Introduction to the Special Issue: Systematic Reviews of Research on Online Learning

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Deep-rooted tensions and controversies have existed in the field of education since the emergence of online forms of learning in the 1980s (Harasim, 1990, 2017). Many of these tensions have roots that extend back much further, reflecting topics researched earlier in the context of teaching and learning more generally. As Web-based learning courses and programs became increasingly common in the late 1990s, research accelerated on such topics as communities of learning, online moderation and role playing, motivation and forms of engagement, forms of interactivity and feedback, and virtual teaming. Many educators and researchers simply wanted to know the state of e-learning (Bonk, 2002) and blended forms of learning (Bonk & Graham, 2006). In those early days, organizations, institutions, and even entire countries wanted to be known as the hub for e-learning (Bonk, 2009, 2016). However, it is impossible for a single entity to assume a leadership role over the entire online learning domain, much as it is impossible for a single researcher to produce the definitive study on the entire online learning domain.

Online learning attained a new level of prominence during the COVID-19 pandemic, with increased opportunities to conduct research. This observation is offered with a caveat: much of the online learning that occurred during the pandemic was emergency remote learning (Hodges et al., 2020), and research on these courses should be carefully considered in context. Still, a new generation of scholars and practitioners are attuned to online learning topics such as learner motivation, forms of interactivity, learner engagement, assessment, cultural differences, forms of personalization, quality, copyright, types of feedback, virtual teaming and collaboration, levels of knowledge negotiation, benefits of asynchronous and synchronous discussion, and effective instructional scaffolds and support structures. With the expanse of this field and increased interest in it due to the pandemic, it is an appropriate time to step back and ponder the state of online learning research. What do we know? What do we not know? Where and how might we find answers?

With the dramatic acceleration in the development and use of online learning in the last two decades (Allen & Seaman, 2017) and the increase in the research on online learning, the purpose of this special issue is to provide a systematic and synthetic overview of the current state of research on various online teaching and learning topics. This context has guided us as we coordinated this special issue. Systematic reviews and scoping reviews offer important lenses to document, analyze, and summarize the prevailing research. Special issues like the present one are attempts to find resolutions to tensions or conflicts in the field and identify future research possibilities that might serve to explicate new concepts or lend insights into emerging theoretical

approaches for understanding a new popular delivery method as HyFlex (Beatty, 2019) or fully online learning.

Need for Systematic Reviews of Research

Systematic reviews rely on a methodology used to "examine secondary data by retrieving, synthesizing, and assessing existing knowledge on a subject in a logical, transparent, and analytical manner" (Martin, Dennen et al., 2020, p.1613). Systematic reviews address critical questions and synthesize sources that otherwise might be considered inconclusive and small-scale. Early research in an area typically focuses on what Borko (2004) refers to as "existence proofs," or one-off studies of individual implementations. It takes time for a more systematic, mature body of research to emerge and fill research gaps. As research accumulates and matures, systematic reviews not only help to identify research themes and answer critical questions but also provide an opportunity to address topics of mixed findings (Ioannidis et al., 1999).

Systematic reviews have several benefits, including a reduction in bias due to the use of a transparent and rigorous process, a greater study breadth due to thorough searches, and the quality of primary research examined. However, conducting systematic reviews also present challenges; high quality reviews, for instance, are time intensive. Other methodological challenges exist, including research questions that are often defined too broadly or narrowly, a lack of access to certain research or publication databases, and subjectivity during the screening and coding process. Nevertheless, benefits outweigh challenges in most cases and offer findings that guide research and practice.

Focus of Systematic Reviews of Research in this Special Issue

This special issue features seven systematic reviews and two scoping reviews. To foster a better understanding of the state of online learning research, we have structured the issue by focus area: (1) systems level; (2) pedagogical level; and (3) people level (see Figure 1). The first and third sections each contain two articles, while the middle section contains five. At the systems level, the issue includes reviews focusing on research trends during COVID-19 and examining the features of high-quality online learning. At the pedagogical level, reviews on engagement and assessment are featured, including collaboration, help-seeking, invisible participation, intersubjectivity, and online learner assessment. The people level contains a review of the research on the role of moderators in an asynchronous online discussion and a review of the research on online learning for minoritized and first-generation students.

Figure 1
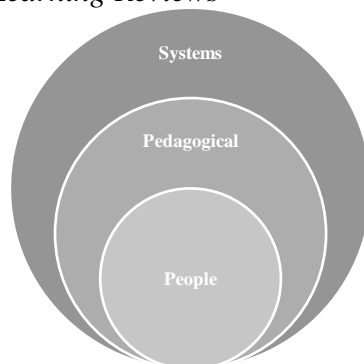*Focus of Online Learning Reviews*

Table 1 provides the author names and titles of the articles in this special issue.

Table 1
List of Articles in Special Issue

Systems Level	
Doo, M; Zhu, M; Bonk, C. J.	*A Systematic Review of the Research Topics in Online Learning During COVID-19: Documenting the Sudden Shift*
Wright, A. C; Carley, T. C; Jivani, R; Nizamuddin, S.	*Features of High-Quality Online Courses in Higher Education: A Scoping Review*
Pedagogical Level	
Oyarzun, B; Martin, F.	*A Systematic Review of Research on Online Learner Collaboration from 2012 – 2021: Collaboration Technologies, Design, Facilitation and Outcomes*
Yang, F; Stefaniak, J.	*A Systematic Review of Studies Exploring Help-Seeking Strategies in Online Learning Environments*
Choi, H; Hur, J.	*Passive Participation in Collaborative Online Learning Activities: A Scoping Review of Research in Formal School Learning Settings*
Dennen, V. P; Hall, B. M; Hedquist, A.	*A Systematic Review of Research on Intersubjectivity in Online Learning: Illuminating Opportunities for Cohesion and Mutual Understanding in the Research Conversation*
Heil, J; Ifenthaler, D.	*Online Assessment in Higher Education: A Systematic Review*
People Level	
Ahlf, M; McNeil, S.	*A Systematic Review of Research on Moderators in Asynchronous Online Discussions*
Gardner, K; Leary, H.	*Online learning for First-Generation and Underrepresented Minoritized Students: A Literature Review Using a Model of Student Engagement*

Systems Focus

Each study of online teaching and learning can prove helpful in understanding how to design high-quality and engaging online activities, courses, and programs. Information about the nuances of each pedagogical strategy and refinement to that instructional approach helps instructors and instructional designers to design and deliver new online courses. Sometimes, however, an understanding of the overall system in which online learning operates is warranted. Two articles in this section offer a systems-level focus. The first, by Doo et al. (2023), explores general research trends during the pandemic. The second, by Wright et al. (2023), investigates the components and factors that enhance online course quality and foster learner success.

Research Trends in Online Learning During the Pandemic

The Doo et al. (2023) article explores the research topics published from the start of the pandemic in early 2020 to April 2022. The article begins with a historiographical discussion of online and distance education research, especially useful to graduate students and novices to understand the evolution of online teaching and learning. Doo and colleagues then detail a couple of existing reviews of the research on online learning during the pandemic, a practice that has often been labeled "emergency remote teaching" (Hodges et al., 2020). There is much to glean from this review, as their findings provide a coherent picture of trends in the research in online learning during the past few years.

Doo et al. (2023) decided to utilize a framework from Martin, Sun et al. (2020) which was first designed and used to summarize the research on online learning from 2009 to 2018. In effect, the Martin, Sun et al. (2020) study combine with the present Doo et al. (2023) research to offer a more complete picture of the topics researched during the past decade as well as the shift in online learning researcher attention during the pandemic. Interestingly, the Doo et al. (2023) study found an uptick in the research on course design and development, course technology, teachers' experiences and perceptions, and instructor characteristics during the pandemic. Unsurprisingly, learner engagement has remained a highly targeted area of research over the past couple of decades. This timely review also identified two new areas of research: parent involvement in online learning situations and adaptation to online learning. Neither category was surprising, given that millions of parents and children were at home during the pandemic and had to adapt to a virtual learning environment.

Those reading the Doo et al. (2023) article will gain insights into the topics that are increasing in salience. They will also better understand the journal dissemination outlets for research on online learning. Clearly, the 191 studies analyzed for this systematic review indicate that online learning research has received increased global attention. Educators, researchers, parents, and politicians have all been impacted by online teaching and learning and, therefore, are interested in it. More interestingly, perhaps, is the shift from a heavy emphasis on learner engagement and characteristics to now include research on online course development, the technology tools and features utilized in such courses, and instructor training for online settings.

Features of High-Quality Online Learning

The second article found in the systems level section, by Wright et al. (2023), explores the components of high-quality online courses. And, as with the Doo et al. (2023) article, an interesting historical overview is provided, offering a better grasp of the common frameworks which have been employed in the past to understand online course quality, such as Community of Inquiry (CoI), as well as more recent frameworks such as Universal Design for Learning

(UDL) and Quality Matters (QM). The proliferation of online and blended forms of learning such as Hybrid-Flexible course design (i.e., HyFlex; see Beatty, 2019) across all sectors of education heightens concerns about the quality of those courses.

This article demonstrates that the components of quality are wide ranging and include technology systems, platforms, and tools employed as well as the course designs and organizational structures, pedagogical strategies and refinements for an engaging online learning environment, and the methods of assessment employed. For those seeking an accessible overview of course quality components and considerations, Wright et al. (2023) provide an excellent summary and insights about online course communication practices, discussion guidelines, appropriate feedback mechanisms, valuable organizational components, and a few assessment considerations for high-quality online courses.

What seems apparent is that enhanced course quality should provide some degree of flexibility in course design and delivery, more than one mode of communication between instructors and students, and multiple means of assessment. At the same time, Wright et al. (2023) caution that there must also be some sense of balance in terms of instructor presence in the course to prevent instructor burnout. Wright and colleagues acknowledge that balance could come from relying on additional sources of course support and feedback such as teaching assistants, tutors, and artificial agents. The article suggests future research related to the professional development and training of instructors who teach via online delivery.

Pedagogical Focus

In attempting to clarify common research themes in distance education, Zawacki-Richter et al. (2009) categorize management, organization, and technology at the meso level, and teaching and learning in distance education at the micro level. At the micro level, focusing on teaching and learning, Zawacki-Richter et al. (2009) include instructional design, interaction and communication in learning communities, and learner characteristics as some of the primary research areas examined in distance education. Focusing specifically on the online learning environment, this special issue offers review articles on engagement and assessment. The five studies with a pedagogical focus include recommendations for the design and delivery of online courses critical to online teaching and learning.

Student engagement is crucial in online learning as it is more likely that learners will drop out of the learning process if they are not engaged. Martin and Borup (2020) define online learner engagement as "the productive cognitive, affective, and behavioral energy that a learner exerts interacting with others and learning materials and/or through learning activities and experiences in online learning environments" (p.164). While educational psychology has emphasized the importance of affective, behavioral, and cognitive engagement, this research emphasizes the importance of reflecting on communication, collaboration, presence, interaction, and community in the online environment.

Like engagement, assessment is critical to the learning process, and a few systematic reviews have focused on online assessment (Gikand et al., 2011; Wei et al., 2021). Gikandi et al. (2011), for example, examined 18 studies to study effective online formative assessments, and Wei et al. (2021) synthesized 65 studies focusing on different assessment types in MOOCs. However, the need for a systematic review to broadly examine online assessments is addressed in this issue by Heil and Ifenthaler (2023) who synthesized publications for assessment modes, formats, and types.

Learner Collaboration

Over the past few decades, online collaboration has gained prominence in both educational and workplace settings. Several waves of technology tools have emerged for online collaboration and teamwork since the early 1990s (Bonk et al., 1994; Bonk & Wiley, 2020). As a result, there is a pressing need to determine the effectiveness of such tools in online environments. In response, Oyarzun and Martin (2023) conducted a systematic review of research on online learner collaboration which examined collaborative technologies, design, facilitation, and outcomes. Particularly, they refer to online learner collaboration as "student interaction that supports socially constructed meaning and the creation of knowledge."

In their timely review, Oyarzun and Martin (2023) and Martin synthesized findings from 63 studies; importantly, in this review of the research on collaborative technologies, they found that learning management systems (LMS), discussion boards, writing tools, and synchronous tools were the technologies primarily selected for online learner collaboration, whereas wikis, blogs, social networks, and annotation tools were employed in just a few studies. The most commonly used collaborative methods were group projects and discussions, with fewer studies mentioning peer review, social/informal, and collaborative experience surveys. In addition, they also examined group size and instructor roles to enhance online learner collaboration. Based on Oyarzun and Martin's review, increased learning, communication, and collaboration skills, and relationship-building were the top opportunities, whereas time, technical issues, and anxiety/fear/stress were challenges that appeared most frequently in online learner collaboration research.

Help-Seeking Strategies

Like collaboration, negotiating and contributing to the online environment is important, and students frequently need assistance in these areas. Just how and when do online learners effectively seek help in their online courses and activities? To investigate these questions, Yang and Stefaniak (2023) explore help-seeking strategies in online learning environments. According to the authors, help-seeking occurs when learners identify a gap in their understanding and seek help to bridge the gap.

In their review of 36 articles, Yang and Stefaniak (2023) outline four types of help-seeking: formal help-seeking, informal help-seeking, instrumental activities, and altering goals. The authors identified a need for additional research studies examining learners' psychological decision-making process when they lower performance aspirations or alter their online learning goals. Most of the studies in their review focused on formal and informal help-seeking strategies, which is not surprising given the proliferation in ways to learn informally and self-direct one's own learning during the early decades of the 21st century (Bonk, 2009, 2016; Bonk et al., 2016). Significantly, these authors call for generalizable studies rather than small case studies.

Intersubjectivity

Related to the prior two articles in this issue on online learner collaboration and help-seeking behaviors is an article that looks at the research on intersubjectivity in online learning. In their systematic review, Dennen et al. (2023) explore research on intersubjectivity, a psychological construct that is a foundation to meaningful learner engagement. Intersubjectivity, which is necessary for mutual understanding to develop, can be evident through archived interactions in both synchronous and asynchronous environments. Unfortunately, not all online interactions achieve intersubjectivity. Instead of attempting to foster it, grading systems in online

courses frequently focus on indicators like post count, word length, and accuracy, or quality of content (Dennen, 2008), none of which provide evidence of either engagement or intersubjectivity.

To address this issue, Dennen et al. (2023) examined 48 studies related to intersubjectivity. Their review showed a very slow but steady stream of publications in this area; however, a deeper examination of cross-citations shows that this research has two strands. One strand is focused on asynchronous discussion, and the other on synchronous learning, primarily in language learning contexts. These strands are not connected, and even within these two strands the research is not heavily interconnected or even representative of a systematically developing research area. Nevertheless, Dennen et al. (2023) reaffirm the importance of intersubjectivity as an underlying construct that influences discussion-based learning and encourage future researchers to pursue this area, noting that greater research focus on intersubjectivity could lead to improvements in practice.

Passive Participation

How learners participate in, or contribute to, an online course can entail vastly different behaviors from what they exhibited in face-to-face courses. Participation can occur at any moment during the course, not just during a limited allotted block of time once or twice a week. Highly reflective and introverted learners, as well as those who are concerned with their language skills, might be deemed to be passive in online courses. In exploring this topic, Choi and Hur (2023) conducted a scoping review of passive participation, an online learning phenomenon in which students are present in the course space but not actively posting messages and interacting with their peers. Instructors might mistakenly consider these students to be absent from the course or believe they are not learning, but the reality can be much more complex.

Examining 42 studies and considering a behavior that goes by different terms (e.g., "lurking" or "listening"), Choi and Hur (2023) found that researchers attempt to understand when and why students are passive participants and how it affects their learning outcomes. Other researchers seek to reduce this behavior, viewing it as a negative form of interaction. Through their review, the authors demonstrate that passive participation remains an underdeveloped research area, with more work needed to understand how learning outcomes are affected and how different pedagogical strategies might shape this behavior.

Assessment

As online forms of teaching and learning accelerate across K-12, higher education, and workplace settings, vital questions remain about assessment practices. Too often, insufficient or surface level answers are provided by researchers and those asking the important assessment questions walk away disappointed. Hence, it is vital to turn to the research literature for such answers, insights, and guidelines about effective online assessment. Heil and Ifenthaler (2023) provide some answers in the next article of this issue. Their review describes online assessments as processes through which information and communication technology is used to gather information about learners and the learning process to make inferences about learner dispositions. In their systematic review synthesizing 114 publications, the authors analyzed assessment modes (i.e., peer, teacher, automated, and self-assessment), assessment formats (i.e., format or summative), and assessment types (i.e., quiz, essay, etc.). The authors also examined the objectives and success factors of online assessments in higher education. Their implications include how online assessments support student learning, but also extend possibilities by, for

example, providing feedback and assessing collaboratively. They conclude that setting expectations is critical to the assessment design process and encourage the selection of various modes, formats, and types of assessments in online learning.

People Focus

The final articles in this issue focus on individuals and their role in the learning context. For all the emphasis placed on designing educational systems at the macro level, curricula at the meso level, and courses at the micro level, course members are the drivers of course interactions (the nano level) no matter how highly designed the course is. Dennen (2022) notes that course design elements such as content and technology are important as learning enablers but that ultimately, learners and instructors have agency and determine what occurs in a course.

Most learners have experienced online learning for many years and perhaps even decades. As a result, online learners bring personal experiences, prior knowledge, and individual needs to the learning context. As expected, they can seamlessly navigate a course as designed. However, they can also purposefully push back on the course design and struggle when there is a mismatch between the course design and their individual characteristics and choices. They may function as a group of individuals, but also may find a new collective identity as they learn together. In other words, as much as one might like to think about online course design and outcomes as a top-down endeavor, the people involved in day-to-day course activities exert pressure on course design in a bottom-up manner.

To assume that behind the keyboard all online learners are alike would be naïve. Not only do they bring different backgrounds, including areas such as socioeconomic status (Yalcin, 2022) and nationality (Choi et al., 2020), but they also navigate their online identities in varied ways (Dennen 2021; Dennen & Burner, 2017). Similarly, it would be erroneous to assume that online instructors simply execute a predetermined design, adding nothing unique to a class. The instructor role in online classes is multifaceted and requires being responsive to student characteristics and needs (Berge, 2000; Bonk et al., 2001; Dennen & Jones, 2022). For this reason, the study of students and instructors as autonomous agents within the online learning context is important, considering not only how each performs in class (i.e., outcomes) but also what they bring to, and need from, the learning experience.

First-Generation and Underrepresented Minoritized Students

One article in this issue examines research on a specific student group: first-generation and underrepresented minoritized students. In their review, Gardner and Leary (2023) focus on the challenges that these students face and the supports that they need to be successful in an online learning setting. Drawing on Borup et al.'s (2020) student engagement model, they consider the experience of these students in affective, behavioral, and cognitive dimensions. Their broad search yielded 42 articles, from which they identified 15 themes across three major areas related to the student experience: (1) Learner Characteristics, (2) Personal Environment, and (3) Course Environment. Using these themes, the authors discuss challenges and offer recommendations for how online courses could better meet the needs of first-generation and underrepresented minoritized students.

Role of Moderators in Asynchronous Online Discussions

Ahlf and McNeil (2023) provide an overview of the research on the moderator's role in asynchronous online discussions (AODs). They appropriately note the wide diversity in research

questions as well as in research designs, areas targeted in that research, and overall outcomes. The historical overview of moderation in the field of online discussion in the initial pages of this article may prove as valuable to people reading this article as the actual research results from this systematic review of moderation in AODs. As Ahlf and McNeil (2023) highlight, the frameworks and models cited from leading AOD scholars such as Gilly Salmon, Andrew Feenberg, Zane Berge, and Panos Vlachopoulus have been effectively utilized for decades. Ironically, when the AOD field arose four decades ago, it quickly attracted researchers and theorists who designed frameworks that have withstood the tests of time. Importantly, this article offers an insightful taxonomy of moderator roles.

There is much to reflect on in the Ahlf and McNeil (2023) article. For instance, the article forces one to consider the history of the field and the shifting nature of the countries of the researchers conducting research on AOD moderation. It is apparent that AOD research seems to have intensified from 2007 to 2012, with 26 of the 52 included studies published during that time. It is also vital for early career scholars to note that the earliest research took place in the 1980s; in effect, this is a quite established field with a comparatively long history.

What should also be of value to young scholars and those new to this field are the types of research conducted about moderation in AODs where single case studies are predominant, followed by experimental designs and qualitative research. The many tables included are also highly informative in laying out the themes in AOD research and descriptions of those themes. What they most obviously indicate is a wide range of potential AOD roles and expectations within those roles (e.g., weaver, knowledge construction supporter, question asker, meta-commentor, feedback giver, leader, guide, manager, social facilitator, etc.). Clearly, the topic of moderation in AODs has far ranging implications in terms of both the design and the success of an online course. As with much of the research discussed in this issue, the field of moderating AODs may have deep roots but, as the authors point out, is nonetheless still evolving with much discord to address and resolve.

Conclusions and Recommendations

The systematic reviews in this special issue of *Online Learning*, while comprehensive within their defined scopes, do not in aggregate provide a comprehensive overview of all research in online learning. Still, taken together, these articles have a collective value. What the articles share is an interest in pedagogy, which they examine from different vantage points and angles. As researcher lenses shift from the macro to the micro level and pan across varied research themes, these articles yield insights into the nature of online learning and its pedagogical trends, including detailing specific learning and assessment strategies and lending thoughts into the agency of learners and instructors in the online classroom. Importantly, the articles also provide meaningful recommendations for online learning practitioners.

Viewed as a whole, this special issue provides anchor points of knowledge in the broader landscape of online learning. Most of the authors have situated their systematic reviews in the context of earlier systematic reviews of online learning. When examining well-established research areas, they nest their findings into existing gaps or extend earlier reviews. Other reviews represent forays into newer areas where research has yet to fully mature; in effect, they offer an initial vision of what is known and how future studies might connect and extend some of the earlier research. In the spaces between these systematic reviews and the ones that came before them are gaps that remain to be filled. Some of these holes represent knowledge about directly related parallel topics (e.g., research on different learner groups or different pedagogical

strategies), while others represent complementary topics (e.g., online learning technology, policy, and administration).

Beyond the content-focused insights offered by these systematic reviews, the articles also serve as models for future online learning reviews. They demonstrate varied ways of viewing and synthesizing a body of related research, including the use of existing frameworks, development of new thematic coding systems, and examinations of time, trends, and even co-citation. They provide methodological guidance and leave ledges onto which future researchers can develop future studies with meaningful foundations as well as update these reviews as years pass and additional research is conducted and published. Future researchers are encouraged to also focus on meso-level topics such as management, organization, and technology as this special issue did not include any studies on them.

Our hope is that readers enjoy the nine articles found in this special issue and utilize their insights in their own future research, teaching, or research translation efforts. Whatever your intended use or situation, we wish that you find this issue informative and beneficial. Given that the application and impact of online learning during the coming decade will likely continue the rapid pace set in the previous ones, there will be assorted uses and applications, many of them unintended or unplanned, of this issue of online learning research as well as the many such journal issues to follow.

