan new studies that address different cultures by considering variables (e.g., course design, instructor behaviour, student characteristics, and learning approach) that may impact students' learning in order to provide more in-depth information about the CoI. Moreover, the current study's results revealed that studies are frequently conducted in the field of Social Sciences and with higher education students. In this context, it is recommended that future studies be conducted with students from different educational levels and academic disciplines.

Conclusion

In total, 102 articles prepared in journals indexed in SSCI about the CoI were analysed in the current study in terms of various variables. The study was performed with both BMA and systematic review of recent studies. The BMA provided an overview of the trends with regards to the frequently preferred words in the abstract and keywords. The systematic review was conducted to examine the studies with regards to their year of publication, the authors, the journals that the studies were published in, geographical distributions, the academic disciplines studied, the research methods employed, course delivery methods, the types of participants, and references in each study. The study presented an up-to-date evaluation and gaps in this field for future researches.

Declarations

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

The author asserted that ethics board approval was not required for this study in their country.

The author declared that they received no financial support for the research, authorship, and/or publication of this article.

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