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A Systematic Review of the Research Topics in Online Learning During COVID-19: Documenting the Sudden Shift

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Abstract

Since most schools and learners had no choice but to learn online during the pandemic, online learning became the mainstream learning mode rather than a substitute for traditional face-to-face learning. Given this enormous change in online learning, we conducted a systematic review of 191 of the most recent online learning studies published during the COVID-19 era. The systematic review results indicated that the themes regarding "courses and instructors" became popular during the pandemic, whereas most online learning research has focused on "learners" pre-COVID-19. Notably, the research topics "course and instructors" and "course technology" received more attention than prior to COVID-19. We found that "engagement" remained the most common research theme even after the pandemic. New research topics included parents, technology acceptance or adoption of online learning, and learners' and instructors' perceptions of online learning.

Keywords: Online learning, distance learning, COVID-19, research trends, systematic review

COVID-19 was an unprecedented pandemic in many ways, with massive political, social, environmental, economic, and educational impacts on society. These structural changes in society most assuredly changed many aspects of our lives in a global and unyielding manner, perhaps forever changing how we access, engage in, and refer to education (Maloney & Kim, 2020). Fortunately, open, online, and distance learning has a rich history and many reliable instructional approaches and forms of delivery, such as synchronous, asynchronous, or some type of blend of the two (Bonk, 2020; Lee, 2019; Moore, 2007; Moore & Kearsley, 2013). As with the Spanish flu and polio epidemics in the previous century, countless millions were, once again, forced to learn from alternative means like radio, television, and printed packets via correspondence (Kanwar & Daniel, 2020; Miks & McIlwaine, 2020; Theirworld, 2020). One might conclude that Charles Wedemeyer's (1981) words from four decades ago are finally coming to pass:

> Our perceptions of teaching, learning, schooling, and knowledge are all undergoing change. It is possible to delay change, to influence change, even (for those who can control their immediate activities) to deny change momentarily; but trends towards change continue, with important implications for teaching, learning, schooling, and knowledge at all levels and in all methodologies (p. 44).

Due to extensive implementation and rapid acceleration of social distancing restrictions and school closures in the spring of 2020, teaching and learning in online learning environments suddenly became mandatory in all schools and across educational levels. Lederman (2019) reported that there was a small but steady rise in the number of students who took at least one online class in the United States, increasing from 33.1% in 2018 to 34.7% in 2019. Not surprisingly, the number of online learners radically changed in 2020 because of COVID-19. UNESCO (2020) estimated that more than 1.5 billion students in 165 countries were impacted by school closures and thus had to learn online. Given that most teaching and learning occurred online, the perceptions and practices of online learning also changed. However, there were concerns that online learning during COVID-19 was not representative of true online learning. Hodges et al. (2020) called the current practice of online teaching and learning "remote emergency teaching," thereby distinguishing it from conventional online learning.

Prior to the pandemic in early 2020, several researchers conducted systematic reviews on online learning to better understand the trends by synthesizing individual research (Bond, 2020; Bond et al., 2021; Martin et al., 2020; Mishra et al., 2021). Bond (2020) conducted a systematic review of emergency remote education in K-12 during the pandemic and added another systematic review on emergency remote teaching in higher education in the following year (Bond et al., 2021). Mishra et al. (2021) also investigated the research trends in online learning during the pandemic by using thematic clustering analysis. More details about the previous systematic review will be presented in the literature review. Martin et al. (2020) conducted a systematic review of online learning research from 2009 to 2018, which, in effect, was just prior to the COVID-19 outbreak. Among their key findings, they discovered that engagement (28.92%) and learner characteristics (21.65%) were the most researched themes in online learning. What Martin et al. (2020) discovered was that researchers prior to the pandemic were focused on understanding how online learners effectively engaged in learning and the common characteristics, traits, and perspectives of learners engaged in online learning pursuits. In contrast, the least researched topic area or theme prior to 2020 was online instructor characteristics (3.39%).

Given the structural changes in online learning taking place during the pandemic, including the extraordinary increase in the number of online learners and the shift from online learning being an alternative to traditional schools to being the only true educational option available (Kanwar & Daniel, 2020; Theirworld, 2020; UNESCO, 2020), it is logical to assume that there have been changes in the online learning research approaches and topics as well as the shifts in the countries or regions of the world where that research took place as governments attempted to determine the impact and challenges of online learning and emergency remote forms of teaching and learning during COVID-19.

The present study began with curiosity about the changes in online learning that COVID-19 brought to help inform online learning scholars and practitioners and guide future research. In this study, the scope of online learning includes emergency remote teaching and learning as well as traditional online learning. Emergency remote teaching and online learning have co-existed during the pandemic despite their conceptual differences. It is also difficult or premature to

differentiate between online learning and emergency remote teaching and learning because the perceptions, awareness, and practices of online teaching and learning are constantly changing throughout the pandemic. For these reasons, the scope of online learning in this study includes traditional online learning and emergency remote teaching and learning. To compare the research topics in online learning before and during the pandemic, we adopted Martin et al.'s (2020) online learning research framework and compared their research findings to the more recent findings in our review. The specific research questions explored here are:

1. What are the most and least researched topics in online learning during COVID-19?
2. What are the differences in research trends in online learning before and during the COVID-19 pandemic?
3. What new topics emerged during COVID-19?

A Systematic Review of Online Learning

Reviews of Research on Emergency Remote Teaching and Online Learning
Several researchers have conducted systematic reviews on online learning or emergent remote teaching during the pandemic (e.g., Bond, 2020; Bond et al., 2021; Crompton et al., 2021). For example, Crompton et al. (2021) reviewed 60 studies on online and remote learning in K-12 settings published between 2010 and 2020. They found that: (1) strategies used to support emergent remote learning include communication, delivery systems, student readiness, partnerships, engagement, and resources, and (2) the technologies used were primarily Internet-based technologies along with non-Internet technologies.

In addition, Bond (2020) reviewed 89 studies from 70 countries on emergency remote education in K-12 and found that: (1) the reviewed research was predominantly conducted in European and Asian countries, (2) studies primarily focused on teachers, and (3) an online survey was used most for data collection. Bond (2020) revealed that recommendations from the articles included: (1) further funding support for professional development, (2) promoting equity, (3) adopting collaborative learning opportunities, and (4) leveraging synchronous and asynchronous technology. Then, in a follow-up study, Bond et al. (2021) conducted a systematic mapping review of 282 studies on online and remote learning in higher education. In this follow-up study, Bond et al. (2021) found that: (1) studies reviewed predominantly focus on undergraduate students and their perceptions of emergency remote learning, (2) studies were conducted in various countries and largely focused on Health, Natural Sciences, and Math fields, and (3) synchronous collaborative tools along with text-based tools were the primary technologies used in online education and remote learning.

More recently, Mishra et al. (2021) examined the research trends in online learning during COVID-19. They searched the literature in the Scopus online database on January 22, 2021, to search for relevant research published between January 2020 and January 2021. Their inclusion criteria included: (1) research on online learning and distance learning, (2) articles written in English, and (3) articles published in peer-reviewed journals. The initial search yielded 525 records; however, more than half of the initial search results were excluded because they failed to satisfy their inclusion criteria. Through a screening process using PRISMA guidelines, 330 articles were included in their systematic review. Of the 330 articles, 112 did not indicate the research methods employed as they were often opinion and reflection pieces, leaving 218 research studies for the thematic analysis. Mishra et al. (2021) found that 67.88% of the studies focused on postsecondary education (i.e., higher education), followed by learning in general (14.24%), K-12 (10.3%), and adult and lifelong learning (7.58%). Based on the disproportional ratio of online learning research at each school level, they contended that scholars need to conduct more online learning research in K-12 given the large population of K-12 students.

In their study, research topics were analyzed using keyword cluster analysis, and four clusters were identified: (1) technologies for teaching and learning, (2) psychosocial issues, (3) learners, and (4) an eclectic category with 19 terms (i.e., others). This classification was based on the results of keyword cluster analysis, and, hence, it was different from Martin et al.'s (2020) framework, which focused on the: (1) learner, (2) course and instructors, and (3) organization. The popular research topics identified in their study include remote teaching, the assessment of distance learning, emergency online teaching, virtual learning environments, and student readiness. In terms of research methods, slightly less than half of the 330 studies (N= 144, 43.64%) adopted quantitative methods, while many used either qualitative methods (N= 44, 13.33%) or mixed methods (N= 30, 9.09%).

In addition, Mishra et al. (2021) found that almost 34% of the 330 studies in the eligibility pool did not describe any research methods (e.g., opinions or reflective papers), indicating that one-third of the studies were not empirical studies.

Mishra and his colleagues uncovered a few trends in their recent study. For instance, they discovered that the most productive country in terms of conducting online learning research was the United States (25.1%), which substantially outperformed the second-most and the third-most productive countries (i.e., Saudi Arabia: 6.28%, and the United Kingdom: 6.07%). Taking a broader lens, online learning research during the pandemic was primarily published in 18 countries, including the three mentioned above, as well as Canada, Indonesia, Russia, India, Spain, South Africa, Pakistan, Germany, Brazil, China, Turkey, Egypt, Italy, Greece, and the Philippines. Based on this data, Mishra et al. (2021) contended that a highly diverse array of countries had produced online learning research during the recent COVID-19 era.

Martin et al.'s (2020) Systematic Review of Online Learning

As indicated, Martin et al. (2020) conducted a timely and insightful systematic review of online learning research from 2009 to 2018. To facilitate their analysis, they, in turn, reviewed three systematic reviews of online learning before the pandemic; see Berge and Mrozowski (2001), Tallent-Runnels et al. (2006), and Zawacki-Richter et al. (2009). Based on these three studies, Martin et al. (2020) developed a framework with three components or stakeholders of online learning: (1) the learner, (2) the course and instructor, and (3) the organization. Their resulting framework included 12 research themes, as shown in Figure 1.

Figure 1

Online Learning Research Themes Framework
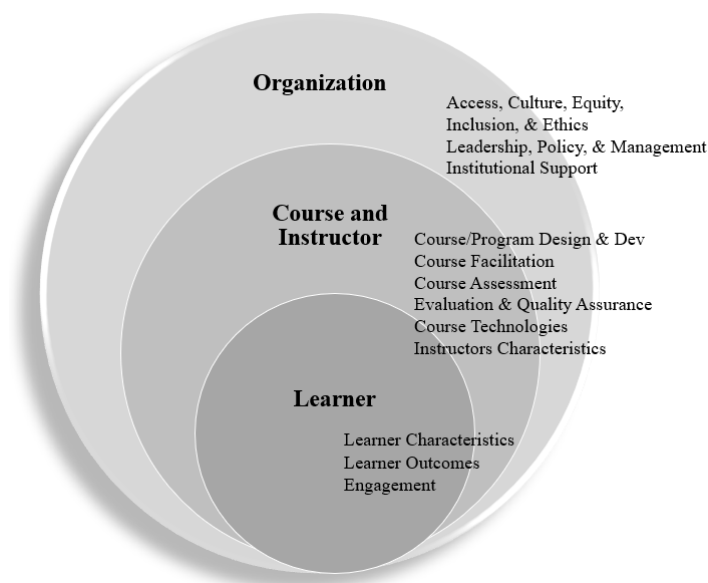
Note. Reconstructed with permission from Martin, Sun, and Westine's (2020) Figure 1 (p. 4).

In their extensive review of 619 relevant online learning studies published between 2009 and 2018, Martin et al. (2020) found that a considerably high percentage of studies dealt with the learner (55.73%) compared to research that targeted either the course and instructor (29.89%) or the organization (14.38%). Among the 12 research themes in their 619 selected studies, learning/learner engagement was the most researched theme in online learning (28.92%), followed by learner characteristics (21.65%). The least researched theme was instructor characteristics (3.39%).

Given the abundance of research on online learning since the emergence of COVID-19 in early 2020, a systematic review of the most recent research is needed to understand how the focus of online learning researchers has changed since that time. Accordingly, the purpose of this study was to examine the research topics in online learning during COVID-19 using a systematic review methodology.

Method

We conducted a systematic review of the recent literature on online learning published during the COVID-19 pandemic from February 2020 to April 2022. Based on Cooper's (1988)

procedure for a systematic review, our research process included the following five stages: (1) identifying the research problems, (2) collecting eligible studies, (3) evaluating the data, (4) analyzing the data, and (5) presenting the findings.

Inclusion and Exclusion Criteria

To investigate our three key research questions, we set four key inclusion criteria for the literature search to identify eligible online learning studies published during the COVID-19 pandemic; namely, the studies included in our scope were: (1) confined to online learning environments; (2) empirical studies adopting quantitative, qualitative, or mixed-method approaches; (3) published since the beginning of COVID-19 (i.e., from February 2020 to April 2022); and (4) written in English. Exclusion criteria included studies that did not meet the inclusion criteria, including editorials or opinions, meta-analyses, or systematic reviews (e.g., Salas-Pilco et al., 2022), technical reports, corporate and non-profit documents, unpublished dissertations, conference proceedings, book reviews, and other miscellaneous reports. In the review process, we found that numerous studies included data collected and analyzed prior to February 2020 (i.e., data collection was completed before COVID-19). Hence, we excluded the research with pre-COVID-19 data as a means to retain the objective of this study (e.g., Chang & Kim, 2021; Pollard & Kumar, 2021).

Search Databases, Strategies, and Process

Using the inclusion criteria, the literature search was conducted through a computer-based database search, including *Web of Science* (https://www.webofscience.com), Education Resources Information Center *(ERI*C, https://eric.ed.gov/), and *Google Scholar* (https://scholar.google.com). In fact, scholarly journals of each database are not exclusive (e.g., the same journal articles can be indexed in different databases if two databases subscribe to the same journals). Hence, we chose the three representative databases which have extensive coverage of publications in education fields (i.e., ERIC), in scholarly works (i.e., Web of Science), and in a variety of disciplines with a Web search engine (i.e., Google Scholar). A combination of the following keywords was used to search for relevant studies: "Online learning," "distance learning," "online teaching," or "online learners," and "COVID-19" or "pandemic." As noted, we limited the literature search from February 2020 to April 2022 to examine the research trends in online learning during COVID-19.

The search and exclusion processes are illustrated using the PRISMA flow diagram in Figure 3. The screening process started with reviewing the titles and abstracts of 454 publications, and we excluded 47 studies due to insufficient or missing data. The remaining 408 publications were full text screened by two authors. We excluded 216 studies that had insufficient data, or were non-empirical studies or systematic reviews, or involved data collection periods prior to January 2020. To make sure that the data for each publication was collected after the COVID-19 pandemic began, the authors double-checked the methodology sections of these publications. A total of 191 online learning studies out of the initial identification of over 68,000 records were finally included in this systematic review.

Figure 3
Search Process Using PRISMA
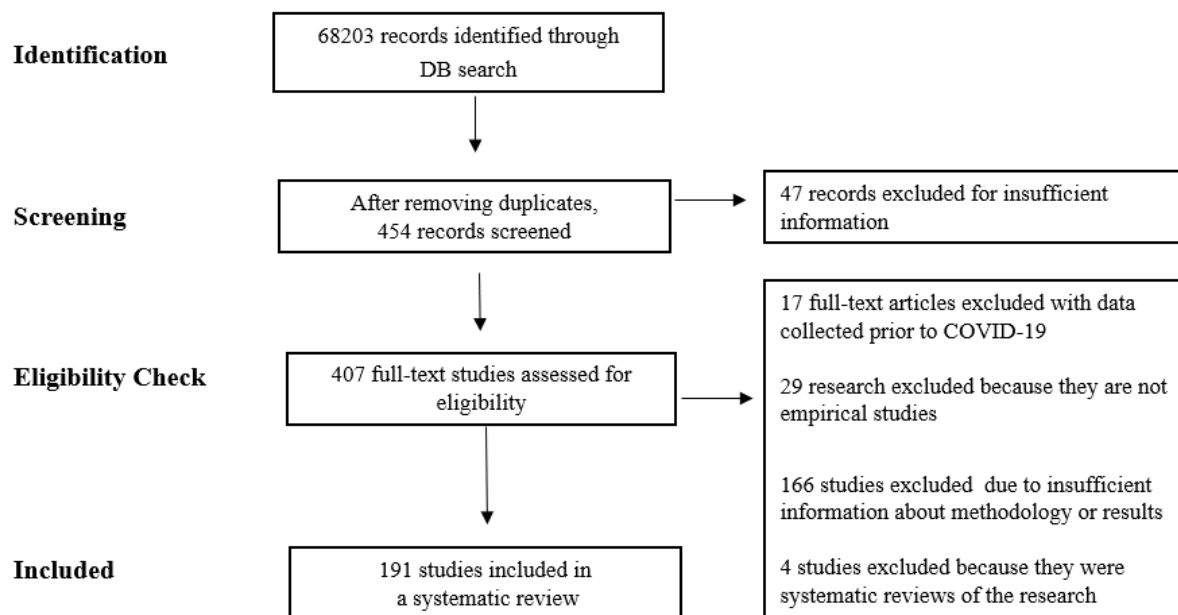
Data Analysis

The coding scheme was created in an Excel file and then transformed to SPSS to analyze descriptive data. The coding scheme consisted of journals, titles, years, author names, participants (i.e., school levels), data collection, data analysis, topics, keywords, and others (e.g., when a judgment call is needed). We used Martin et al.'s (2020) research framework for coding for research domains and research themes. First, we categorized each study into one of three domains: organization, courses and instructors, and learner. Based on keywords, abstract, and titles of the study, each study was classified into one of 12 research themes (i.e., (1) Access, culture, equity, inclusion, and ethics, (2) leadership, policy, and management, (3) institutional support, (4) course/program design and development, (5) course facilitation, (6) course assessment, (7) evaluation and quality assurance, (8) course technologies, (9) instructor characteristics, (10) learner characteristics, (11) learner outcomes, and (12) engagement).

If a study did not fit into Martin et al.'s domains or research themes, we called 'others' and left memos for further analysis. Two researchers individually conducted a pilot coding of the first ten articles and discussed the discrepancies until reaching consensuses (i.e., initial intercoder reliability was 93.99%) on coding schemes. Then each researcher coded half of the rest of the articles. After coding was completed, we conducted a thematic analysis (Braun & Clarke, 2006; Braun et al., 2014).

Results

Publication Patterns

As indicated, this systematic review found 191 articles that met the four key inclusionary criteria. Since February 2020, a third of the online learning studies published during the COVID-19 pandemic were in 2021 (N= 144, 75.4%), followed by 2022 (N= 29, 15.2%) and then 2020 (N= 18, 9.4%). The 191 studies analyzed in the systematic review came from 31 peer-reviewed journals, including *British Journal of Educational Technology, Education and Information Technologies, Education Sciences, Frontiers in Psychology, Journal of Computer Assisted Learning, Online Learning, Computers and Education, Frontiers in Education, Asia Pacific Education Researchers, International Journal of Emerging Technologies in Learning, Children and Youth Service Review, The International Review of Research in Open and Distributed Learning, Distance Education, Educational Technology Research & Development, Interactive Learning Environments,* and *Journal of University Teaching and Learning Practices.*

In terms of the location of the publications, the 191 studies were conducted around the world. We found that online learning research was conducted in 58 countries, including the United States, Canada, Mexico, China, Bangladesh, Thailand, the UK, Estonia, Ghana, Egypt, United Arab Emirates, Australia, and New Zealand. The United States has been the most productive country in terms of online learning research published during the COVID-19 pandemic thus far, with 17.8% of the total research (N= 34). China, including mainland China,

Hong Kong, and Taiwan, also produced nearly as large a portion (N= 32, 16.7 %) of the publications during this time.

Naturally, there were a variety of methods utilized. Quantitative methods were predominantly used in online learning research (N= 111, 58.1%), followed by qualitative methods (N= 46, 24.1%) and mixed methods (N= 33, 17.3%). Only one study which adopted a developmental research methodology was included in the analysis. As for the data collection methods, more than half of the research (N= 122, 63.54%) adopted survey methodology (e.g., Munir et al., 2021; Oinas et al., 2022), and approximately one in five (i.e., N= 36, 18.75%) used interviews, including focus group interviews, to conduct qualitative research (e.g., Cao et al., 2021; VanLeeuwen et al., 2020). Interestingly, only four studies in our pool of 191 studies adopted an experimental or quasi-experimental research design (e.g., Liu & Butzlaff, 2021; Petersen et al., 2022).

Online Learning Topics: The Most and Least Studied Research Topics

From the three components of Martin et al. (2020) framework (i.e., learners, courses and instructors, and schools and organizations), there was slightly more research on courses and instructors (N= 78, 40.8%) than learners (N= 76, 39.8%). About 9.4% of the research focused on organizations, and the remaining 9.9% included other categories, including parents (N= 7, 3.7%). This ratio is considerably different from Martin et al.'s (2020) research findings that focused on learners (55.73%), courses and instructors (29.89%), and schools and organizations (14.38%).

Table 1 summarizes the 12 topics in online learning research in the current research and compares it to Martin et al.'s (2020) study, as shown in Figure 1. The top research theme in our study was engagement (22.5%), followed by course design and development (12.6%) and course technology (11.0%). The least researched topics included evaluation and quality assurance (0.5%), access, culture, equity, inclusion, and ethics (1.6%), and leadership, policy, and management (2.1%).

Table 1
The Percentage of Research Topics

Category	Research Topics	Current study (2022)	Martin's study (2020)
Learner	Engagement	22.5	28.92
	Learner Characteristics	6.3	21.65
	Learner Outcome	4.2	5.17
	Learners' Experiences and Perceptions	6.3	
	Learners' Psychological Well-Being	1.0	
Course and Instructor	Evaluation and Quality Assurance	0.5	6.14
	Course Technologies	11.0	5.65
	Course Facilitation	3.1	5.49
	Course Assessment	3.1	4.85
	Course Design and Development	12.6	4.36
	Instructor Characteristics	5.8	3.39
	Teachers' Experiences and Perceptions	5.8	
Organization	Institutional Support	5.8	5.33
	Access, Culture, Equity, Inclusion, and Ethics	1.6	4.68
	Leadership, Policy, and Management	2.1	4.36
Others	Adaptation to Online Learning	4.7	
	Parents' Involvement in Online Learning	3.7	

The research settings were diverse, including early childhood, K-12, higher education, and adult and lifelong learning. The predominant research settings included higher education (64.5 %), with far less (26.7%) based on K-12 settings, including elementary, middle, and high schools. Only three studies were conducted in early childhood and two studies in adult learning. We also analyzed a total of 2,212 keywords from 191 studies using a Word Cloud.

In terms of the frequencies and relevance of each keyword, the top listed keywords included "online learning" (N=91, .999), "distance learning" (N=38, .539), "distance education" (N= 19, .238), "higher education" (N= 38, .492), "remote teaching" (N= 20, .254), and "COVID-19" (N= 146, .018). Excluding the keywords indicating environments (e.g., online learning or education, distance learning or education, and COVID-19 or pandemic), the top listed keywords included "higher education" (N= 38, .492), "student engagement" (N=7, .095), "secondary education" (N= 6, .063), "community of inquiry (N= 4, .095), "blended learning (N=6, .095), "perception" (N= 12, .045), and satisfaction (N=14, .045).

Newly Emerged Topics in Online Learning

We found unclear or incomparable coding that did not fit into the previous framework. These newly emerged topics included parents (3.7%) (e.g., parents' well-being, parental involvement, or parent satisfaction) (e.g., Canales-Romero & Hachfeld, 2022; Hamaidi et al., 2021; Zhan et al., 2021), learners' experiences and perceptions about online learning (6.3%) (e.g., Seabra et al., 2021), teachers' experience during COVID-19 (5.8%) (e.g., Nguyen et al., 2021), technology acceptance or adoption of technology (4.7%) (e.g., Azizan et al., 2022), and learners' psychological well-being or stress (1.0%) (e.g., Huang & Zhang, 2021).

Discussion

This study explored the most recent research on online learning during COVID-19 to provide insights about how the research trends or research topics in online learning have changed due to the pandemic. Perhaps it will shed a few clues as to what online learning research will be pursued in the future. In this study, we compared our results with recent systematic reviews by Martin et al.'s (2020) and Mishra et al.'s (2021) research findings to highlight the changes and make some projections about future directions.

The Most and Least Studied Research Topics

First, using Martin et al.'s (2020) framework as a guide, among the three components of online learning (i.e., learners, courses and instructors, and schools and organizations), most previous online learning research was conducted about learners (55.73%). However, the present study found that online learning researchers focused on courses and instructors (41.9%) as well as learners (40.3%) during the first two years of the pandemic. It is interesting to see the research interests moved from mostly focusing on learners to now also exploring courses and instructors. In terms of school levels of learners, more than 70% of the studies were conducted in higher education in the reviewed literature, which is similar to Mishra et al.'s (2021) findings (i.e., higher education: 67.88%, K-12: 10.3%).

In accordance with the study from Mishra and his colleagues (Mishra et al., 2021), in the present study, only 26.7% of the research was conducted in K-12 settings, which is considerably less than in higher education settings. As might be expected given concerns about cost, quality, flexibility, and access of education, K-12 online learning was rapidly growing even before COVID-19 suddenly struck the world and then it accelerated during the pandemic (Erwin, 2021; Gross, 2021). Based on the National Center for Education Statistics related to America's public schools, during school year of 2013-2014, the total number of virtual schools was 478 (National Center for Education Statistics, 2015). Five years later, during 2018 and 2019, the total number of virtual schools was 675 and the number of not fully virtual schools was 7,872 (National Center for Education Statistics, 2020). Then, during 2019-2020 the number of fully virtual schools was 691 and the number of not fully virtual schools was 8,673 (National Center for Education Statistics, 2021). This rise in virtual schools in the United States during the past decade (Erwin, 2021; Gross, 2021) indicates the K-12 online learning was significantly increasing before the pandemic started. Given the increasing number of fully virtual schools and not fully virtual schools in the U.S. during the past few years, we agree with Mishra et al.'s (2021) assertion that greater online learning research at the K-12 level might be warranted.

Second, in terms of the first main research question regarding the most and least researched topics in online learning during COVID-19, the most researched theme in online learning during COVID-19 was engagement (22.5%). The significance or popularity of engagement as a research theme has remained stable as this result is identical to Martin et al.'s (2020) research finding (28.92%). Similarly, the research targeting learning outcomes also remained low at about four percent, which is, again, roughly the same as Martin et al.'s previous finding (5.17%). It is necessary to examine why engagement is much more popular than learning outcomes as a research theme in online learning research.

The Differences in Research Trends in Online Learning Before and During the COVID-19 Pandemic

There were several differences between these studies as well. For instance, unlike previous studies, course design and development (12.6%) and course technology (11.0%) have received greater attention in academia during the past couple of years compared to the pre-COVID-19 era (i.e., 4.36% and 5.65%, respectively). The substantial change may be because the population of online teaching and learning has changed during the pandemic. In the past, online learning was mostly considered a substitute for traditional classrooms or was often a key aspect of non-formal learning for adult learners. Regardless of school level, online learning was offered during the pandemic and, during this time, many instructors and teachers were asked to teach online regardless of their preference for online learning as a teaching mode. As a result, researchers appear to have become more interested in course design and development and course technology in online learning research.

Our review of the research also highlighted the fact that the heavy research interest in learners before the pandemic shifted toward research on instructors during the pandemic. In fact, the proportions of research about learner characteristics dramatically lessened from 21.65% in 2020 to 6.3% in 2022, whereas the research on instructor characteristics in 2020 (3.39%) moved up to 5.8% in 2022. The gigantic structural changes taking place in schools and higher education institutions during COVID-19 enabled researchers to appreciate the importance of the roles and responsibilities of instructors and the components of effective or high-quality course design and development for successful online learning. Meanwhile, many of the least researched areas remained unchanged through the COVID-19 pandemic, such as "access, culture, equity, inclusion, and ethics," "leadership, policy, and management," "course facilitation," and "course assessment." These topics might need greater attention to better understand the long-term success of online learning.

Third, in terms of where the studies were published, researchers in the United States have been the most prolific in terms of the published online learning research in the past, as noted by Mishra et al. (2021) and this leadership remained in our study (17.8%). However, it is notable that the present study included research conducted in 58 countries in Asia, Africa, North America, South America, Europe, Australia, and Oceania, which is far more than Mishra et al.'s (2021) review of the research had found, which included only 17 countries.

Given that there are 195 countries, our data revealed that nearly 30% of all the countries in the world community produced online learning research during the pandemic, demonstrating just how extensively online learning has permeated the globe in both usages and as a focus of research. This result also confirms Mishra et al.'s (2021) contention that researchers in many countries started to produce online learning research due to COVID-19. Of course, the global expansion of online learning was the likely trigger for researchers around the world to decide to conduct research on this topic, many of whom were likely responding to requests from their governments as well as local institutions and organizations for such more focused and intensive research analysis and insights to better understand the impact of online learning during the pandemic, and how to better equip educators for various online delivery formats and pedagogical approaches.

What is interesting is the nearly nonexistent experimental research studies in our investigation of the research on online learning during the first two years of the pandemic. When only two percent of the studies reviewed employed experimental design methodology, one must ponder on the causes. While pure experimental design approaches with treatment and comparison groups in the field of education have often been of questionable value and fallen out of favor for the past couple of decades, these findings are also likely due to the suddenness of the shift to online environments during the pandemic that left minimal time to plan complex studies involving treatment and control groups. Stated another way, during the past couple of years, researchers were unlikely to be manipulating variables, but instead attempting to study what was, in fact, happening throughout the ebb and flow of the COVID-19 pandemic and the associated educator, educational institution, and community reactions to the latest news and pronouncements.

New Topics Emerged During COVID-19

Last, to address Research Question #3, the new topics that emerged in our systematic review demonstrate how online learning environments changed during COVID-19. For example, we found several studies about parents, including parents' perceptions about online learning, parents' well-being, and parents' involvement in online learning, including one study in Germany (Canales-Romero & Hachfeld, 2022), one study in China (Zhan et al., 2021), and another in Jordan (Hamaidi et al., 2021). This finding aligns with the study by Aslan et al. (2022) that showed that parental involvement is important in the success of K-12 online education.

Given that most K-12 students had to learn in an online manner while at home during the pandemic, parents' roles and responsibilities became even more pronounced and vital. Technology acceptance or adoption of online learning was also a new or more prominent theme in the present study (e.g., Azizan et al., 2022). The technology acceptance model (TAM) by Davis (1989) is a well-known and extensively applied research framework for emerging technology research. Not too surprisingly, this model has recently re-emerged to understand the experiences of those who had no prior online learning experiences in terms of their acceptance and adoption of online learning.

While new trends in the research on online learning were revealed, we caution the reader that some topical changes and emerging areas of research could simply be due to the evolution of online learning research that would have taken place despite the pandemic. Stated another way, as with most any field, there is a ceaseless evolution in the research literature as each study typically attempts to build upon the previous ones. It just may have been time for greater research on the technologies used in online courses as they have matured since online courses became mainstream more than two decades ago. Online course design and development may have become increasingly essential during the pandemic when countless millions were learning online with educators espousing goals of elevating course quality and effectiveness as well as learner satisfaction. The days solely focusing on learner characteristics and learning outcomes, without consideration of instructor training, motivation to teach online, and pedagogical decision making, or the course design and overall quality appear to be over.

Limitations and Future Directions

This systematic review has some limitations. First, in this study, we only examined peer-reviewed journal articles. Hence, research published in conference proceedings, magazines, book chapters, reports, technical reports, white papers, etc., would most likely have been excluded from this systematic review. Future researchers could extend the scope of the publication outlets to gain a more comprehensive picture of the relevant research.

Second, the articles reviewed in this study were limited to publications in English. Articles published in languages, such as Spanish, Korean, or Chinese, were excluded. Undoubtedly, important findings and discussions within the online learning research during the pandemic published in non-English journals were missed. To obtain a more comprehensive picture of global online learning research, future systematic reviews might review articles on online learning published in diverse languages and cultures.

Third, while the pandemic seems to be significantly subsiding, it is clearly not over (CDC, 2022; Charumilind et al., 2022). Research is needed that takes a more longitudinal look at online learning effectiveness and impact during the pandemic and far beyond. As part of such long-range views, it is vital to know about the impact of instructor online training programs and initiatives.

Fourth, given the fact that educational research often takes years to publish from the inception of a study, there are likely a wide array of studies currently in process or accepted for publication that took place during the pandemic but as yet are unpublished. Ambitious and insightful researchers might pose interesting and insightful research questions in the coming decade or two that extend the purview of this study while helping to understand the effectiveness of online educational delivery options during times of crisis or structural educational changes.

In this study, we did not differentiate traditional online learning and emergency remote teaching despite the conceptual and historical differences between the two terms. Online learning and emergency remote teaching have co-existed during the pandemic, but the term online learning was used more often in general unless other terms were delineated by the researchers.

The other reason is that this study analyzed the literature (i.e., secondary data) published during the COVID-19 era as a systematic review; as such, it was difficult and potentially inaccurate to tell which studies were about emergency remote teaching and which ones were not. Some authors clearly indicated the emergency remote teaching in the titles or keywords (e.g., Oliveira et al., 2021; Valsaraj, 2021; Xie et al., 2021); however, it was deemed dangerous to make such assumptions about each of the 191 articles in this study without making further inquiries to the authors of each of these publications.

Clearly, there are myriad directions for online learning researchers in the years to come. For instance, while blended learning has been researched for decades (Bonk et al., 2002; Bonk & Graham, 2006; Shen et al., 2013; Picciano, et al., 2014; Picciano et al., 2022), the hybridization of learning that was witnessed since the pandemic arose to dramatically disrupt educational spaces and common delivery mechanisms begs for greater research attention than has been witnessed to date. It is vital to know how educators innovated in terms of educational delivery models like HyFlex course design (Beatty, 2019). And as open and online educational resources proliferate, it is extremely critical to determine how such resources help lessen the impact of the shift to online delivery formats.

Finally, additional research is also needed on the wellness and mental health of online learning participants, including learners, instructors, instructional designers, and program administrators. Too often, the focus of research is strictly limited to cognitive gains, while the emotional aspects of online learning and the psychological well-being of online learners and developers and deliverers of online instruction remain underexplored (An et al, 2022; Heo et al., 2022). From our own previous research (Heo et al., 2022), we realize that highly anxious, stressed-out, and depressed students will exhibit lowered degrees of learning engagement and have reduced self-efficacy as learners.

Implications for Instructors, Practitioners, and Researchers

Systematic reviews of the research on educational technology trends can shine a light on where that technology is being deployed and how it is being evaluated. As is clear from this review of the research since the start of the pandemic, the forced deployment of forms of online learning around the globe has set in motion hundreds, if not thousands, of researchers who are concerned with the impact on the learner, instructor, course, and organizational or institutional level. No longer can instructors, communities, governments, schools, or higher education entities sit idly by and ignore online and blended forms of learning. The students in their local K-12 school communities or attending institutions of higher learning in their cities, as well as the workers in the companies or governments organizations in their region or across the state or provincial lines, are now relying on quality online learning courses and programs to equip them for their future careers, prepare them for entrance into higher levels of education, and reskill them for new or emerging job roles and responsibilities.

Online forms of learning are pervasive. As this study, as well as the recent one from Mishra et al. (2021) before, revealed, online and remote learning research is currently being conducted across the world. This implies that all teachers will need professional development for such online teaching at some point in their careers, especially, during tumultuous times such as a public health emergency or weather-related catastrophe. Similarly, students need preparedness and readiness training. And, as young people are increasingly learning from home, their parents need such readiness training and online learning advice. Of course, proactive training programs will lessen the burden when the next tragedy arises.

At the same time, researchers in the online learning camp need to ponder their long-term goals and research possibilities. No longer will one-off interventional or observational studies be enough; researchers intending to make a substantive contribution have to conduct studies or initiatives that are cross-institutional, cross-cultural, or longitudinal in nature as well as involving mixed methods to help triangulate the data obtained so as to provide a clearer understanding of the implementation and impact of online teaching and learning. They also need to conduct research on emerging flexible and blended forms of learning that were experimented with during the pandemic and that were continued or refined after it. Such novel forms of learning are not going away. And researchers must find ways to share their findings on the known gaps in the research on fully online and blended learning with others both locally and internationally.

Online learning possibilities have expanded to every citizen of this planet as a result of the COVID-19 pandemic. More flexible and open models of learning were experimented with in the first weeks, months, semesters, and now years. Some of these experiments were highly successful; others clearly were not. As a result, online learning quality remains a pressing concern. It is also true that there are many doors and windows now open to learners, educators, researchers, institutions, organizations, and governments today that were fully closed just a few short years ago. It is time to push on and make new discoveries and design novel pedagogical methods that can advance the various forms of online teaching and learning taking place around the planet today.

Conclusions

The education world entered a state of turmoil in early 2020 due to a public health pandemic that threatened the lives of nearly everyone on this planet. Instructors across educational sectors had to adjust their teaching practices, many of them in transformative ways never considered or contemplated. With those sudden and often transformative changes came interesting shifts in the research on online learning uncovered in this systematic review. However, by the spring of 2022, some two years later, there had been a significant reduction in deaths in the United States resulting from COVID-19 due to several viable vaccines, improved understanding of effective public health practices, and other factors. As deaths abated, a prevailing controversy about whether a controlled pandemic or endemic had emerged (Park, 2022). In fact, the Centers for Disease Control and Prevention (CDC) predicted that COVID-19 was likely to become an endemic disease soon (Charumilind et al., 2022). Accordingly, there will likely be additional adjustments and changes in teaching and learning in the post-COVID-19 era. As those adjustments occur, additional reviews of the online and blended learning research literature will likely be needed.

This systematic review examined the research trends in online learning during COVID-19 from February 2020 to April 2022. As shown, this review of 191 peer-reviewed journal articles published in English shed some light on the direction of online learning research during the initial years of the pandemic. The findings reveal that during this time more researchers focused their research efforts on online courses and instructors, especially the course technology utilized during the pandemic, and fewer of them concentrated on learner characteristics and learning outcomes as much as they had in the past. This is a marked shift in the research in a short span of time. However, learner engagement in online learning remained of high interest to online researchers and educators during the pandemic. New research topics regarding parent involvement, technology acceptance, and instructors' perceptions of online learning emerged during the pandemic.

As the pandemic subsides, it will be interesting to determine if the research topics in online education identified in this study will continue to be the areas of concentration witnessed in the relevant journals and publications. It will also be intriguing to see how these topics evolve over the next decade and in what directions. Future investigations should explore how the research topics evolve post-pandemic as new technologies, delivery mechanisms, and pedagogical practices are developed and refined. Whatever the direction, these are exciting times for online learning research and development as well as for those teaching in these continually evolving online environments.

Declarations
The authors declare no conflicts of interest in this research.
The data used and/or analyzed in the current study are available from the author upon request.

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Appendix: A

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Features of High-Quality Online Courses in Higher Education: A Scoping Review

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Abstract

What are the features of high-quality online courses in higher education? In this scoping review, we explore peer-reviewed scholarship related to the features of online learning in postsecondary contexts. We searched ERIC (EBSCO), Education Research Complete, and SocINDEX with Fulltext to retrieve peer-reviewed literature from 2010-2022 pertaining to features of online learning in higher education. Two reviewers independently conducted the initial title and abstract screening (n = 1,574), full text review (n = 483), and data extraction of the included articles (n = 38). Using thematic content analysis to explore the data extracted from each article, we found that the literature predominately included scholarship related to quality online course design, instructor facilitation in online courses, quality assessment of online courses, and student engagement in online courses. The breadth of these themes included a multiplicity of strategies and approaches to consider when designing online learning experiences. We recommend that administrators, faculty members, and instructors responsible for designing online courses and programs for postsecondary contexts continue to incorporate these considerations to promote high-quality and consistent online offerings. We conclude the review by presenting four high-level considerations to guide these discussions.

Keywords: Higher education, online learning, features, high-quality, course design

The last three years have witnessed immense growth in the demand for high-quality online learning in all education systems due to the global pandemic that shifted nearly all of us online (Bhagat & Kim, 2020). Now more than ever, the online learning scholarship that has flourished for more than two decades is in the spotlight, attracting new and experienced audiences and contributors in droves. The momentous growth of the field of online learning prior to and during these unprecedented times has resulted in a depth and breadth of research studies and associated information for educators to draw upon (Martin et al., 2020; Mayer, 2019; Greenhow et al., 2022). The current landscape of higher education has morphed into a diverse mix of face-to-face, fully online, and blended learning environments. As fully online courses and programs gain more prominence in higher education, a tremendous need exists to curate and synthesize the mountain of scholarship about online learning. What features of online learning create high-quality learning experiences for both students and educators in diverse contexts?

Broadly, high-quality online learning experiences provide stakeholders with an understanding of purpose, connection, and achievement through intentional course design, strategies, and interaction (Esfijani, 2018). Since the term "high-quality" is both subjective and nuanced, we approached this work with the understanding that scholars have identified and elaborated upon principal features of online courses that contribute to positive learning experiences for students and improve the teaching experience for educators. Contextually, features of high-quality online learning include specific frameworks that guide the creation and evaluation of online learning, such as the Community of Inquiry framework (Garrison et al., 1999), which defines quality teaching, social, and cognitive presences. We also utilized the Universal Design for Learning (UDL) framework (King-Sears, 2009), which explains that accessible tools and strategies can be implemented within the classroom to promote the success of all students. Third, we relied on the Quality Matters (QM) framework (Lowenthal & Hodges, 2015), which focuses on eight standards to evaluate courses. Features of high-quality online learning also encompass specific tools to engage students, such as synchronous chats, asynchronous discussion boards, video conferencing services, news forums or announcements, calendars, intelligent agents, automated email reminders, and adaptive quizzes and assessments. Feedback/assessment strategies and evaluation rubrics are also considered to be features of online learning in higher education. To design with these features in mind, the Online Learning Consortium Scorecard Suite (Online Learning Consortium, n.d.) has provided educators with a robust repository of online course design rubrics, checklists, and resources that have been developed based on best practices and evidence in the literature and practice.

To date, research about online learning in higher education has been predominantly focused on the systemic and structural components of online learning, such as evaluation frameworks for online learning (Hosiea et al., 2005), quality features of teaching and learning online (Keengwe & Kidd, 2010), virtual interactions between teachers and students (Wallace, 2003), and student engagement in online environments (Dumford & Miller, 2018). Since the start of the pandemic, online learning scholarship has expanded to include topics related to UDL in online classrooms during COVID-19 (Dickinson & Gronseth, 2020; Havens, 2020; Ntombela, 2022), strategies and tools to ensure quality online learning during the pandemic (Chu et al., 2021; García-Morales et al., 2021), and faculty development and responses to the immediate transition to online learning (Johnson et al., 2020; Tucker & Quintero-Ares, 2021). These recent contributions have highlighted the relevance of student-centered online course design and created possibilities for merging structural and interpersonal elements in online learning moving forward.

The recent reliance on online environments has increased our awareness of the need to create accessible, equitable, and inclusive learning experiences that reduce the barriers to student engagement and achievement of learning outcomes. As highlighted here, researchers and scholars dedicated time to these considerations prior to the pandemic and their work has gained renewed attention. For example, one may draw upon research conducted about increasing access to education for people living with disabilities through the adoption and creation of accessibility tools and technologies (Batanero et al., 2019; McKeown & McKeown, 2019). Such practices may help expand the utility or impact of the UDL framework to spotlight key accessibility strategies that have been previously used to support people living with disabilities and can be reimagined for use with students of all abilities.

While there is a preponderance of research and scholarship about instructional strategies and approaches to the design of online learning experiences, persistent gaps have been identified. Tuncay (2021) concludes that gaps in online education pertain to the capabilities of instructors to teach online and for students to learn online. As she stated, "the most accepted gaps are Internet gaps, age gaps, digital gaps, knowledge gaps, access gaps, economic gaps, and performance gaps" (Tuncay, p. 2). Interestingly, a 2019 study with award-winning instructors who taught online courses found that their ability to bridge these and other gaps contributed to their success as faculty members (Martin et al., 2019). By conducting this scoping review in which we synthesize key features of high-quality online learning, we hope to provide educators with access to high-impact strategies and approaches that may help them fill in these gaps in their teaching practice.

There is a paucity of systematic and scoping reviews that examine specific features of high-quality online learning in higher education institutions. Contextually, a systematic review focuses on the impact that treatments have on a specific outcome, whereas a scoping review seeks to uncover evidence regarding a specific topic through a comprehensive search of the available literature (Munn et al., 2018). Previous reviews that pertain to the high-quality features of online learning have predominantly focused on blended and hybrid learning (Anthony et al., 2020; Leidl et al., 2020), K-12 education (Cavanaugh et al., 2009), nursing programs (Leidl et al., 2020), and physical education (Killian et al., 2019). In our review, we set out to synthesize the key features of high-quality online learning experiences in higher education across disciplines using a scoping review framework.

Currently, online learning across all disciplines is a global reality for higher education institutions, and the authors presume that these environments will continue to be influential moving forward. The findings from this scoping review may be relevant to our audience of instructors, professors, course designers, and faculty members, as they outline key features of fully online courses essential for the quality engagement and success of student and faculty experiences in these courses.

Review Questions

The purpose of this review was to explore the features of high-quality online learning in higher education and to identify any existing areas of inquiry in the literature regarding these features for further investigation. This was the primary research question: What features of high-quality, fully online higher education courses have been identified in the existing literature?

Methods

Scoping Review

A scoping review is a type of knowledge synthesis that maps existing scholarship and literature across a broad topic for the purpose of identifying key concepts, gaps, and opportunities for further research (Munn et al., 2018). A scoping review follows similarly rigorous and transparent processes as systematic reviews; the key difference between them is that scoping reviews are intended to examine a broad body of scholarship on a topic whereas systematic reviews are intended to answer a focused research question based on a body of empirical literature. We adapted the Joanna Briggs Institute scoping review protocol for this study, comprised of the search strategy, inclusion and exclusion criteria, evidence screening and selection, data extraction, and synthesis (Khalil et al., 2020; Peters et al., 2020). The JBI protocol provides guidance on the organization of scoping review manuscripts, and we have organized our manuscript with the following sections in order: (a) abstract; (b) introduction; (c) review questions; (d) methods, including the search strategy, inclusion and exclusion criteria, source of evidence screening and selection, and data extraction; (e) results; (f) discussion; (g) recommendations and conclusions; and (h) conflicts and acknowledgements (Peters et al., 2020).

Search Strategy

The draft protocol was developed in collaboration with the research team, comprised of three graduate research assistants and a faculty member from a large research university in Western Canada. The first and fourth authors were responsible for the development of the protocol, including database searches and importing references into Covidence, an online screening and data extraction application, for review. The second and fourth authors independently reviewed the titles and abstracts of the references. Subsequently, the second and third authors independently conducted full-text screening, data extraction, and quality assessment (Khalil et al., 2020; Tricco et al., 2016). The first author engaged in consensus discussions and provided supervision of the search process, analysis, and synthesis.

Inclusion Criteria

We included peer-reviewed publications from 2010-2022 with a focus on fully online learning and course design in higher education in this review. In effect, a decision was made to focus on recent literature due to the exponential change and growth in the online learning landscape during the past decade. This focus also included changes in learning technologies and diversity of learning needs among students and educators. We considered qualitative, quantitative, and mixed methods studies about the features, principles, and/or characteristics of high-quality online learning in higher education, including university, two-year college, and trade and professional schools.

Exclusion Criteria

We did not include publications that focused on blended, hybrid, or flipped classrooms because we sought to focus on fully online learning environments. We excluded articles that were concerned with evaluating learning management systems (LMS) for the purpose of institutional adoption or decision-making, as those articles tended to focus on administrative functionality rather than student learning experiences. Moreover, we excluded articles focusing

on massive open online courses (MOOCs) because our focus was only on academic online courses offered in higher education institutions. Thus, we also excluded articles that focused on K-12 education, community education, and professional/corporate online training courses. Finally, we excluded dissertations and conference proceedings from our criteria, as we wanted to ensure that our sources were peer-reviewed articles published in academic journals.

Source of Evidence Screening and Selection

The research team developed the scoping review protocol and conducted the database searches between October 2021 and December 2021 (Table 1). Using five search strings with relevant keywords, we searched the following databases to identify relevant documents and literature: ERIC (EBSCO), Education Research Complete, and SocINDEX with Fulltext. The search strategy was limited by the following parameters: (a) articles published between 2010 and 2022; (b) full text available, (c) English only, and (d) peer-reviewed. We collected and imported 2,173 references to Covidence, a cloud-based platform that researchers use to conduct systematic, scoping, and other forms of evidence synthesis of scholarship and literature on various topics. Covidence has been designed to promote reliable and transparent evidence-syntheses by adhering to the PRISMA guidelines for conducting scoping and systematic reviews. The software removed 599 duplicates, leaving 1,574 references for title and abstract screening.

Table 1
Scoping Review Search Process

Stage	Details
Databases	ERIC (EBSCO)
	Education Research Complete
	SocINDEX with Fulltext
Search Terms	(high quality) AND (online teach*) OR (online learn*) AND principles AND features AND (high* educa*)
	Factors AND Quality AND E-Learning AND (high* educa*)
	Effective AND Features AND Online learning AND (high* educa*)
	Quality AND Features AND (online learn*) AND (high* educa*)
	Quality AND Features AND (Online Learn*) AND (high* educa*)
Inclusion Criteria	Full Text: Yes
	Date: 2010 to 2022
	Language: English-only
	Type: peer-reviewed; journal articles; books; book sections
	Education Level: Post-secondary; higher education; university; two-year colleges; trade or professional schools
	Focus: quality online learning; faculty and students' perspectives on quality online learning; online course design; instructional design
Exclusion Criteria	Education Level: K-12, community or professional/corporate training online courses
	Type: Dissertations, conference proceedings
	Focus: Blended/hybrid/flipped learning, MOOC

Data Extraction

The second and third authors independently conducted a quality assessment and data extraction for each of the 38 included articles. Once completed, they met to come to consensus for each component. We adopted the *JBI Critical Appraisal Checklist for Qualitative Research*
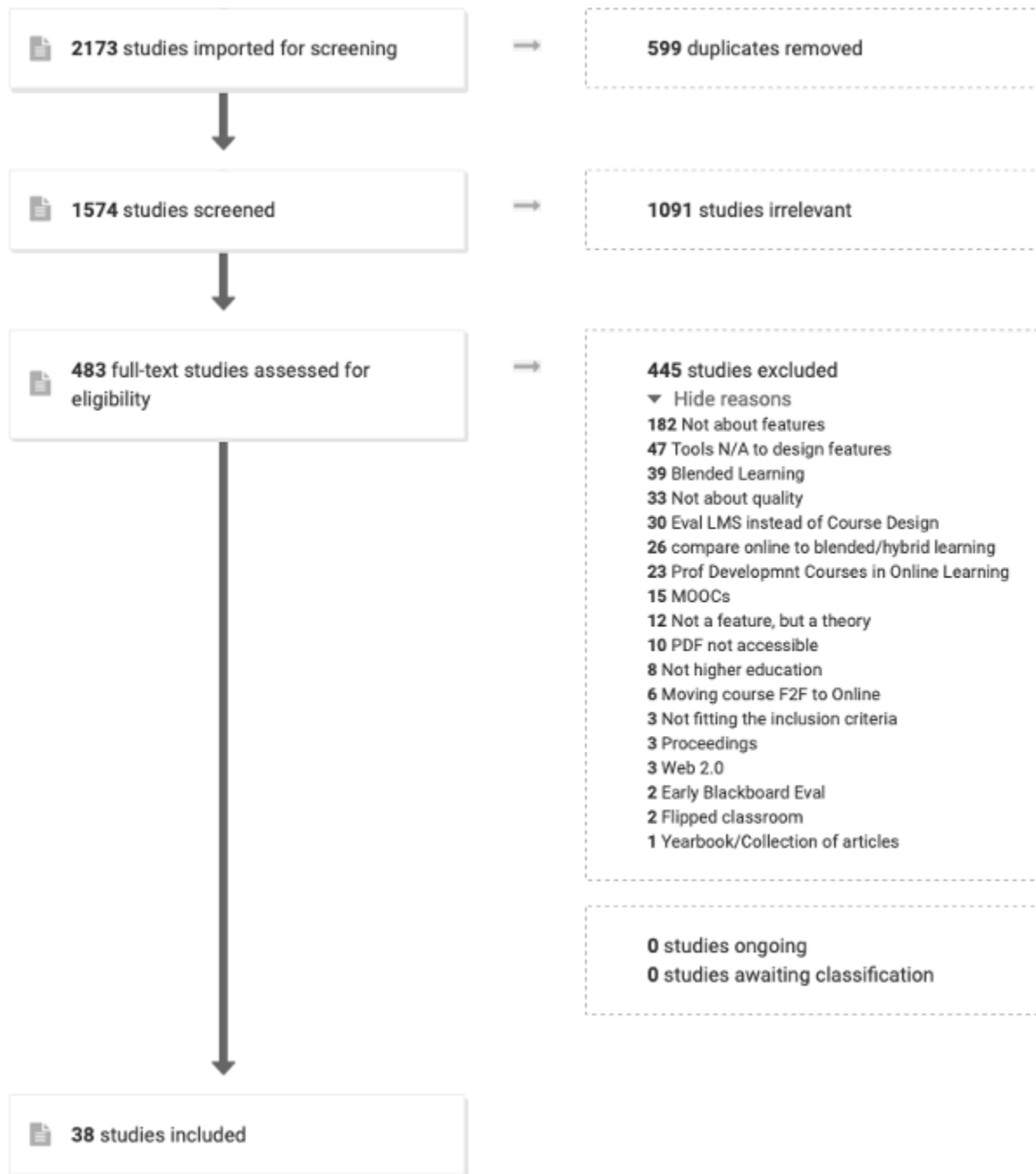
to determine the overall quality of the studies included in this review. The appraisal focused on congruence between the research questions, methods, analysis, interpretation, and representation of data, as well as ethical considerations such as the influence of the researchers on the study, the representation of participants' voices, and ethical approval for the research (JBI Global, 2020). These considerations were used to determine an overall assessment of quality of the included studies.

We used a pre-defined charting form to extract data from the included articles, specifically study characteristics (e.g., location, year conducted, etc.), methods (e.g., aims, study design, methods, analysis, etc.), participant characteristics, key findings, supporting evidence (e.g., quality of supporting evidence), and authors' conclusions (e.g., implications and recommendations). After the two independent reviewers had reached consensus on the data extraction, they exported the data to a spreadsheet and extrapolated the key findings from each study. Once complete, the research team conducted a thematic content analysis to identify themes within the key findings.

Search Results

Two graduate research assistants (both master's level) used Covidence to screen the titles and abstracts of 1,574 references. To ensure screening reliability and consistency, the two research assistants and the first author conducted a test screen of 100 references using the inclusion and exclusion criteria listed above. Upon completion of the test screen, the two research assistants independently screened each title and abstract to determine inclusion based on the inclusion and exclusion criteria and met to resolve conflicts and determine the final references to include for full-text review. After screening the title and abstracts, 483 articles were included for full-text review. Two research assistants followed the same inclusion/exclusion criteria for the full-text review. Of these 483 articles, 445 articles were removed because they did not meet the inclusion criteria (Figure 1). Following full-text review, 38 articles were included for data extraction.

Figure 1
PRISMA Diagram

2173 studies imported for screening	→	599 duplicates removed
1574 studies screened	→	1091 studies irrelevant
483 full-text studies assessed for eligibility	→	445 studies excluded ▼ Hide reasons

445 studies excluded
▼ Hide reasons
182 Not about features
47 Tools N/A to design features
39 Blended Learning
33 Not about quality
30 Eval LMS instead of Course Design
26 compare online to blended/hybrid learning
23 Prof Developmnt Courses in Online Learning
15 MOOCs
12 Not a feature, but a theory
10 PDF not accessible
8 Not higher education
6 Moving course F2F to Online
3 Not fitting the inclusion criteria
3 Proceedings
3 Web 2.0
2 Early Blackboard Eval
2 Flipped classroom
1 Yearbook/Collection of articles

0 studies ongoing
0 studies awaiting classification

38 studies included

Analysis and Synthesis

The authors used thematic content analysis to determine key themes within the included articles. Thematic content analysis is a process by which researchers examine qualitative data (e.g., written text or content) to identify patterns (Vaismoradi et al., 2013). These patterns are then presented descriptively, usually segregated by thematic terms or statements (Erlingsson & Brysiewicz, 2017; Sandelowski & Leeman, 2012). Two authors reviewed the key findings from the studies to identify initial patterns and recurrences within the data. The research team then met

to discuss and refine these initial themes, organizing studies according to similarities in content and focus. We identified four themes related to online course design within the findings of the included articles: (a) design, (b) technology, (c) evaluation, and (d) student engagement.

In accordance with the JBI framework for conducting scoping reviews, the results section was organized in the following manner (Khalil et al., 2020; Peters et al., 2020JBI citation). First, we provide an overview of the characteristics of the 38 articles included in this review. We then present a summary of the four themes, subthemes, and considerations identified in the literature. We conclude this section with a brief summary of the findings before discussing the implications of these findings for the features of high-quality online learning in higher education.

Results

Inclusion of Sources of Evidence

Nearly all studies included in this review were published between 2014 and 2021 (73.6%) and most were conducted in North America (68.4%). The most common study designs were qualitative (47.4%) and evidence synthesis (36.8%), encompassing systematic, scoping, and literature reviews.

Table 2

Study Characteristics

Characteristic		Count (%)
Year Published	2018-2021	14 (36.8%)
	2014-2017	14 (36.8%)
	2010-2013	10 (26.3%)
Study Design	Qualitative	18 (47.4%)
	Evidence Synthesis	14 (36.8%)
	Quantitative	3 (7.9%)
	Mixed Methods	2 (5.3%)
	Experimental	1 (2.6%)
Continent	North America	26 (68.4%)
	Asia	4 (10.5%)
	Not specified	3 (7.9%)
	Europe	2 (5.3%)
	Australia	1 (2.6%)
	Africa	1 (2.6%)
	South America	1 (2.6%)

Themes

We identified four distinct themes related to online courses in the 38 articles included in this review: (a) design, (b) instructors' facilitation, (c) student engagement, and (d) quality assessment. Most of the articles focused on the design (n = 15; 39.5%) and instructor facilitation (n = 12; 31.6%) in online courses, and both themes included the role and use of technology. Here, it is important to distinguish the role of technology in online courses from evaluations of

learning management systems (LMSs) for the purpose of administrative and information technology (IT) decision making for software adoption or rejection. The role of technology in online courses extends beyond the LMS to include the use of artificial intelligence agents, accessibility software, integration of third-party learning technologies, and use of non-academic technologies to enhance learning experiences. As such, we excluded studies that focused on the evaluation of specific LMS components and aspects, as they extended beyond the scope of this review. Other themes, less evident in the literature, were student engagement (n = 9; 23.7%) and quality assessment of online courses (n = 2; 5.2%). While only two of the included articles were about quality assessment of online courses, we found that the content provided in both articles were relevant to the scope of this review and provided important considerations for high-quality online learning. We summarize the themes, subthemes, and considerations for each subtheme in Table 3 for reference.

Table 3
Summary of Themes, Subthemes, and Considerations for High-Quality Online Course Design

Theme	Subthemes	Considerations
Design	Communication	• Multiple pathways for communication • Flexibility in roles • Promote peer-to-peer interaction • Timely feedback • Administrative support
	Frameworks	• Universal Design for Learning (UDL) • Universal instructional design • Community of Inquiry • Create a new framework
	Principles	• Collaborative pedagogies and competencies • Clear learning outcomes • Humanize and chunk course content
Facilitation	Asynchronous Discussions	• Personal anecdotes and emotion • Student-student collaboration • Discussions support course objectives • Constrained, anchored, and visualized environments
	Instructor Presence	• Timely responses and availability • Clear communication and instruction • Rapport with students • Encouragement instead of discouragement
	Feedback	• Constructive and personalized feedback • Outline the limitations of the student's work • Private messaging features
	Use of ICTs	• Surveys • Hand-raising functions • Interactive whiteboards • Chat rooms
Student Engagement	Use of ICTs	• Virtual reminders of deadlines • Combination of ICT tools internal and external to the institution • Wireless, accessible, able to be used by many students at once • PowerPoint presentations

	Course Organization	• Accessible course navigation • Class community and collaboration • Detailed expectations of the course in the syllabus • Multiple options to demonstrate knowledge
	Course Modification	• General changes to course design were favourable • Passive instructor presence and interaction was preferred by students
Quality Assessment	Assessment Rubrics and Framework	• Focus on evaluation instruments that assess course design and assessment, interaction, technology, accessibility, and collaboration. • Engage with course quality frameworks that examine policy, course design, interaction, and teaching practices.

Design of Online Courses

Fifteen (39.5%) of the studies discussed the design of online courses, specifically examining various frameworks and approaches that inform course design strategies. Additionally, principles noted by scholars as being beneficial to the design of online courses were also analyzed.

Communication Within Online Classrooms. Dalton (2018) posited that fundamental aspects of designing higher education online courses include multiple communication modes between instructor and student that instructors can contribute to frequently, flexible design features that all students can use, and multiple avenues for assessment. Additionally, Khan et al. (2017) and Martin et al. (2019) argued that discussion forums with explicit expectations, mentorship opportunities among students, and a flexible instructor role that adapts to the specific expectations of the classroom are key strategies in online course design. Notably, Kamlaskar and Killedar (2015) evaluated 10 online courses at a specific university, which promoted threee fundamental ideas: student-student and student-instructor interaction; the administration of feedback, specifically through email; and engaging with students through opportunities to exercise critical thinking. Further, Hadullo et al. (2018) conducted a qualitative literature review supported by interviews with higher education students and faculty to uncover the technological and administrative background required for effective course design. The results of this study specified that administrative support for students pertaining to enrollment and registration, academic advice, and the general description of the strengths of the university are all pertinent. From a faculty perspective, e-learning technicians are necessary to ensure that the digital organization and functions of a course operate smoothly.

Frameworks Creating an Online Classroom. Scholars also focused on the use of specific frameworks to guide the design of online courses. Both Dell (2015) and Houston (2018) explained that the UDL framework ensures that information is presented in multiple ways to ensure cohesive cognition of course content among all students. UDL can be implemented in a variety of forms, including closed captioning technologies for media with audio and screen readers for documents with text, which benefits those who live with disabilities and those who do not live with disabilities. Similarly, Elias (2010) evaluated their online course based on eight principles of universal instructional design, which revealed that virtual documents should have

accessible fonts and font sizes, cursor magnifiers, and text-to-speech features. In addition, she found that instructors should be aware of the physical capabilities of their students. Finally, Elias noted that discussion forums are effective for fostering efficient communication in classrooms. Similarly, deNoyelles et al. (2014) promoted the Community of Inquiry framework in their article, which demonstrated the importance of a strong cognitive, teaching, and social presence in the classroom to nurture community and critical thought among virtual students (Garrison et al., 1999).

Instead of proposing a specific framework to guide the design of online classrooms, Al-Aghbari et al. (2021) strove to create their own framework. Their process included evaluating current interaction among students, the effectiveness of one's current instructional design, how students are being evaluated, and the various modes in which students are being supported in their online studies. Further, the authors postulate the consideration of contextual logistics in the design of virtual classrooms, in that students' personal affairs can impact their participation in the classroom.

Principles in Designing an Online Classroom. Beyond design frameworks for online classes in higher education, scholars discussed various principles essential to consider when envisioning the design of online courses. For instance, Brown et al. (2013) noted that effective pedagogies, universal competencies, disciplinary knowledge, and effective connections among students and instructors are all overarching principles that should be considered when designing online courses in higher education. A year later, Afifi and Alamri (2014) conducted a literature review of the design of online courses, recommending that learning outcomes need to be clear, that different styles of learning are pertinent, and that feedback should be detailed yet administered quickly. More recently, McGuire (2017) and Baldwin (2019) used interviews with higher education instructors to reveal that humanizing and chunking course content increases student engagement, alongside the engagement that is fostered when utilizing course technologies to replicate in-person learning environments. In contrast to interviews, Jung (2011) employed qualitative surveys completed by higher education students to promote the importance of faculty development and support when undertaking the task of designing an online course, as such professional development is often important to faculty and students alike.

These 15 articles explored the multiplicity of designing online classes and the key considerations, strategies, and frameworks to be cognizant of when creating a digital higher education classroom. Broadly, the considerations of efficient feedback, discussion boards, and multiple forms of assessment were commonly noted. Many scholars also described the importance of using or creating an interface that is interactive and accessible. Regarding frameworks or models, it was not productive to identify only one as the quintessential framework or model, but instead to be aware that implementing frameworks or models that work for instructors and students contextually is beneficial to the virtual classroom.

Instructors' Facilitation in Online Courses

Twelve (31.6%) of the studies examined how instructors facilitated quality experiences within online courses. The main aspects of this theme include discussion forums, instructor presence, feedback, and information communication technology (ICT) tools.

Asynchronous Discussion Forums. Fear and Erikson-Brown (2014), Gao et al., (2013), and Tibi (2016) conducted literature reviews on the impact that asynchronous discussion forums had on the quality of higher education online learning. Two common themes from the instructor's perspective were the significance of instructors' use of personal anecdotes and emotion in these forums to humanize the content (Fear and Erikson-Brown, 2014) and urging students to support each other in their learning capabilities through exchanging knowledge and asking each other questions (Tibi, 2016). Further, the structure of online asynchronous discussion forums requires comprehensive expectations and guidelines to streamline the direction of topics being discussed (Tibi, 2016) and each forum must support the course objectives to ensure high-quality instruction (Fear & Erikson-Brown, 2014). Notably, Gao et al. (2013) described three forms of asynchronous discussion forums: constrained, anchored, and visualized environments. Constrained environments ensure that the topics of these forums are well organized and structured. Anchored environments, by contrast, include interactive functions for students to interact with as they engage in the forum. Finally, visualized environments give students the ability to view the relationships among discussions through visual media. Additionally, the authors posited a fourth type of asynchronous discussion environment, which combines aspects of two or more of these environments together to uphold quality standards of online learning.

Instructor Presence. To examine the features of instructor presence, Baker (2010) and Hodges and Cowan (2012) conducted surveys for undergraduate students to express their perspectives of the aspects of quality instructor presence. Baker's (2010) survey revealed that comparatively, instructor presence and immediacy was high in synchronous online learning environments and instructor presence and immediacy was low in asynchronous online learning environments. Hodges and Cowan's (2012) survey determined four key components of quality instructor presence: (1) timely responses, (2) clear communication and instruction, (3) instructor availability, and (4) the design and layout of the course.

Other research on instructor presence includes Ladyshewsky's (2013) case study that examined course evaluations from a graduate course to inform their analysis. The author discovered that the instructor's ability to nurture a class community was perceived as more important than the overall design of the course, and that instructor-student interaction increased student satisfaction in the classroom. Further, Vlachopoulos and Makri (2019) conducted a framework study which revealed that the instructor can be impactful in the following ways: encouraging and facilitating active learning, reciprocity between instructor and student, and clear expectations of the course; acknowledging that all students learn differently; and administering detailed and efficient feedback. Similarly, Baghdadi's (2011) literature review focused on general features pertaining to the online classroom and found that instructor presence should strive to establish a balance between always being available immediately and not at all.

Feedback. Regarding feedback as an important aspect of higher education online courses, Steele and Holbeck (2018) conducted a literature review explaining that personalized feedback was crucial for student satisfaction. Particularly, feedback should be communicated in a constructive manner that mentions the limitations of the student's work but simultaneously assures the student that they can perform better in the future through implementing specific strategies into their work.

ICT Tools. Diverse ICT tools were also mentioned as key aspects of online courses in higher education. MacKinnon et al. (2020) mentioned that private notes and messaging features embedded within virtual classes is a feature that maintains confidentiality and encourages class participation in multiple ways. Jaggers and Xu (2016) asserted that interaction and technology were key components in improving students' successful completion of online courses. Using an instructor's perspective, Dusing et al. (2012) isolated key ICT tools that benefitted the higher education virtual classroom and helped to foster community, including chat rooms, interactive whiteboards, surveys, and hand-raising functions.

Generally, the 12 aforementioned articles have established that instructors' facilitation of quality in online courses in higher education improve the quality of learning for the students who engage with these courses. Discussion forums are a useful tool that encourage community building and knowledge sharing among students, which is predicated on the facilitation of these environments from the instructor. Instructor presence, although complex, requires the instructor to interact with students within their own boundaries and assure and support students in their experiences within and beyond online classrooms. Ideally, feedback should be administered in an efficient and detailed fashion and rely on how the student accepts feedback, which proves to be difficult when students have diverse needs. Finally, multiple ICT tools can be used in the classroom to benefit students' learning and performances within higher education online classrooms.

Student Engagement in Online Courses

Nine (23.7%) of the included papers discussed student engagement and participation in online classrooms in higher education, specifically, students' experiences with information and communication technology (ICT) tools, course organization and expectations, and general interactions with the course, including interactions with faculty and students.

Student Perceptions of ICT Tools. Çakýroðlu, (2014) and Jiang et al. (2019) both used qualitative surveys completed by undergraduate students which resulted in great insight into the recognition of ICT tools in the virtual classroom. More specifically, Çakýroðlu (2014) reported that text and video reminders of upcoming course deadlines were impactful to students, and although sometimes there were technological problems in the classroom, the students were able to overcome these barriers. Jiang et al. (2019) further contributed to this area of research by outlining ICT tools that students seek out themselves to further their own learning, including YouTube videos, Khan Academy, peer study groups, supplemental books, and the search engine Google. Further, the authors specified that the most impactful ICT tool in the virtual classroom was PowerPoint presentations, as students perceived these to be the most influential instructional mode that improved their learning. From a different perspective, Amemado (2014) conducted interviews with higher education faculty members about the impact that ICT tools had in their classrooms and the reasons these tools were created. The responses indicated that quality ICT tools should be wireless, adaptable for all students and faculty members alike, easy to use, and have capacity for use by many students at once. They should also Web 2.0 tools, interact with learning management systems, and a mix of asynchronous and synchronous tools.

Student Perceptions of Course Organization. To uncover students' perceptions about how the course was organized, Fayer (2014) and Zhang et al. (2020) examined survey responses from undergraduate students. Fayer (2014) posited that the three key components of online

courses as noted by students were the organization of the course, instructor feedback, and relevance of the course content to the course objectives. Similarly, the results of the survey that Zhang et al. (2020) administered to undergraduate students shared the same sentiments. Students stated that course navigation, application of the course content to their everyday lives, and course objectives are key beneficial components to students. Conversely, Secret et al. (2016) collected data from graduate students who completed course evaluation surveys and course reflection papers to garner an understanding of students' expectations of quality online courses. The results demonstrated that comprehensively articulated expectations of class community and behaviour were impactful to students, alongside participatory group discussions that included all members of the group. The online format of this classroom was supported because students stated that they felt more comfortable participating in online course discussions in comparison to in-person class participation. Along these lines, Rao and Tanners (2011) collected qualitative and quantitative course evaluations from graduate students, which specified key organizational features of online courses: a clear and concise syllabus, detailed expectations of the course, short weekly assignments and weekly reminders to complete these assignments, and multiple options to demonstrate and receive knowledge.

Student Perceptions of Course Modifications. Generally, modifications to the course were perceived as positive, as demonstrated by surveys that Carr et al. (2014) administered to higher education students. In other words, implementing general changes to the course created a variety of avenues for student interactions. Likewise, Rasmussen et al. (2018) also conducted a survey with higher education students; however, they focused on the interactions between students and instructors. In their study, students indicated that instructor presence and interactions with instructors were perceived as beneficial for student learning, yet meeting the instructor virtually was not noted as a key component of the course.

Student engagement in higher education online courses is comprised of their perceptions of the aspects and organization of these courses, and the interactions that they have within these courses. Contextually, the ICT tools within and outside of virtual classrooms are generally perceived as beneficial to student learning when they are created and implemented successfully. Further, the organization of the course is important to students, as they feel more comfortable interacting with other students due to the virtual organization of the course, especially when the course content aligns with the course objectives and applicable skills. In addition, general interactions with the course and the instructors are perceived as positive, especially when the course undergoes helpful modifications to adapt to students' needs.

Quality Assessment of Online Courses
Two (5.2%) articles detailed the importance of quality assessment of online courses and programs as a principal component of the design and delivery of high-quality online courses, achieved using rubrics and frameworks.

Assessment Rubrics and Frameworks. Baldwin et al. (2018) and Pedro et al. (2020) conducted Google searches to find different rubrics and frameworks to isolate the key features that need to be evaluated in online courses to ensure continuous quality; yet, the researchers focused on different modes of evaluation. Baldwin et al. (2018) researched the application of six different course evaluation instruments that were commonly used in the United States. Although each of the evaluation instruments focused on a combination of various aspects of the online

course, course design, assessment, interaction, collaboration, accessibility, and technology were the commonly reported facets that these instruments focused on. In contrast, Pedro et al. (2020) researched 13 online quality assurance frameworks that investigate specific services and features of online courses that can be evaluated. The findings of this article detail that faculty development in policy, course design, interaction, and teaching was a commonly reported quality assurance factor within most of the frameworks. Further, administrative services for both faculty and students were another factor that determined the quality of the experiences in online courses.

Summary

Four major themes emerged in from the research regarding online courses within higher education, including: a) effective course design, b) the role of instructors in facilitating quality experiences, c) student engagement, and d) quality assessment. The first theme detailed important qualities of successful course design including ensuring multiple pathways for communication, timely feedback, and administrative support. Additionally, the research highlighted the use of frameworks to support the design of online courses, such as utilizing Universal Design for Learning principles or the Community of Inquiry framework. The research also emphasized various principles that are essential when designing online courses including designing collaborative pedagogies and competencies, creating clear learning outcomes, and humanizing and chunking course content for student accessibility and ease. The second distinct theme the researchers examined was the role of the instructor in facilitating quality experiences. In fact, the research emphasized the essential role of the educator within asynchronous discussions, constructive and personalized feedback, strong instructor presence, and encouraging the use of information and communication technology (ICT) tools. The third theme was student engagement within online courses, and more specifically, students' perceptions regarding the uses of ICT tools, course design, and course modifications. Students were found to be more engaged in class if all the components of the online classroom were accessible, easy to use, and fostered collaboration with other students. The final theme was that of quality assessment, specifically, the use of course evaluation rubrics and frameworks to ensure quality instruction and design of online courses. Key aspects of the online classroom assessed by these rubrics and frameworks include policy, assessment, student-student and student-instructor interaction, accessibility, and technology.

Discussion

In this scoping review, we identified and analyzed articles focused on the design of online courses with the intention of identifying prominent features of high-quality online learning in higher education institutions. Thematic grouping allowed us to identify four key themes: (a) design, (b) instructor facilitation, (c) student engagement, and (d) quality assessment. From these four key themes, we identified four areas where instructors could integrate these features of high-quality online courses in their teaching: (a) collaboration, (b) information and communication technology (ICT) tools, (c) instructor presence and availability, and (d) the role of frameworks in online learning.

Collaboration

Collaboration in online learning environments was identified across all four themes to be critical to student success in online learning (Al-Aghbari et al., 2021; Amemado, 2014; Baldwin et al., 2018; Dusing et al., 2012; Kamlaskar & Killedar, 2015). However, the articles

implemented and suggested various classroom design strategies that spotlighted collaboration. In other words, the authors could not isolate one comprehensive design strategy that was the most effective when integrated within their online learning environments. Although a singular collaboration strategy would be beneficial, the authors recognized that collaboration is not monolithic. Instead, a combination of strategies is contextually necessary in course design to ensure a quality virtual experience. Further, instructors' approaches for the implementation of collaboration strategies need to be concisely articulated to ensure positive impact on student success.

Once instructors recognize strategies that benefit their unique online classroom, they will be able to facilitate effective students-student and student-instructor collaboration. These strategies will also improve upon student engagement, as students will learn from both instructors and fellow students. Finally, collaboration with administrative services and other faculty members through faculty development and course quality assessment are impactful, as it becomes difficult to determine effective approaches to quality online learning independently. Thus, perspectives across faculties can be impactful to gather different approaches in fostering these forms of collaboration in the online classroom. We suggest that future research focus on the evaluation of these collaboration strategies and how they operate in diverse virtual learning environments.

Information and Communication Technology (ICT) Tools

The use of information and communication technology (ICT) tools was also identified as an effective area that instructors employed to improve upon course design and student engagement in the online classroom. The broad impacts that ICT tools had within the virtual classroom included accessibility (Dell, 2015), student-student interaction and student-instructor interaction (Baldwin, 2019), feedback (Kamlaskar & Killedar, 2015), and student participation (MacKinnon et al., 2020). Although student success was common due to the implementation of ICT tools, no discernable tool was the most effective for high quality online learning. Thus, multiple ICT tools may be necessary for high quality online learning in higher education. One potential avenue for future research regarding ICT tools could focus on educator and faculty literacy on effective utilization of these tools to facilitate student engagement and effective course design. In addition, uncovering specific contexts in which diverse combinations of ICT tools could be applied would also be potentially impactful as it could evolve into an ample repository of these impacts. Similarly, further research could also investigate student literacy of ICT tools to make salient any correlation found between ICT tool use and student success when engaging with online class material.

Instructor Presence and Availability

Instructor presence and availability was present within all four themes, as many of the articles reported on the importance of instructor presence and availability as a key aspect of student success (Baghdadi, 2011; Baldwin et al., 2018; deNoyelles et al., 2014; Rasmussen et al., 2018). Positive outcomes related to instructor presence were often articulated, yet further research is still necessary to understand to what degree instructor interaction and presence is sustainable since diverse magnitudes exist as to how an instructor demonstrates her availability within the design of her course. In other words, finding an appropriate balance of instructor interaction and presence within online learning is vital to explore. Further, future research should also consider the instructor's impact on their students and the impact that additional educators,

such as teaching assistants, tutors, or other intelligent agents, have on instructor presence and availability concerning the quality of education of students, as that was not a commonly reported aspect of online courses in the literature. This suggestion includes reassessing course expectations and outcomes to ensure that the inclusion of additional stakeholders within the classroom will be beneficial towards the virtual classroom. Further, this research could help determine what strategies could be recommended to ease the workload of instructors, while simultaneously increasing the quality of online course offerings.

Role of Frameworks in Online Learning

Findings from this review suggest that implementing effective frameworks into the classroom is imperative to successful online learning environments (Çakýroðlu, 2014; Houston, 2018; Pedro et al., 2020; Vlachopoulos & Makri, 2019). Several approaches to these frameworks include cohesive and well-structured discussion forums that allow for collaboration and student interaction, effective use of learning management systems, encouraging and enabling active learning through various technological tools, and student satisfaction through listening to their feedback. However, online learning frameworks encompass diverse directions and ideas towards quality online learning and should be utilized as suggestions to best fit the contextual classroom that an instructor is leading. Therefore, more research is needed to understand the effectiveness of certain strategies in specific virtual contexts that nurture purposeful implementation of these key framework approaches. In addition, certain studies revealed the technological and administrative background required for effective course frameworks (Hadullo et al., 2018; Pedro et al., 2020) which many educators may not possess. Thus, future research on quality professional development or training would be essential in ensuring consistent implementation of these strategies.

Summary

In summary, we found that collaboration within online learning was an expansive area of online courses as it comprises collaboration between instructor and student, student and student, and student and course (Baldwin, 2019; Kamlaskar & Killedar, 2015). A few strategies expedite and improve upon collaboration in online courses, such as asynchronous discussion boards, course announcements, and accessible navigation through online platforms. Further, ICT tools were key indicators of quality in online courses as they are utilized for diverse features of the course: student satisfaction (Amemado, 2014; Jiang et al., 2019), fostering community (Dusing et al., 2012), and upholding the Universal Design for Learning framework (Dell, 2015). Instructor presence and availability was also notable within the features of high-quality online learning, as there are diverse ways to demonstrate instructor presence, including: response time, availability, and clear instruction (Hodges & Cowan, 2012); feedback, frequent posting, and extending invitations for students to engage in discussion (Jaggers & Xu, 2016); and combining social, cognitive, and teaching presence into the virtual classroom (deNoyelles et al., 2014).

Finally, the use of frameworks in designing online courses was central to students' satisfaction with their online learning experiences (Carr, 2014; Fayer, 2014; Rao & Tanners, 2011). Additionally, the way that information is presented also expands upon the quality of online courses (Dell, 2015; Elias, 2010; Houston, 2018). In this section we suggest potential avenues of future research, while also recommending that higher education educators, course designers, policy makers, and administrators consider the findings within this scoping review when evaluating, designing, and restructuring their own online courses.

Recommendations

Based on the findings from this scoping review, we recommend that educators who design and/or deliver online courses and programs consider the significant time and human/technological resources necessary to ensure the quality of their course design, use of ICT tools, approaches to student engagement, and strategies to evaluate their courses. To respond to these considerations, dedicated technological support and teaching development opportunities are crucial to benefit educators' confidence and ability to teach online, as educational knowledge and strategies continue to change as online education evolves. Thus, it is recommended that administrators, teaching and learning support staff, and centres for teaching and learning consider how best to provide these forms of support to instructors and faculties so they can deliver quality online learning experiences for their students.

Further, we recommend that stakeholders collaborate and seek knowledge by other higher education institutions because, as previously noted, there is no singular way to approach learning. However, it is always impactful to continue growing a repository of learning knowledge to implement strategies that best fit one's specific classroom. Moreover, the level of instructional competence in the use of online education tools impacts collaboration, instructor presence and availability, and the frameworks that inform the creation and design of online classrooms. Thus, we recommend that instructors consider disciplinary and pedagogical priorities related to the provision of improving upon these areas to develop a consistent approach that can be integrated into various online offerings while promoting academic autonomy for instructors.

Conclusion

Through a comprehensive scoping review, we asked, "what features of high-quality, fully online higher education courses have been identified in the existing literature?" Our findings suggest that high-quality online courses are predicated upon four themes: course design, instructor facilitation, student engagement, and quality assessment. From these themes, instructional preparation and presence, course design frameworks and approaches, collaboration, and ICT tools were four identified features that reinforce effective online course design and delivery. In summary, the development and sustainability of high-quality online learning experiences is impacted by the administrative commitment to providing the requisite technological, pedagogical, and human resources to design, deliver, and evaluate online courses and programs.These considerations must be continually expanded upon in the future to improve the quality of higher education online learning.

Declarations

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A Systematic Review of Research on Online Learner Collaboration from 2012–21: Collaboration Technologies, Design, Facilitation, and Outcomes

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Abstract
Online Learner Collaboration (OLC) supports the development of knowledge and skills through social construction. In this systematic review of research spanning a decade, authors examined 63 articles for publication patterns, participant and context trends, and research methodology trends using an online learner collaboration framework consisting of the following elements: collaborative technologies, design, facilitation, and outcomes. The higher education context and education discipline had the most research conducted on OLC among the studies reviewed. All three research methods (quantitative, qualitative, and mixed methods) were used equally in the articles. The most commonly used technologies for OLC were learning management systems (LMS), discussion boards, writing tools, and synchronous tools. The most commonly used collaborative methods were group projects and discussions. The most common grouping size was small groups, and groups were commonly formed through random assignment, based on criteria, or student-formed. Instructors mostly assumed roles as designers, facilitators, supporters, and evaluators during OLC. Increased learning, communication and collaboration skills, and relationship building were the top three opportunities that OLC offered. Time, technical issues, and anxiety/fear/stress were challenges that appeared most frequently. Most of the research on OLC focused on cognitive and affective outcomes. The review has implications for online instructors and instructional designers who design and facilitate collaborative online courses.

Keywords: Online learner collaboration, virtual collaboration, systematic review, collaboration design, collaboration facilitation, collaboration outcomes

Collaboration is routinely identified as an important skill in various job descriptions (Martin, et al., 2021) and is required of most professionals in all fields (Marutschke et al., 2019). Remote employment increasingly requires virtual collaboration as a crucial skill for college graduates. Technology affordances have developed such that learner collaboration can occur effectively and virtually, resulting in individual, group, and organizational success (Mitchell, 2021). The online learning environment is an ideal environment to teach virtual collaboration skills in higher education to better prepare students for a virtual collaborative working environment. Online learning has continued to increase in higher education institutions. According to the National Center for Education Statistics (2022), 11.8 million undergraduate students were enrolled in at least one online course, and 7 million were enrolled exclusively in online courses in the fall of 2020. The number of undergraduate students enrolled exclusively in online courses was 186% higher in 2020 than in 2019. One way to teach virtual collaborative skills is by incorporating collaborative learning activities to provide online opportunities for students to practice these skills. Researchers define online learner collaboration as student interaction that supports socially constructed meaning and the creation of knowledge (Palloff & Pratt, 2010). Student collaboration around shared goals can be designed and facilitated in various ways depending on the desired learning outcome. Some methods of learner collaboration include cooperative learning activities, group projects, case studies, peer reviews, debates, and discussions. All of these methods can be incorporated into online course design and delivery. Cooperative and collaborative learning are often used interchangeably but have distinct differences. Cooperative learning has more specific and structured methods of implementation (Panitz, 1999). For the purposes of this study, cooperative learning is considered a type or subset of collaborative learning. In addition, the focus of this review is on learner collaboration in online settings, and not broadly in all computer-supported settings. While Computer Supported Collaborative Learning (CSCL) could be used in face-to-face, blended, and online contexts, the focus of this review was learner collaboration specific to the online setting.

The effectiveness of collaboration in online learning has been explored in research in various ways. Means et al. (2009) conducted a meta-analysis and review on the effectiveness of online learning and found larger positive effect sizes for studies that included online learner collaboration as opposed to individual work. More recently, research has found that collaborative learning activities in the online environment increase students' motivation (Ozkara & Cakir, 2020), engagement (Alahmari, 2019), and achievement (Yunus et al., 2021). Overall, well designed and implemented online learner collaboration has been found to be beneficial for online learners in achieving learning outcomes and enhancing engagement.

However, challenges exist with online learner collaboration as well. Kauppi et al. (2020) studied the benefits and challenges of working and creating knowledge together, virtually, in a multidisciplinary group, and discussed students' need for guidance and support and the limitations of learning management systems. Similarly, Demosthenous et al. (2020) drew attention to the challenges of overcoming students' anxiety and low self-efficacy beliefs when working collaboratively online. Paterson and Prideaux (2020) suggest that challenges to collaboration and cohesion in online group settings can be overcome through intentionally applied design elements and a student-centric pedagogical approach.

Theories and Frameworks Used

Several theories and frameworks have been used to explore various aspects of online learner collaboration, all of them grounded in social constructivism which suggests that social

interaction plays a significant role in learning (Vygotsky, 1978). Collaborative learning creates an environment in which social interaction is more likely to occur. Online collaboration requires that learners collaborate completely virtually through various types of technological mediums. Table 1 presents some of the theories and frameworks used to examine online learner collaboration along with the major elements of each. The primary elements of the top three are often presented in Venn diagrams to show that the elements overlap to create an effective educational experience. The Online Collaborative Learning theory is presented more linearly and is concerned more with the process of how collaboration occurs.

Table 1
Frameworks Used to Examine Online Learner Collaboration

Framework Name	Framework Components		
Computer Supported Collaborative Learning (CSCL)	Computers	Collaboration	Learning
Community of Inquiry (COI)	Teaching Presence	Social Presence	Cognitive Presence
Three Types of Interaction	Learner to Instructor	Learner to Learner	Learner to Content
Online Collaborative Learning (OCL)	Idea generating	Idea organizing	Idea Convergence

Previous Systematic Reviews or Meta-Analyses on Online Learner Collaboration

Systematic reviews and meta-analyses have been conducted on online learner collaboration using all these frameworks. Previous systematic reviews and meta-analyses have focused on specific aspects related to online learner collaboration. These are summarized within each of the framework sections below.

Computer Supported Collaborative Learning (CSCL)

Computer Supported Collaborative Learning (CSCL) is defined as learning experiences mediated by technologies where small groups of learners interact to solve a complex problem (Johnson, Johnson & Stanne, 2000). CSCL has proven to be effective in various disciplines. For example, Jeong et al. (2016) conducted a meta-analysis on the effects of CSCL on STEM learning with 143 studies and 316 outcomes. Effect sizes were moderate (0.51) but notable. The largest effect size was on process outcomes followed by knowledge outcomes, then affective outcomes. These outcomes were moderated by types, learning levels, and domains of learning. The conclusion was that no single one-size-fits-all approach to implementing CSCL effectively in STEM learning exists. Other researchers have compared CSCL methods such as Radkowitsch et al. (2020) who conducted a meta-analysis of 53 primary studies comparing the effects of scripted CSCL versus unguided CSCL moderated with motivation, learning, and collaboration skills. The effect sizes were moderately positive (Hedges g =.72) for collaboration skills and a small positive effect on motivation (Hedges g = 0.24).

While these studies signal that CSCL is well researched, it is a broad framework that encompasses any instructional delivery medium in which computers can support collaborative learning. Online learning is included in that broad umbrella along with face-to-face and blended delivery methods.

Community of Inquiry (CoI)

The Community of Inquiry (CoI) framework was created to explain a quality online or blended learning experience (Garrison et al., 2000). The three major components are social presence, cognitive presence, and teaching presence. These components overlap to create an online learning experience that results in deep and meaningful learning. Researchers have explored the CoI's effects on various learning outcomes. For instance, Martin et al. (2022) conducted a meta-analysis of 13 studies on CoI presences and their correlations with learning outcomes, actual learning, perceived learning, and satisfaction. Strong correlations were found between cognitive presence and perceived learning (r=.663), cognitive presence and satisfaction (r=.586), and teaching presence and satisfaction (r=.510). The CoI framework contains a survey instrument often used in online learning research as an outcome measure to assess the presence of community. Stenbom (2018) conducted a systematic review regarding the use of the CoI survey and found it to be a valid and reliable measure that can be used to study the existence of community in online learning experiences. The CoI framework and presences are key for building and measuring quality online learning experiences. However, these experiences may or may not include collaboration.

Three Types of Interaction

The three types of interaction developed by Moore (1989) include learner-to-learner, learner-to-instructor, and learner-to-content interactions. A quality online course would ideally contain all three types of interaction throughout the course. Bernard et al. (2009) conducted a meta-analysis of the three types of interaction with 74 studies and 74 achievement effects. The results supported the importance of the three types of interaction and their effects on achievement outcomes (0.38). Borokhovski et al. (2012) reviewed a subset of 32 of Bernard's research studies on contextual and designed interaction treatments in distance education settings. According to Borokhovski and his colleagues, contextual interactions refer to environments when interaction conditions are present, but interactions among participants are not intentionally designed but student initiated. Designed interactions are intentionally implemented in collaborative instructional conditions for the purposes of improved learning outcomes and instructor guided. The results of their study suggested that the most effective student-to-student interaction treatments in online learning are designed and implemented intentionally to provide students with opportunities to work collaboratively. The presence of interaction, however, does not necessarily ensure that collaboration occurs.

Online Collaborative Learning

The Online Collaborative Learning theory focuses specifically on collaboration in the online learning context. Harasim (2012) discussed the three intellectual phases of online collaborative learning from idea generation and idea organization to the intellectual convergence stage. Approaching meta-synthesis from the theoretical perspective of online collaborative learning, Mnkandla and Minnaar (2017) concluded that shared space for discourse and interaction provided by social media is central to collaborative learning and knowledge building.

There was an emphasis on the importance of student support since support is vital to collaboration, especially in online settings. Cherney et al. (2018) used meta-synthesis techniques on 41 articles to investigate online collaborative learning and found inconsistent definitions, methodological issues, and a lack of interdisciplinary contributions. They recommended further research on group processes in online learning with stronger empirical methodology and various disciplines to glean practical suggestions for online course instructors and students.

Other online learner collaboration review articles focused on specific technological tools such as 3D virtual learning environments (Reisoğlu et al., 2017), Wikis (Deng, 2018), online collaboration competencies for higher education students (Kolm et al, 2022), and teamwork construction in e-learning (Abid et al., 2016). Table 2 summarizes the review studies on online learner collaboration based on the different frameworks.

Table 2
Summary of Review Studies

Authors	Review Focus	Type of Review	Number of Studies
Jeong et al.	Computer Supported Collaborative Learning	Meta-Analysis	132
Radkowitsch et al.	Scripted CSCL versus unguided CSCL	Meta-Analysis	53
Martin et al. (2022)	COI Presences on Learning Outcomes	Meta-Analysis	13
Stenbom (2018)	COI Survey to build Community	Systematic Review	103
Bernard et al. (2009)	Effects of Interaction	Meta-Analysis	74
Borokhovski et al. (2012)	Learner-Learner Interaction	Meta-Analysis	32
Mnkandla and Minnaar (2017)	Use of social media in e-learning	Meta-Synthesis	6
Cherney et al. (2018)	Online Course Student Collaboration	Meta-Synthesis	41
Reisoğlu et al., 2017	3D virtual learning environments in education	A meta-review	167
Deng (2018)	Participatory Learning through Wikis	Systematic Review	108
Kolm, et al, 2022	International Online Collaboration Competencies	Systematic Review	14
Abid et al. (2016)	Teamwork Construction in E-learning	Systematic Review	12

Framework for Online Learner Collaboration Research

Building on the various research studies and reviews, we developed the following framework to guide this systematic review specifically focused on the design, development, technologies, and outcomes of collaborative learning in online learning contexts. The Online Collaborative Learning (OCL) framework (see Figure 1) includes four components: (1) Collaboration Technologies, (2) Collaboration Design, (3) Collaboration Facilitation, and (4) Collaboration Outcomes which are briefly introduced.

Collaboration Technologies.

Collaboration technologies are the medium learners use to collaborate on tasks in the online learning environment. These technologies differ depending on the delivery method of the course. For instance, synchronous delivery methods may use a whiteboard or a breakout room for student collaboration whereas an asynchronous environment may incorporate technology such as Google Apps or Learning Management Systems tools to allow learner collaboration.

Technologies used for collaboration have been researched in various ways. For instance, Hernández-Sellés et al. (2019) explored the relationship between interaction, emotional support, and online collaborative tools, and found that collaborative tools had a positive influence on group interactions and emotional support. Biasutti (2017) compared the use of forums and wikis for collaborative learning and found that each tool had its own benefits and challenges regarding processes and functions. Wikis were used to produce content collaboratively, whereas forums were used to infer, evaluate, organize, and support while discussing and sharing ideas.
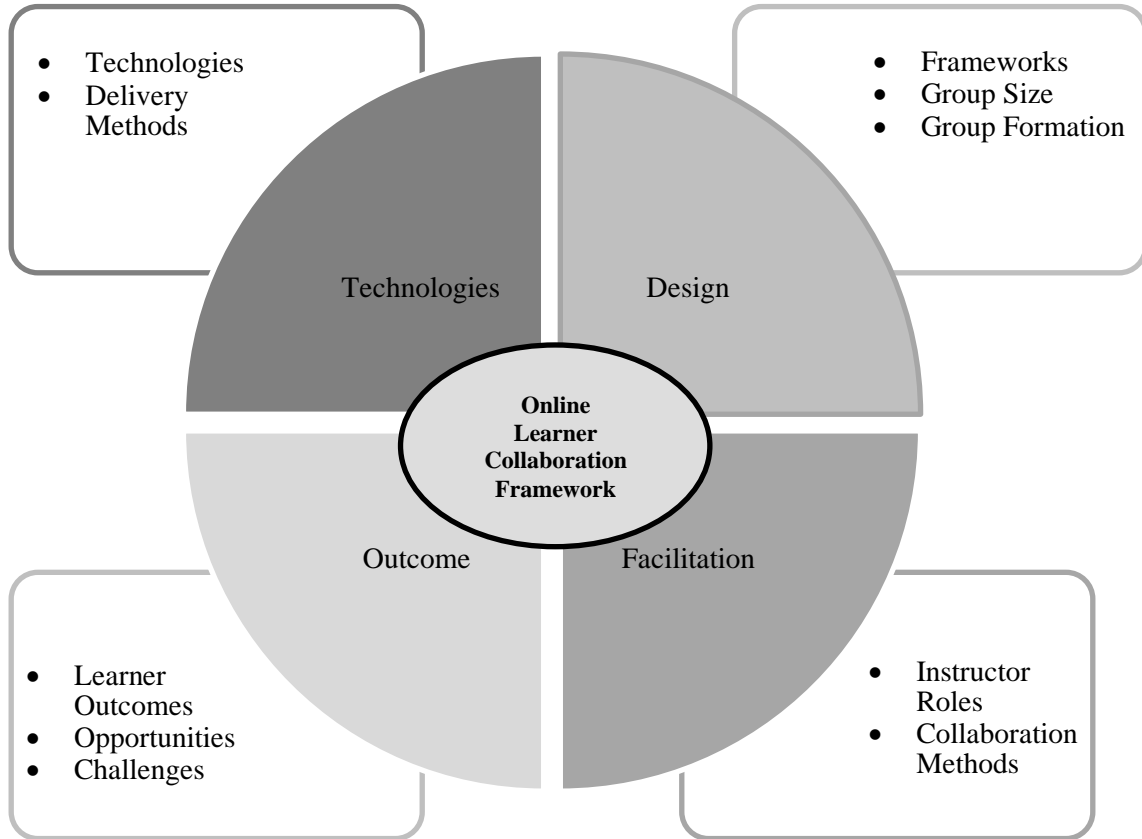
Collaboration Design. Collaboration design refers to how instructors foster collaboration through the design of online learning activities. The design of the activities includes frameworks used, group size, and group formation strategies. The design of online collaborative activities has also been explored to determine effectiveness. Zheng et al. (2020) used a design-centered research approach to investigate the alignment of the design and enactment of online collaborative activity. The alignment significantly improved in the second iteration after optimizing the design, which improved group performance. The results were used to produce a design framework that includes the following elements: goals, tasks, interactive approach, resources, and assessment methods.

Collaboration Facilitation. Collaboration facilitation refers to how instructors support and guide students during online collaborative activities and the methods they use. Altowairiki (2021) analyzed the process of online collaborative learning and found that social, pedagogical, and technical support play critical roles in facilitating successful online collaborative learning experiences. Zheng et al. (2019) explored the effects of metacognitive scaffolding on group performance and cognitive load. The metacognitive scaffolding significantly impacted group behavior and performance but did not increase cognitive load.

Collaboration Outcomes. Outcomes of online collaborative learning experiences refer to how successful the learning experience was and how that success was measured. For instance, Kurucay (2015) measured student perceptions of collaboration, sense of community, satisfaction, and perceived learning in two courses. One course had collaborative assessments while the other had individual assessments. They found that the students working in collaborative groups

reported significantly higher scores in perceptions of collaboration, sense of community, and achievement. Opportunities and challenges during online learner collaboration are also discussed as collaboration outcomes.

Figure 1
Online Learner Collaboration (OLC) Framework

- Technologies
- Delivery Methods

Technologies

- Frameworks
- Group Size
- Group Formation

Design

Online Learner Collaboration Framework

Outcome

Facilitation

- Learner Outcomes
- Opportunities
- Challenges

- Instructor Roles
- Collaboration Methods

Purpose of this Review and Research Questions

While the previous systematic reviews have looked at specific instructional strategies or tools in online learning and their relation to collaboration, our review fills a gap in the literature by considering the overall online collaborative learning activity's design, facilitation, use of technologies, and outcomes. Our review takes a broad approach to online learner collaboration studies by identifying publication patterns, participant and context trends, research methods, technologies and delivery methods used to collaborate online, collaboration design, facilitation, and outcomes by addressing the following research questions.

1. *Publication Pattern:* What are the publication trends of research on online learner collaboration? (i.e., the number of articles published each year, and journals that publish online learner collaboration research)
2. *Participant Characteristics and Context Trends:* What are the participant characteristics and contexts of online learner collaboration research published? (i.e., participant gender, age, countries represented, subject areas represented, and instructional settings)

3. *Research Methodology Trends:* What research methodology components are used in online learner collaboration research (i.e., research methods, data collection methods, and assessment measures)?
4. *Technologies:* What technologies and delivery methods are used in online learner collaboration research?
5. *Design of Collaborative Activity:* How are online learning collaborative activities designed in the research published? (i.e., frameworks, group size, and group formation strategy)
6. *Facilitation:* What instructor roles and collaborative methods are used to facilitate online learner collaboration in the research reviewed?
7. *Outcomes:* What learner outcomes, opportunities and challenges resulted during online learner collaboration in the research reviewed?

Methods

The study followed the five-step systematic review process described in the U.S. Department of Education, Institute of Education Sciences, What Works Clearinghouse Procedures and Standards Handbook, Version 4.1 (2020): (1) developing the review protocol, (2) identifying relevant literature, (3) screening studies, (4) reviewing articles, and (5) reporting findings.

Data Sources and Search Strategies

Six EBSCO databases, Academic search complete, APA PsycINFO, Education Research Complete, ERIC, Library, Information Science & Technology Abstracts with full text, and Teacher Reference Center were used in the search for the research on online learner collaboration between 2012 and 2021.

Two search rounds were performed with the keywords listed below. The keywords were selected because the researchers wanted to capture any and all types of collaboration occurring in online learning settings. "Design" was initially used because the initial focus was on how instructors designed effective collaboration activities in online learning settings that included methods, facilitation, and strategies. The second search was conducted upon completion of the coding of the first search as the coders realized some relevant studies had been eliminated that would be of interest but were not listed in the results of the first search results. Also, the use of the term "design" included other design fields in addition to education, such as architecture and interior design. The terms used in the second search were more specific to teaching and learning in the online learning setting. The title was used instead of subject terms due to the large volume of articles (n = 1,484) found in the search with subject terms on the first line of the second search.

Search 1
- Subject terms: "design" and "online"
- Title: "collabor*" or "group" or "team" or "cooperat*"

Search 2
- Title: "online learning" or "e-learning" or "distance education" or "online education"
- Title: "collabor*" or "group" or "team" or "cooperat*"

Inclusion/ Exclusion Criteria

Inclusion and exclusion criteria were developed, and each study was screened using this criterion to be included in this systematic review (Table 3).
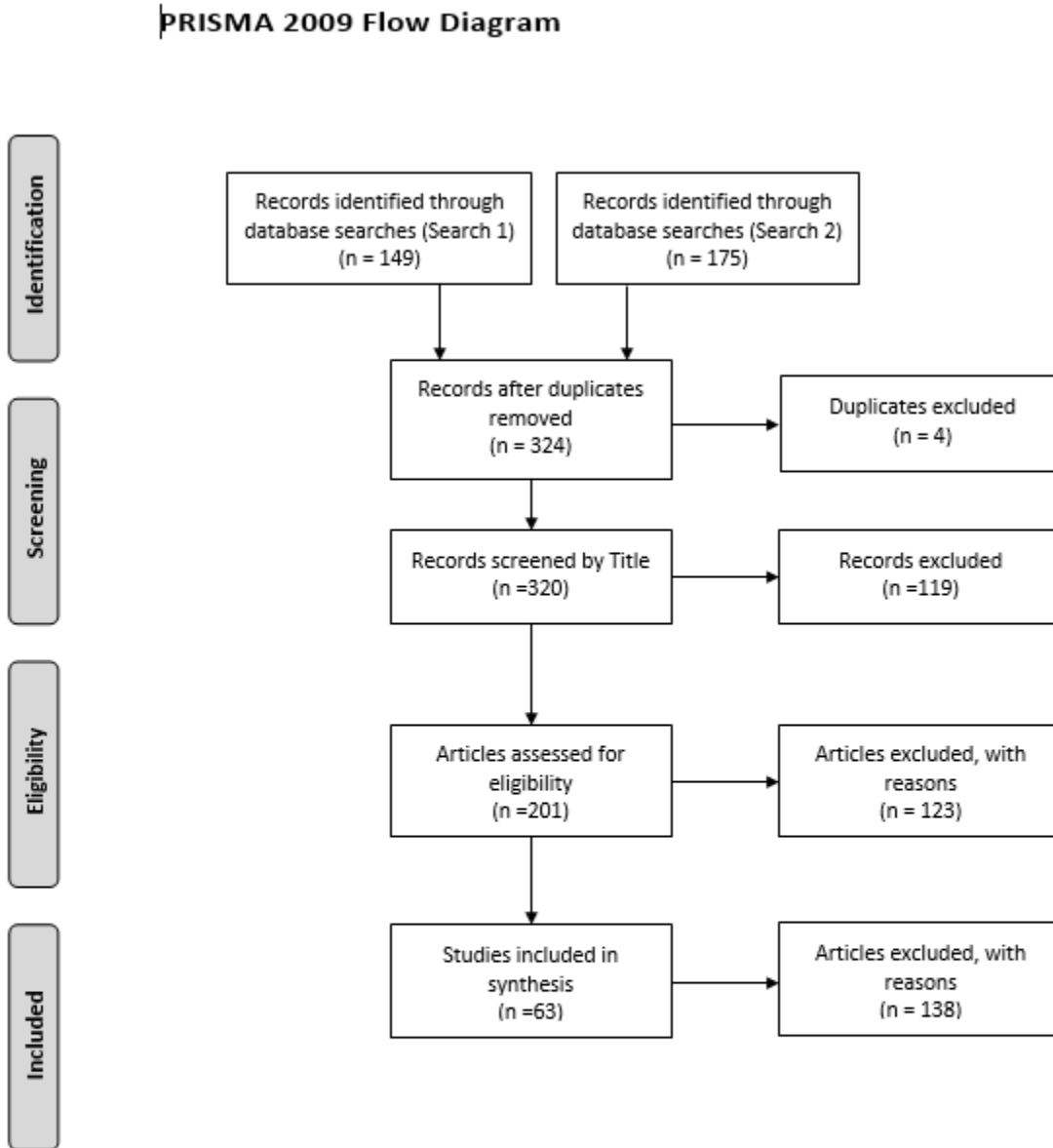
Table 3
Inclusion/Exclusion Criteria

Criteria	Inclusion	Exclusion
Publication Date	Publication years 2012 to 2021	Prior to 2012 and after 2021
Publication Type	Scholarly articles of original research from peer-reviewed journals.	Book chapters, technical reports, dissertations, or proceedings
Focus of the Article	Articles focused primarily on online collaborative learning	Articles did not include online collaborative learning
Research Method and Results	There was an identifiable method and results section describing how the empirical study was conducted and the findings. Quantitative, qualitative, and mixed methods were included.	Reviews of other articles, opinions, or discussion papers that do not include a discussion of the procedures of the empirical study or analysis of data such as product reviews or conceptual articles.
Language	The Journal article was written in English.	Articles in other languages were not included.

Process Flow of the Systematic Review

The systematic process followed PRISMA guidelines proposed by the Ottawa Methods Center for reporting items for systematic reviews and meta-analyses (Moher et al., 2009). Figure 2 illustrates the identification, screening, eligibility, and inclusion steps of the process flow. The review began by identifying 324 articles in two searches, and through screening and assessing eligibility, resulted in 63 articles.

Figure 2

PRISMA Flow Diagram

PRISMA 2009 Flow Diagram

Identification

- Records identified through database searches (Search 1) (n = 149)
- Records identified through database searches (Search 2) (n = 175)

Screening

- Records after duplicates removed (n = 324) → Duplicates excluded (n = 4)
- Records screened by Title (n = 320) → Records excluded (n = 119)

Eligibility

- Articles assessed for eligibility (n = 201) → Articles excluded, with reasons (n = 123)

Included

- Studies included in synthesis (n = 63) → Articles excluded, with reasons (n = 138)

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred *Reporting Items* for Systematic Reviews and *Meta-Analyses*: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Coding of Data and Interrater Reliability

The codebook was created based on prior research. However, the codebook was adapted during the coding process. The open-coded items were categorized to facilitate the coding process. Therefore, both deductive and inductive coding processes were used. The research team collaboratively coded the articles on a Google spreadsheet. The coding schemes are described in Table 4. The studies were reviewed and coded by a faculty researcher and a doctoral student researcher. Each researcher independently coded 10% of the articles per coding session and then discussed the coding to ensure reliability. When there was disagreement, the researchers discussed it before further coding. The items coded as open-ended items were then categorized into themes inductively based upon frequency and relationships of codes. For example, collaboration technologies were coded as an open-ended item and the name of each technology was coded when it was mentioned. These were collapsed inductively into tool categories such as LMS instead of naming each LMS collaborative technology such as discussion boards, blogs, and wikis.

Table 4

Description of the Coded Elements

Element	Description
Article Information	Full reference including author(s), year of publication, article title, and journal name.
Participant Demographics	The number of participants in the study, gender, age, and ethnicity.
Context	The instructional setting was coded as K-12, higher education, government, healthcare, military, or business and industry. K-12, subject area and country were open-ended.
Research Method	Codes included quantitative, qualitative and mixed-method. A study could have more than one method such as mixed methods or multimethod studies with both a quantitative and a qualitative component.
Data Collection	Open-ended. During analysis categorized into interview, focus group, observation, survey, content analysis, grades, and LMS/MOOC data.
Collaboration Measures	Open Coded
Delivery Method	This was coded as asynchronous, synchronous, or bichronous
Collaboration Technology	Coded as an open-ended item. During analysis categorized into LMS tools, discussion board, wiki, blogs, synchronous tools, social networks, annotation tools, and writing tools.
Theoretical Framework	Theoretical framework for online learner collaboration was coded as an open-ended item
Group Size	Coded as an open-ended item
Group Formation Method	Coded as an open-ended item. During analysis categorized into randomly assigned, student formed, algorithm, or combination of various methods.

Facilitation	The role of Instructor was open-ended and categorized into the following. Designer, facilitator, supporter, developer, coordinator, evaluator, and information provider.
Collaboration Methods	Coded as an open-ended item. During analysis categorized into, projects, discussions, peer review, social/informal and multiple methods
Opportunities and Challenges	Opportunities: Learner-Centered, Communication and Collaboration skills, Relationship building, Valuing perspectives, Problem-solving skills, Achievement, and Self efficacy. Challenges: Time, Workload, Group Composition, Technical issues, Inactive participation, and poor communication.
Learning Outcome	Coded as Cognitive, Affective, Behavior, and Other. Cognitive focused on thought, affective focused on feelings and behavioral focused on interactions. "Other" option was also included for those articles that focused on other outcomes.

Data Analysis

Descriptive statistics, including frequency and percentages, are included for publication outlets, participant characteristics (gender, age, and ethnicity), context (instructional setting, discipline, and countries), research methods and data collection. The frequency of measures in online learner collaboration research is also included. Publication pattern by year was depicted through a line chart. Delivery methods and technologies were open-coded but frequencies and percentages were tabulated. For design, conceptual and theoretical frameworks are collapsed into categories to identify themes. Group size and group formation methods are coded into categories and the frequencies and percentages are reported. For facilitation, the role of the instructor, and collaboration methods were coded and collapsed into categories to identify themes. For outcomes, learner outcomes were coded, and frequencies and percentages were tabulated. Opportunities and challenges were coded and collapsed into categories to identify themes. Examples of studies are included where it supports.

Results

The results section includes the findings from the review for each research question categorized by sections.

Research Question 1: Publication Patterns

To address the first research question, the publication patterns and outlets were examined. Figure 3 displays the publication trends of research on online learner collaboration in the last decade. The number of publications fluctuated with an increase that peaked in 2014 which then decreased and increased again in 2018.

Figure 3
Publications by Year
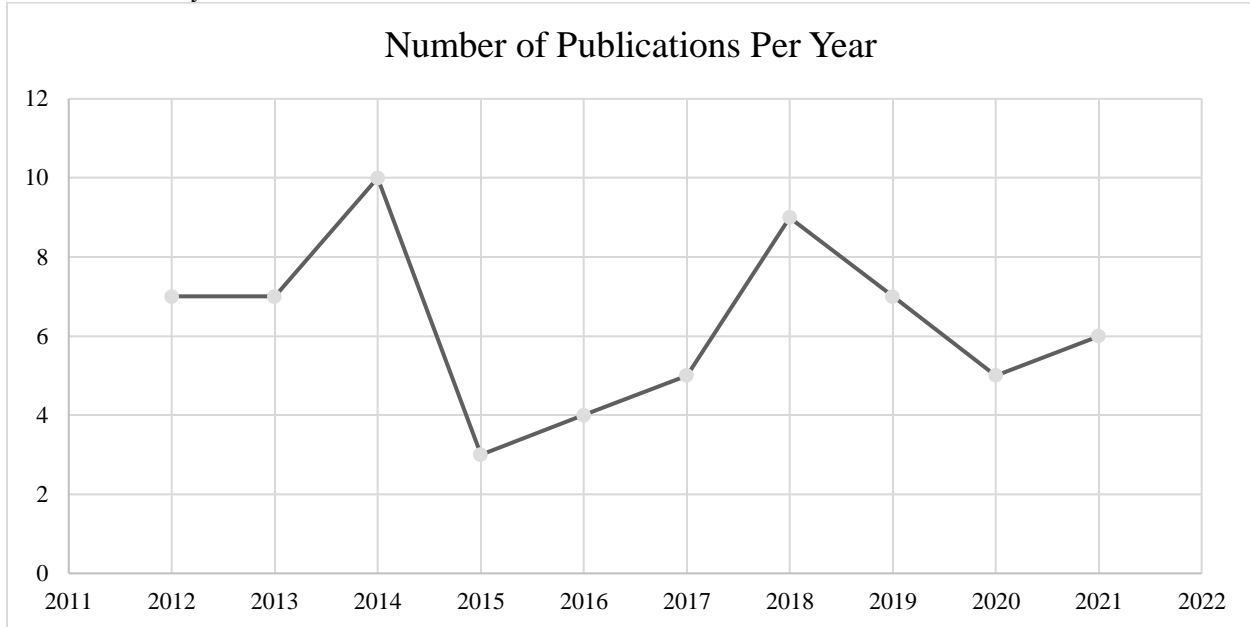
Six journals published more than one article on online learner collaboration. *International Journal of Emerging Technologies in Learning and Turkish Journal of Distance Education* published the most articles (n=5, 8.1%) on online learner collaboration, followed by *Online Learning* which published 4 articles. Three journals published two articles each (Table 5) and the remaining studies were published in various journals. Surprisingly, the *International Journal of Computer Supported Collaborative Learning* (IJCSCL) was not as represented in these results as the researchers anticipated. This journal had only two articles in the second search and none in the first search. Hence, articles in IJCSL may not use the search terms in their titles or subject terms given the scope of this review's focus on online learner collaboration.

Table 5
Journal Outlets for Online Learner Collaboration Research

Journal	Frequency	Percentage
International Journal of Emerging Technologies in Learning	5	8.1
Turkish Online Journal of Distance Education (TOJDE)	5	8.1
Online Learning	4	6.5
International Review of Research in Open & Distance Learning	2	3.2
British Journal of Educational Technology	2	3.2
International Journal of e-Collaboration	2	3.2

Research Question 2: Participant Characteristics and Context Trends

To address Research Question Two, participant characteristics (number of participants, gender, age, and ethnicity) and context (instructional setting, discipline, and countries) were examined.

Participants

The 63 studies represented a total of 5,600 research participants with studies ranging from 9 to 998. At least four studies did not include the number of research participants. Fewer students reported on the other participant characteristics. Twenty-four studies reported the gender of participants. Of the 2,126 participants in those studies, 1,407 (66.2%) were female, 716 (33.7%) were male, and three (.001%) were not reported. Twelve studies reported age data. The majority of those 993 participants were between 20 and 34 years of age. Only four studies reported ethnicity. The majority of those 389 participants were white (75%).

Instructional Setting

While studies from various instructional settings were included in this review, most of the studies were from higher education (n=58, 92.1%). There were two from continuing education/MOOC settings, one article from K-12 and two from other professional settings.

Discipline

Discipline was open coded, and the highest number of studies published were in Education (30.2%) followed by Computer Science and Information Technology (12.7%). Other disciplines are included in Table 6.

Table 6
Disciplines of Studies Published

Discipline	Frequency	Percentage
Education	19	30.2
Computer Science and Information Technology	8	12.7
Health Care	5	7.9
Library and Information Studies	3	4.8
Engineering	4	6.4
Writing	2	3.2
Sciences (STEM, Biology)	3	4.8
Business	4	6.4
Communication	2	3.2
Multiple	6	9.5
Other	6	9.5

Not Reported	1	1.6
Total	**63**	**100**

Countries

Research conducted in the United States (n=25, 39.7%) had the greatest number of published studies included in this review, followed by several studies (n=8, 12.7%) conducted in multiple countries. Four studies were published in several countries in Europe, three in Taiwan, and two each in Greece, Morocco, Spain, the United Kingdom, and Turkey. Thirteen studies were published in various countries.

Research Question 3: Research Methodology

To address Research Question Three, research methodologies, data collection methods, and measures used were analyzed.

Research Methods

There was about an equal distribution of all three research methods: Qualitative (n=22, 34.9%), Quantitative (n=21, 33.3%), and Mixed-Method studies (n=20, 31.8%).

Data Collection

In addition, the different data collection methods were open coded and tabulated in Table 7. Some studies used more than one data collection method. More than half of the studies used survey approaches as the data collection method (n=33, 52.4%) followed by content analysis (n=25, 14.5%).

Table 7
Data Collection Methods Used

Data Collection	Frequency	Percentage
Survey	33	52.4
Content Analysis	25	39.7
Interview	12	19.1
Grades	9	14.3
Focus Group	4	6.4
LMS/MOOC Data	6	9.5
Observations	2	3.2

Measures for Online Collaboration

Twenty-eight studies reported the measures used to investigate various aspects of online learner collaboration. The majority were researcher-developed surveys (n=10) measuring group regulation, group processing, attitudes toward teamwork, trust, stressors, the process of transferring expertise, challenges and roles of social networks, self-efficacy growth, learner

satisfaction, achievement, learning experiences, collaborative activities, cognitive aspects, social aspects, skills, knowledge, and problem-solving skills. The most used measure was to determine community either through the Community of Inquiry survey (n=3) or the sense of community scale (n=1). Self-efficacy and learning satisfaction measures were used in two studies. All other measures were only used once, including belonging, trust, sociability, presence, motivation, and learning.

Research Question 4: Collaboration Technologies

To address Research Question Four, delivery methods and technologies used in online learner collaboration research studies were examined.

Delivery Methods

The different delivery methods used in the research studies were coded. Online learning collaboration was mostly researched in asynchronous online (n=32, 50.8%) courses followed by bichronous online, a blend of asynchronous and synchronous online courses (n=25, 39.7%). Very few studies investigated online collaboration using only synchronous online delivery methods (n=5, 7.9%) though more studies explored bichronous online methods. One study did not report the online delivery method.

Technologies for Online Collaboration

Technologies used for online learner collaboration were open coded and categorized (Table 8). Some studies used more than one technology. These items were coded as presented in the articles. Some articles reported using the LMS without detailing what tools were used within it, and others reported specific tools without stating whether they were located within the LMS. Learning Management Systems was the technology used for online learner collaboration in most studies (n=16, 22.5%), and examples included WebCT, Blackboard, Schoology, Edmodo, Moodle, and WebTycho. Synchronous technologies included Google Hangout, Skype, Elluminate, and Go To Meeting. Researchers also specifically studied discussion boards (n=13, 18.3%) and writing tools (n=9, 12.7%) included Google Apps, Titan Pad, and MS Word. These were identified as the top three technologies studied.

Table 8
Technology Used

Technology	Frequency	Percentage
Learning Management System	16	22.5
Discussion Board	13	18.3
Writing tools	9	12.7
Synchronous technology	8	11.3
Wiki	7	9.9
Blogs	5	7.0

	3	4.2
Social Network	3	4.2
Annotation Tools	1	1.4
Not reported	9	12.7

One study that used LMS technology was Ozkara et al. (2020) which implemented project-based learning both collaboratively and individually for comparison of learning outcomes, satisfaction, and motivation. The LMS tools used were different depending on whether the learner was working collaboratively or individually. No difference in achievement or satisfaction was reported, but the collaborative groups reported higher motivation. Discussion boards were used by Tawfik et al. (2014) to investigate whether discussions using case study methodology differ from more traditional discussions. The case study condition achieved more participation and more significant types of participation than the other group. Regarding synchronous technology, Cheng et al. (2013) used a chat tool entitled ThinkTank to investigate trust development in online collaboration. They found that trust development differs among groups when using such a synchronous tool. Mehlenbacher et al. (2018) used the writing tool Google Docs to investigate how students use cloud technologies for collaborative writing and found that cloud-based technologies such as Google Docs allow for easier digital collaboration. At the same time, they found that such online collaborative technology like Google Docs also requires instructors to rethink the methods in which these technologies are used.

Research Question 5: Design of Collaborative Activities

To address Research Question Five on collaboration design, theoretical and conceptual frameworks, group size, and group formation strategy were examined.

Theoretical and Conceptual Frameworks

The 63 studies were analyzed for the theoretical or conceptual frameworks that they used to study online collaboration. Four types of frameworks were used in the research studies on online collaboration (See Table 9). Some studies used more than one framework.

Table 9
Frameworks Used in Online Learner Collaboration Research

Framework	Frequency	Percentage
Collaborative (Computer Supported Collaborative Learning, Collaborative Learning, Online Collaborative Learning, Cooperative Learning, Group Work)	33	50.0
Social (Community of Inquiry, Sense of Community, Social Presence, Social Interdependence, trust)	20	30.3
Learning Theories (Active, Problem Based, Constructivist, ARCS, Connectivism, 3P (Presage, Process, Product)	10	15.1
Technology (TPACK, eLearning, Visualization tools)	3	4.5

An example from the social category is Wicks et al. (2015) who compared two courses designed with low collaboration strategies and high collaboration strategies, respectively. The Community of Inquiry survey and a survey of learning presence were administered to compare the courses. Findings revealed that students in the lower collaboration course perceived greater levels of teaching presence while students in the higher collaboration courses perceived greater levels of social presence.

From the collaboration category, Demosthenous et al. (2020) used the collaborative learning theory to explore group dynamics during collaborative work. Findings reported that student complaints were focused on time and logistical barriers. Findings also highlight students' low self-efficacy for collaborative work due to a lack of experience in online and traditional learning environments.

Focusing on the learning theories category, Verstegen et al. (2018) used the problem-based learning theory to investigate how teams collaborate without the guidance of the instructor in a MOOC. The teams successfully collaborated on tasks without extensive guidance. Explicit instructions about grouping and tasks, a positive tone, and acceptance of unequal contributions were identified as positive outcomes. Additional support for learners to prepare learners for collaboration and develop digital literacy skills was recommended to stimulate more elaborate collaboration.

Group Size

Group sizes were reported in various ways (See Table 10). Some reported a range for the group sizes and some had multiple groups within the study and reported that the size varied with each strategy. Some studies did not have specific group sizes but opted for descriptions of small or large groups. Excluding the not reported, descriptions, and various reports, the most popular group sizes were small groups of 2 to 4 members (n =23) from the various categories that include this range: two, three, four, two to four, three to four, three to five, and small. The three to five category was included in the small group, and the four to five category was included in the medium size group as they each straddled the cutoff.

Table 10
Group Sizes Used Online Learner Collaboration Research

Group Size	Frequency	Percentage
Small (2, 3, 4, 2-4, 3-4, 3-5, small)	23	33.8
Medium (5, 6, 4-5, 4-8, medium)	10	14.7
Large (9, 10, larger, whole class)	14	20.6
Various group sizes	8	11.8
Not Reported	13	19.1

Group Formation Strategy

The grouping strategies were the ways in which the groups were formed for collaboration (see Table 11). Some studies included various group formations as they had multiple collaborations occurring within the course such as group projects and whole-class discussions and peer reviews. Each collaboration had a different group formation strategy. The most popular method to group students for collaboration was randomly assigning groups (n=14, 21.9%). Table 11 summarizes the various group formation strategies used.

Table 11

Group Formation Strategy Used

Group Formation Strategy	Frequency	Percentage	Sample Studies
Randomly assigned	14	21.9	Chen et al. (2021), Demosthenous et al. (2020), Sharp (2018), Trespalacios (2017), Tawfik et al. (2014), Rawlings (2014)
Various grouping methods	9	14.1	Kupczynski (2013), Kumi-Yeboah (2018), Alzain (2019), Yeh (2014)
Based on criteria	8	12.5	Arndt et al. (2021), Adwan (2016), Aydin & Gumus (2016)
Student formed	7	10.9	Verstegen et al. (2018), Oyarzun & Morrison (2013), Ornellas et al. (2014)
Existing groups (n/a)	5	7.8	Schaefer et al. (2019), Huang (2019), Barra et al. (2014)
Instructor assigned	3	4.7	Han & Resta (2020), Liu et al. (2018) Mehlenbacher et al. (2015)
By algorithm	2	3.1	Ullmann et al. (2018), Prabhakar & Zaiane (2017)
Not reported	16	25.0	Lowell & Ashby (2018), Rebmann et al. (2017)

Research Question 6: Collaboration Facilitation

To address Research Question Six, we examined the role of the instructor and collaboration methods in online learner collaboration research.

Role of Instructor. The instructor's role in online collaboration was mentioned 60 times. The instructor assumed roles as the designer of the collaborative activity, facilitator of the collaboration, evaluator of the work, developer of the course content, coordinator of the course activities, and provider of instructional information. Overwhelmingly, the most mentioned role of the instructor is the designer of the activity (n=28, 46.7%). Facilitator (n=14, 23.3%) was the second most mentioned role of the instructor followed by a supporter (n=8, 13.3%). Other roles

mentioned were evaluator (n=4, 6.8%), developer (n=2, 3.3%), coordinator (n=2, 3.3%), and information provider (n=2, 3.3%). Many studies mentioned more than one role for the instructor. For example, Paterson and Prideaux (2020) interviewed faculty members regarding their design use of collaborative online learning activities and found that structured design coupled with supportive facilitation was important for collaborative learning activities' success. Similarly, Ornellas and Carril (2014) used project-based learning, computer-supported collaborative learning, and a participatory culture to design and test an online collaborative learning activity and found that providing a rich design and adequate support helped ensure learner success.

Collaboration Methods

We refer to collaboration methods as those methods instructors used within the design of collaborative activities that required online learner collaboration. Table 12 includes the various collaboration methods used in the studies reviewed. These included a group or collaborative project, group or whole-class discussions, peer review, or social/informal discussions/backchannel.

Table 12
Collaboration Methods Used

Methods	Description	Frequency	Percentage
Project	Group of students collaborating to create a paper or presentation	45	59.2
Discussions	Group or whole-class discussion taking place within a discussion board on an assigned topic	19	25.0
Peer Review	Consists of students reviewing each other's work and providing feedback for improvement	9	11.8
Social/informal	Informal or social discussions might be done through social media or chat during the collaboration.	2	2.6
Collaborative Experience Survey	Various institution's teachers and students were surveyed about their online collaboration experiences	1	1.3

Many studies used multiple collaboration methods to encourage collaboration among learners. For example, Trespalacios (2017) required small groups to analyze case studies and collaboratively create and record a presentation on the main issues of the case using VoiceThread. This study also incorporated collaborative discussion requiring students to lead a whole-class discussion on a case as well. Peterson et al. (2018) used both asynchronous and synchronous discussions to investigate the differences in process, belonging, engagement, and emotions in the cooperative process. Asynchronous learners reported higher levels of

individualism, competition, and negative affect while synchronous learners reported higher levels of cooperation, belonging, and positive emotion. Discussion boards are prevalent in online learning environments, but they are not always part of an intended collaborative learning activity in which learners have to work together; for example, to solve a case study, lead a discussion as a group, or collectively diagnose patient symptoms. The discussions in the studies included in this review went beyond the traditional use of forums using discussions as part of a collaborative learning experience.

Research Question 7: Collaboration Outcomes

To address Research Question Seven, learner outcomes achieved were examined, as well as opportunities and challenges from online learner collaboration.

Learner Outcomes

Learner outcomes were coded as cognitive, affective, and behavioral. The largest number of studies had affective outcomes (n=23, 36.5%) followed by cognitive outcomes (n=22, 34.9%). Behavioral outcomes were included in only four studies (6.4%). Multiple outcomes were explored in 11 studies (17.5%) and other outcomes focusing on the collaboration process (i.e., the role technology plays and the role of the instructor) was examined in three studies (4.8%).

Opportunities in Online Collaboration

Online collaboration affords learners opportunities to develop new skills in addition to learning. A total of 74 opportunities were mentioned throughout the 63 studies. Increased learning was the opportunity mentioned the most (n=12, 16.22%). The second most mentioned category surrounded communication and collaboration skills (n=11, 14.86%) including increasing these skills or changing learners' perceptions of them. The third most mentioned benefit involved relationship building (n=9, 12.16%). This category included building trust, increasing social presence, and the opportunity to socialize. The fourth most mentioned benefit was having the learning tasks student-centered (n=8, 10.81%). The terms mentioned included learner autonomy and personalized learning. Other opportunities were: increased problem solving/critical thinking skills (n=7, 9.46%); increased awareness of other perspectives (n=5, 6.76%); reflection (n=4, 5.41%); increased confidence/self-efficacy (n=4, 5.41%); authentic tasks (n=3, 4.05%); peer support (n=3, 4.05%); and increased interaction/engagement (n=3, 4.05%).

Challenges in Online Collaboration Participants.

Challenges were not mentioned as frequently in these studies (n=49). Time (n=7, 14.29%), technical issues (n=5, 10.20%), and anxiety/fear/stress (n=5, 10.20%) were the challenges that appeared most frequently. Other concerns included group composition, poor communication, inactive participants, and workload issues (each had n=4, 8.16%).

Discussion

Trends in Publication, Participants, Contexts, and Methods

Among the 63 studies reviewed on online collaborative learning, 92% were in higher education and 30.2% of the studies were in the field of education. Such findings show that online collaborative learning is investigated more with higher education students than the K-12 students or in other contexts. Also, researchers in Education studied collaboration the most, followed by researchers in Computer Science and Information Technology more than the other disciplines. In addition to higher education researchers in the field of education who see the value of online collaboration, online collaborative learning was also studied Computer Science which indicates the importance of online collaboration in computing jobs.

The studies in this review were predominantly (39.7%) conducted in the United States. Such dominance is perhaps indicative of the importance of online collaboration in the US context but it could also have been because the researchers of this review are based in the US and might have had access to mostly US-based databases and analyzed articles only written in English. Notably, all three research methods (quantitative, qualitative, and mixed methods) were used equally in the articles in this review. This finding highlights the importance of all these methods in online collaborative learning research. In addition, surveys, content analysis, and interviews were the most commonly used data collection methods. There is a need for additional data collection methods such as observations, LMS data, focus groups, and achievement data through grades and tests.

Technology is Paramount for Online Collaboration

Among the studies used in this review on online learner collaboration, half of the studies were conducted in asynchronous online settings (50.8%), followed by bichronous online settings (39.7%). This fact demonstrates the opportunity for online collaborative learning. However, this also shows the need for more research on online collaborative learning in synchronous online settings. This could also have been such that most courses are asynchronous or bichronous online (Martin et al., 2020) and few courses exist that are only synchronous online without the use of asynchronous functionality.

Learning Management Systems, discussion boards, writing tools and synchronous technology were the tools most used to support online collaboration in the studies reviewed. Such data highlight the potential and importance of using these tools to support collaborative activities. Of course, Learning Management Systems are the backbone of online courses and include a number of functionalities including discussion boards that support online learner collaboration. Some of the functionality of Learning Management Systems include discussion boards, Q&A forums, and team submissions. Importantly, researchers have found that using Learning Management Systems such as Edmodo help to motivate learners but also helps to maintain interest and engagement (Olson, 2014). While a systematic review concluded that there is no consensus among researchers on best practices for asynchronous online discussions (Fehrman & Watson, 2020), some researchers did find empirically based strategies to maximize engagement in online asynchronous discussions.

Writing tools like Google Docs and Microsoft Word were also used in several studies. Cloud-based technologies such as Google Docs have made the virtual collaborative writing process and communication easier. More recently, group awareness tools have been developed specifically to increase engagement. Peng et al. (2022) developed a group awareness tool to

increase engagement in online collaborative writing. The tools contained functionality to chat, collaboratively write, peer review, and provide visualization for social and cognitive awareness. Group awareness information is also visualized in word clouds and word counts gathered from the writing and the peer review. These visualizations had positive effects on learner engagement and writing performance.

Also, widely used by researchers in this review were synchronous technologies. Synchronous tools can be embedded within the Learning Management System or can be external to it. Synchronous tools come with a variety of collaborative functionalities such as breakout rooms, whiteboards, chat options, screen sharing, file upload, download, and polling (Bower, 2011). Bower identified various synchronous collaborative competencies that included operational, interactional, managerial and design aspects. Synchronous technologies can also be used for the collaboration of virtual and remote laboratories (Jara et al., 2012). In addition to the use of technology to support online learner collaboration, it is critical to carefully select learning tasks, sequence of activities, and arrange tools to support knowledge construction to maximize the use of technology for online collaboration (Jeong & Hmelo-Silver, 2016). As Martin and Borup (2022) revealed in a recent study, synchronous online tools can enhance engagement through collaboration. Research focusing on how learners can collaborate effectively in such real-time settings should benefit both instructors and students.

Design of the Collaborative Activity is Critical for Effective Online Learner Collaboration

Designing online collaboration includes using a theoretical or conceptual framework to guide collaboration, deciding on group sizes and formation methods, and taking learner characteristics into account. Such findings highlight the importance of design in setting up a collaboration activity. About half of the studies (50%) in this review used a framework focused on collaboration. This collaboration focus included Computer-Supported Collaborative Learning, Collaborative Learning, Online Collaborative Learning, Cooperative Learning, and Group Work. The second most pervasive focus was on the social aspect, which was included in 30.3% of the studies and included Community of Inquiry, sense of community, social presence, social interdependence, and trust. Both social and collaborative aspects were considered valuable by the researchers. A few researchers also used learning theories as the guiding theoretical framework. It is important for research and practice design to be guided by theoretical and conceptual frameworks for effective online collaboration.

In this review, we also found various grouping sizes used by researchers with the most-commonly used sizes being small groups containing from two to five students (n =23). Depending on class size, collaboration activity scope, and learner needs, the instructor can decide the grouping sizes. Zheng et al. (2015) studied the impact of small learning group composition on student engagement and success in MOOC and concluded that small groups might reduce student drop-out rates. Wang (2011) discusses the importance of grouping strategies and assignment design in cross-cultural online collaboration and found that having strict requirements for communication between partners and using technology tools for informal communication was helpful.

Also, of various group formation strategies, the most commonly used in this review were random assignment, based on criteria and student-formed, which has been used by previous researchers for collaboration although not in online settings (Chan et al., 2010; Hilton & Philips, 2010). Surprisingly, self-grouping was not more prevalent in these studies as some research suggests that allowing learners self-select into course groups is preferable given the various time

zones and schedules of online learners (Li et al., 2020). Based on instructional context and learners' needs, online instructors could adopt different group formation strategies in collaboration activity design. Notably, researchers have emphasized the importance of accounting for factors such as student ability, gender, and ethnicity for effective collaborative work, as heterogeneity favors collaborative learning (Scheurell, 2010). Lei et al. (2010) recommended that, while grouping, future researchers consider six factors as fundamental for group formation: gender, ethnicity, familiarity among members, ability, motivational level, and source. Irrespective of the group formation strategy used, it is important for instructors to take learner characteristics into account during group formation.

Facilitation is Key to Effective Online Collaboration

Though design is critical for online collaboration and emphasizes how the instructor forms the group, designs the activity, and chooses the theoretical or conceptual framework to guide it, collaboration is enhanced during course facilitation. Instructors can assume several roles during facilitation to support the collaboration process. During online collaboration, instructors acted as designers, facilitators, supporters, developers, coordinators, information providers, and evaluators. Some of these roles, though, originate during collaboration design while several of them continue through facilitation. Instructors act as facilitators, supporters, coordinators, information providers, and evaluators during facilitation. This underscores the critical nature of the role of the instructor during the entire collaboration process. In fact, our prior research (Martin et al., 2021) has found that these are some of the key roles that instructors assume in online courses: subject matter expert, course designer and developer, course facilitator, course manager, advisor/mentor, assessor/evaluator, technology expert, and lifelong learner. In that study, Martin and colleagues explore the frequency of use of various competencies within those eight roles. Of the competencies for the course facilitation role, facilitating online discussions and fostering interaction among learners were two competencies frequently used by online instructors to engage the learners.

When reviewing collaboration methods, projects were the most used (59.2%) followed by discussions (25%). Designing online collaborative projects should involve a careful selection of tasks and activities, provide guidelines for who sets the goals, who regulate and what is regulated, and focus on team dynamics, team acquaintance, and instructor support (Järvelä & Hadwin, 2013; Ku et al., 2013). Researchers have also found that empirically based strategies such as peer-facilitated discussions and providing feedback during facilitation maximize engagement in asynchronous discussions (Guo et al., 2014; Xie & Ke, 2011). Additional collaboration methods used in the research studies included peer review and social/informal. Regarding peer review, Zhao et al. (2013) studied peer review groups in asynchronous computer conferencing and found that participation, interaction, and social presence are essential for online collaboration. Social/informal collaboration refers to student-initiated collaboration on social media platforms or in other informal ways to build social ties and learning support networks outside the formal learning environment. Gilmore (2020) discovered that strong social ties build social inclusion and create a more effective learning experience.

Stephens and Roberts (2017) discussed four strategies that can be used to facilitate online collaboration in groups. These strategies include creating groups, establishing expectations, communication tools, and assignments and activities. Their suggestions are aligned with some of the findings from this review. In addition, Haythornthwaite (2006) proposed several recommendations for facilitating online collaboration including the promotion of "an information

sharing culture, model group norms, setting some, but letting others emerge, model good communication behaviors, establish social and/or technical means for synchronous or near-synchronous communication, provide means for faster feedback, build community capacity by providing means for students to socialize and get to know each other, provide both public and private means of communication" (p.17). These strategies are helpful to facilitate effective online collaboration.

Online Collaboration Has Several Outcomes

Most studies on online learner collaboration included either affective or cognitive outcomes, with little focus on behavioral outcomes. Prior research has demonstrated that the use of technology to collaborate could have a significant impact on student learning, satisfaction, and engagement (Ku et al., 2013), and studying behavioral outcomes in addition to affective and cognitive outcomes is important. Increased learning, communication and collaboration skills, and relationship building were the top three opportunities during online collaboration. Researchers have found that collaboration engages the learner and results in increased learning (Ng, et al., 2022); similarly, it also increases their communication and collaboration skills (Owens & Hite, 2020). Finally, in online courses where students are isolated, collaborative opportunities assist them with building a sense of community and building relationships with others which is critical for them to be successful in online courses (Qureshi et al., 2021).

These prospects were also discussed by Jeong and Hmelo-Silver (2016) who identified seven opportunities afforded by technology for collaboration including "(1) engage in a joint task, (2) communicate, (3) share resources, (4) engage in productive collaborative learning processes, (5) engage in co-construction, (6) monitor and regulate collaborative learning, and (7) find and build groups and communities" (Jeong & Hmelo-Silver, 2016, p. 247).

Time, technical issues, and anxiety/fear/stress were the challenges that appeared most frequently in this review. Some of these challenges can also be due to the lack of time management for online collaboration or technical expertise. Online learner collaboration can also be challenging because team members do not see each other in person (Capdeferro & Romero, 2012) and this could result in anxiety, fear, and stress related to working in a team (Demosthenous et al., 2020). Additional challenges found in this review were due to group composition, poor communication, inactive participants, and workload issues. This is aligned with Ku et al. (2013), whose study found that team dynamics, team acquaintance, and instructor support was critical for online teamwork satisfaction.

Limitations

Several methodological limitations in this review can be identified. For instance, a limited number of search terms were used in this study. Although the search was performed twice, it is likely that certain studies that did not use the search terms used in this study were excluded. Since the search terms were broad and not specific to collaborative technology, some of the studies focusing on specific collaborative technology might have been excluded. Second, only articles published in English and selected databases available to researchers were included. This could have excluded other online learner collaboration work published in other languages or other databases could have been excluded. Third, only peer-reviewed articles were included. Such an approach could have excluded high quality empirical research published in other sources. Fourth, there is the possibility of researcher bias during the coding process. Finally, when examining the delivery method, students could be collaborating using additional

technologies and modalities outside the online course. These tools and methods could therefore not be collected or examined. For example, learners could collaborate synchronously or meet face-to-face while taking an asynchronous course.

Future Directions for Research

More research is needed on online collaborative learning in synchronous online settings and in disciplines besides education. There is also a need to standardize the terminology regarding online learner collaboration to help researchers successfully locate the appropriate research. This is consistent with the findings of Cherney et al. (2017) who point out the lack of conceptualization and various definitions of the term "social presence." The current frameworks and theories are either broader than the online learning context or focused on online but broader than collaborative learning. Even though two searches were conducted for this review, articles that would have met the inclusion criteria for this research were excluded and may have changed the results. Particularly, few articles from the *International Journal of Computer Supported Collaborative Learning* (IJCSCL) were located with the search terms used in this study. If an online collaboration framework were implemented in more studies, then researchers would have a consistent way to search and present research in this area. Hopefully, the OLC framework proposed in this study can provide that guidance and structure for future researchers.

It is also recommended that more research be conducted on group formation strategies in an online learning context to ensure learner satisfaction and success. More research is also needed on the use of social collaborative methods and social collaborative technologies to further understand how social ties inclusion plays a role in increasing the success of online learner collaboration. Additionally, group formation in online courses utilizing various strategies warrants in-depth examination. While cognitive and affective outcomes have been often investigated, there is a need for more studies to explore behavioral outcomes. One of the challenges is that researchers do not describe the specifics of how online collaboration occurs using technology such as in the LMS.

Implications

The collaboration methods and strategies discussed in this review will benefit both online instructors and instructional designers who support instructors in designing online courses. This review also discusses the various design and facilitation aspects that instructors can integrate into online courses for effective online collaboration. Implications can be found in all areas of the framework.

Technology can enhance or create barriers to online learner collaboration. Using learning management systems, discussion boards, writing tools, synchronous tools, wiki, blogs, social network tools, and annotation tools can enhance online collaboration if selected to support the learning outcome rather than focusing solely on the use of the tool. Instructors should encourage students and provide technologies that allow them to collaborate both formally and informally both inside and outside of the learning environment.

When designing collaborative online learning experiences, instructors consider learner characteristics, guiding frameworks, and grouping methods. It is valuable for the instructor to keep class size, learner needs, and scope of the collaboration in mind during design and group formation. Consider a framework to guide the design and have students create a group work profile that would assist them in self-grouping or the instructor in creating groups.

The instructor assumes various roles during the facilitation of online collaborative learning experiences as structured collaborative activities should have multiple ways of interaction and assessment to provide a richer educational experience. Instructors can use various collaboration methods to support learning outcomes such as projects, discussions, peer reviews, and social/informal activities in their online courses. In addition, instructors can also use a collaborative experience survey to measure the learner experience from the online collaboration process.

The outcomes of online collaborative learning experiences can be focused on (1) cognitive (achievement), (2) affective (satisfaction, motivation), and (3) behavioral (participation) when designing and facilitating online collaboration depending on the desired learning outcomes. Instructors should study opportunities and challenges during the design and facilitation of online collaboration. Online learner collaboration will include some challenges, but the opportunities must outweigh these barriers for instructors to include online collaboration in their courses.

Conclusion

This systematic review of research on online learner collaboration fills a gap in the literature by studying the overall research based on online collaborative learning activity's design, facilitation, use of technologies, and outcomes. Our review takes a broad approach to online learner collaboration studies by identifying publication patterns, participant and context trends, research methods, technologies and delivery methods used to collaborate online, collaboration design, facilitation, and outcomes. The Online Learning Collaboration framework will guide both researchers and practitioners in studying and implementing online collaboration activities. This review has identified implications for the online learner, instructor, and instructional designer.

Declarations

The author(s) declare no potential competing interests with respect to the research, authorship, and/or publication of this article.

Data are available via link to this Appendix containing citation information for 63 articles used in the systematic review.

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A Systematic Review of Studies Exploring Help-Seeking Strategies in Online Learning Environments

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Abstract
Adaptive help-seeking as a learning strategy can influence learners' learning outcomes. Learners in online learning environments need more self-regulation and especially more help-seeking strategies. A systematic review was conducted to explore help-seeking strategies in online learning environments. A search on help-seeking strategies in online environments in Educational Research Information Center (ERIC) and PsycInfo yielded 36 peer-reviewed articles that met the inclusion criteria for this study. Karabenick and Knapp's categories of help-seeking (formal help-seeking, informal help-seeking, instrumental activities, lowering performance aspirations, and altering goals) were used to review the strategies employed by students in online learning. The results show that there is an extreme lack of research on learners' psychological decision-making process when they lower performance aspirations or alter their goals. Moreover, most studies focus on the learners' formal and informal help-seeking behaviors in online settings. Since much research has been limited to small case studies that are not always generalizable, future studies are encouraged to include more instructional contexts and personal variables like gender, age, educational background, and mastery of computer skills. To avoid biases that may occur in self-reporting studies, recommendations are made for future studies that use more subjective methods to trace their actual help-seeking behaviors.

Help-seeking occurs when learners recognize a gap in their comprehension, and they seek assistance to bridge the existing gap. An effective way for learners to bridge the gap is to seek help from credible sources, including more experienced or knowledgeable people or places where they believe guidance is available. Seeking help had been regarded as an act of dependence by researchers until the 1980s when Nelson-Le Gall strengthened the adaptive role of help-seeking behavior (Puustinen, 1998). Nelson-Le Gall (1981) argued that a reconceptualization of help-seeking was required, and help-seeking should be viewed as an effective method for dealing with difficulties instead of stigmatizing and self-threatening behavior. Nelson-Le Gall (1985) further related "executive" to dependency-oriented help-seeking and "instrumental" to mastery-oriented help-seeking (see Table 1).

For executive help seekers, they intend to get the exact amount of help to solve the problem or attain a goal without focusing too much on understanding or internalizing the learning process. Instrumental help seekers, however, aim to obtain effective methods that enable them to solve problems independently and they typically refuse help when they can do certain tasks on their own. They focus on attaining the knowledge and skills to solve problems independently. Learners engaged in online learning environments are faced with more challenges in seeking help as instantly and effectively as they do in traditional face-to-face learning settings (Landrum, 2020; Li et al., 2021). To have a clear understanding of how help-seeking is employed by online learners, we did a systematic review, hoping to bring researchers' attention to the adaptive nature of help-seeking (Newman, 2002a).

Categorizations of Help-Seeking Strategies

Researchers' categorizations of those help-seeking strategies have evolved and become more inclusive than ever. In the 1980s, Nelson-Le Gall introduced the dichotomy of executive (or expedient) help-seeking and instrumental (or adaptive) help-seeking, which laid a foundation for the following categorizations. According to her categorization, those executive help-seekers are dependency-orientated, relying on external sources of help for problem solving. For adaptive help-seekers who are mastery-orientated, they choose to use all sources of help to facilitate their problem-solving process.

In 1991, Karabenick and Knapp performed a survey to test learners' help-seeking tendencies based on a 7-point rating scale and they further classified help-seeking behaviors into five categories, including formal help-seeking, informal help-seeking, instrumental activities, lowering performance aspirations, and altering goals. Definitions and examples for each category are presented in Table 1. Their categorizations take into consideration learners' psychological decision-making process and illustrate its influence on learners' instrumental activities, including the use of various learning strategies and especially their frequency of help-seeking (Karabenick & Knapp, 1991).

Table 1
Categorization of Help-seeking by Karabenick & Knapp

Category	Definition	Example
Formal Help-seeking	Learners obtain help from formal sources.	Seek help from instructors, university-provided support personnel, and ask questions in class, etc.
Informal Help-seeking	Learners obtain help from informal sources.	Seek help from other students and more knowledgeable friends, etc.
Instrumental Activities	Learners take actions to help them perform better.	Try harder, study more, or take better notes, etc.
Lowering Performance	Learners lower their original aspirations and do easier things next time.	Take a lighter load next time, and select easier courses next term, etc.
Altering Goals	Learners change their goals based on past experiences.	Transfer to another school, change major or minor, etc.

Help-Seeking Strategies in Online Environments

The use of computer-mediated technologies supports both synchronous and asynchronous communications between instructors and learners, thus making online teaching and learning more common (U.S. Department of Education, 2010). The recent COVID-19 pandemic has further drawn researchers' attention to the learning efficacy in online learning environments. Much of the literature on help-seeking in higher education has focused on traditional face-to-face learning settings without paying enough attention to those online learners (Cheng et al., 2013). Online learning environments differ from traditional face-to-face meetings in that learners need more self-regulation of their learning, and they don't have the same opportunities to receive help as they do in face-to-face settings (Broadbent & Lodge, 2021).

Based on the uniqueness of online learning settings, Cheng et al. (2013) identified three types of online academic help-seeking, including information searching (e.g., search for specific information to solve academic problems on Google or other websites), formal query (e.g., email or contact course instructors for help), and informal query (make online requests to peers or unknown experts for academic help), taking into consideration learners' computer competencies, specifically learners' information searching skills. The new categorization has brought people's attention to learners' online help-seeking behavior, further strengthening the influence of help-seeking on online learners' learning outcome. Definitions and examples of the three categorizations are presented in Table 2.

Table 2
Categorization of Online Help-seeking by Cheng et al.

Category	Definition	Example
Information Searching	Search online for answers to solve academic problems.	Search for information on Google or other relevant websites.
Formal Query	Contact teachers or tutors online to request help.	Email course instructors or tutors to get help or receive help through e-tutor systems.
Informal Query	Seek help through formal and informal sources.	Go to social network sites to request help from unknown experts or other peers.

Makara and Karabenick (2013) argued that technology transformed the traditional formal and informal dichotomy, and they proposed a more diversified framework to categorize learners' help-seeking sources. Their categorization covers help-seeking strategies in both online and face-to-face learning environments. The first group of formal and informal help-seeking is the same as what researchers did in the past. Their second characterization centers on the relationship between the help giver and help receiver. Personal help-seeking indicates that the help learners receive comes from the person they are familiar with or close to, while impersonal help-seeking means the opposite. The third dimension focuses on the involvement of technologies and yields a group of mediated help-seeking and face-to-face help-seeking. Mediated help-seeking occurs with the help of technological tools, while face-to-face help-seeking doesn't require the presence of technology. The last dimension is determined by the adaptability of the help-seeking source. If it can change or adapt to learners' needs over time, it is called dynamic help-seeking, whereas it is categorized as static help-seeking, meaning that it stays the same over time. Definitions and examples are presented in Table 3.

Table 3

Categorization of Help-seeking by Makara & Karabenick (2013)

Categorization	Definition	Example
Formal (F) & Informal (In)	Seek help through formal and informal sources.	F: course website, instructor, syllabus, textbook, tutor center, etc. In: chat room, discussion board, peer, etc.
Personal (P) & Impersonal (Im)	The relationship between the help seeker and the help source is close or distant.	P: peer, instructor in person, friend, family, etc. Im: course website, web search engine, syllabus, textbook, etc.
Mediated (M) & Face-to-face (F)	Via some form of technology & meet the help source physically.	M: chat room, discussion board, course website, syllabus, textbooks, etc. F: instructor in person, peer in person, tutor center, etc.
Dynamic (D) & Static (S)	The help source adapts or changes over time based on learners' needs or not.	D: chat room, discussion board, instructor, peer, friend, tutor center, etc. S: course website, syllabus, textbook, etc.

As a manifestation of self-regulation, adaptive help-seeking requires learners to monitor their academic performance, show awareness of difficulties they cannot independently overcome, and exhibit a willingness to conquer that difficulty by requesting help from a more knowledgeable individual (Newman, 2002b). As a result, adaptive help-seeking is situated in one's ability to engage in self-regulated learning and is influenced by the environment (Giblin & Stefaniak, 2017; Karabenick & Dembo, 2011a). Learners' abilities to employ adaptive help-seeking strategies are greatly influenced when their learning environment is perceived as being mastery-oriented (Karabenick & Dembo, 2011b).

Purpose of Study

Help-seeking is a technique that is predominantly referenced in healthcare, counseling, and educational settings. While systematic reviews have been conducted to explore how help-seeking strategies support individuals in health disciplines, none have been conducted to explore help-seeking strategies in instruction. A systematic review exploring the types of strategies used to promote and facilitate adaptive help-seeking in online learning environments will help scholars identify trends in help-seeking research and identify opportunities for further exploration. It will also provide a comprehensive overview of the types of research methodologies that have been used to explore help-seeking as well as determine if emphasis has been placed on promoting adaptive or executive help-seeking strategies.

The following research questions guided this review:
1. What are the publication trends of help-seeking research in online learning environments (e.g., journals, years of publication, geographical location)?
2. What is the context of help-seeking research in online learning environments published (i.e., academic disciplines, instructional setting)?
3. What research design and data collection methods are used in the studies reviewed?
4. What guidelines and implications exist concerning the promotion of help-seeking strategies in online learning environments?

Methods

This study followed guidelines for conducting systematic reviews outlined in the Preferred Reporting of Items for Systematic Reviews and Meta-Analyses Statement (Liberati et al., 2009) and the U.S. Department of Education, Institute of Education Science (2017). We employed the following criteria in our systematic review:
1. Studies included in this review must have been published in peer-reviewed journals. Papers published in non-peer-reviewed journals, book chapters, technical reports, dissertations, or conference proceedings were excluded.
2. Papers included in this review must have been written in English. Non-English language journals were excluded.
3. The reviewed studies must include original research. Qualitative and quantitative methods were included. Studies were required to have identifiable methods and result sections. Review pieces, opinions, literature reviews, or conceptual papers were not included.
4. Studies included in this review addressed help-seeking research in online learning settings.

Screening Phase

Two databases, Educational Research Information Center (ERIC) and PsycInfo, were searched for eligible studies exploring help-seeking strategies in online learning environments. The five topical searches (TS) that were performed were TS = ("help-seeking" and "online learning"), which yielded 204 records in ERIC and 94 records in PsycInfo, TS = ("help-seeking" and "distance education"), which yielded 39 records in ERIC and 49 records in PsycInfo, TS = ("help-seeking" and "online education"), which yielded 383 records in ERIC and 173 records in PsycInfo, TS = ("help-seeking" and "blended learning"), which yielded 19 records in ERIC and 7 records in PsycInfo, and TS = ("help-seeking" and "e-learning"), which yielded 123 records in ERIC and 55 records in PsycInfo. Our initial search yielded a total of 1,146 papers. A total of

566 studies remained upon removing duplicates, non-English papers, and conceptual framework or literature review papers. After removing all papers that focus on the interrelationship between aspects of motivation and help-seeking, we were left with a total of 99 papers for further review. We then began to screen each study to see if specific help-seeking strategies were included. Of the 99 studies, a total of 36 studies remained in our review (see Figure 1). Each author reviewed and coded half of the studies included in this review. To ensure the reliability of the review process, we reviewed each other's codes. Due to the nature of the codes used for this study, there were no discrepancies between the reviewers during the coding phase.

Figure 1
Overview of the Screening Process
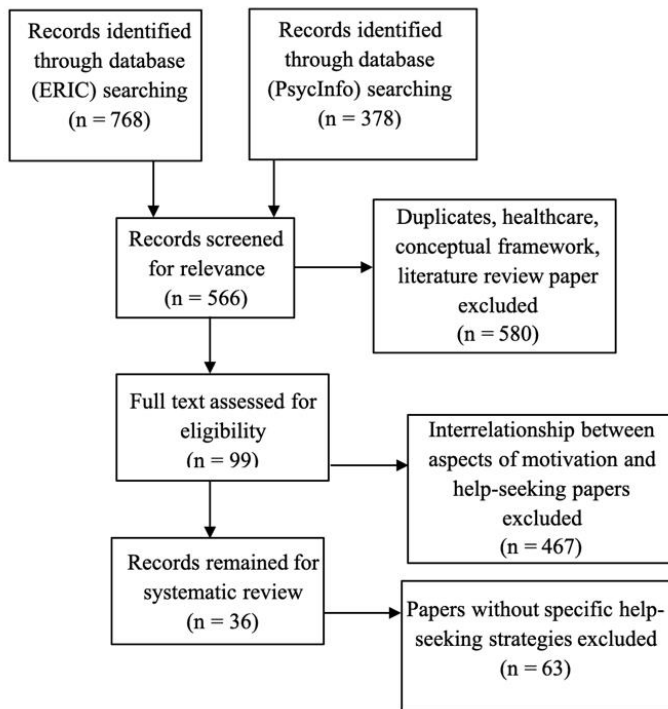
Results

Publication Trajectory

We did not impose any restrictions on dates of publication for this systematic review. We chose not to impose a data range for this review because there have not been a lot of studies focusing on online help-seeking. Due to the timing that this review was completed, all studies included were published between 2000 and 2021. Table 4 provides an overview of the publication trajectory of studies examining help-seeking strategies in online learning environments. As outlined in the table, research on help-seeking has significantly grown since 2011 with 33.3% (n = 12) of the studies included in this review occurring between 2011 and 2015 and 55.6% (n = 20) between 2016 and 2021. The increase in studies examining help-seeking in online environments coincides with the growth of online learning in higher education and K–12 settings (Allen & Seaman, 2017).

Table 4
Publication Trajectory

Years	(n)	Studies
2000–2005	1	Taplin et al. (2001)
2006–2010	3	Bannier (2007); Cheng & Tsai (2011); Kitsantas & Chow (2007); Whipp & Lorentz (2009)
2011–2015	12	Barbour et al. (2012); Brown et al. (2013); Cheng et al. (2013a, b); Er et al. (2015); Hao et al. (2016); Hao et al. (2017); Huet et al. (2011); Lee et al. (2014); Mahasneh et al. (2012); Reeves & Sperling (2015); Roll et al. (2014); Schworm & Gruber (2012)
2016–2021	20	Algharaibeh (2020); Al Hashimi (2019); Amador & Amador (2017); Astatke (2018); Butler et al. (2021); Çakiroglu & Öztürk (2017); Chao et al. (2018); Daley et al. (2016); Ding & Er (2018); Giblin & Stefaniak (2021); Giblin et al. (2021); Gleeson et al. (2019); Koc & Liu (2016); Lee et al. (2021); Mundia et al. (2016); Vanslambrouck et al. (2019)

Geographic Distribution

Regarding the geographic distribution of studies, the majority of studies examining help-seeking strategies in online learning environments were conducted in North American and Asian countries. Most studies were conducted in North America (52.7%), followed by Asia (33.3%), Europe (8.3%), Australia (2.8%), and Oceania (2.8%). A total of 13 countries or regions were represented by the research as outlined in Table 5. The geographic distribution may be attributed to the fact that one of the criteria for inclusion in this review was that studies must be published in English. The distribution can also be attributed to the rate of adoption of online learning environments.

Table 5
Countries & Regions of Study

Continent/Region	Country/Region	(n)
North America	United States	18
	Canada	1
Asia	Taiwan, China	6
	Jordan	2
	Bahrain	1
	Brunei	1
	Hong Kong, China	1
	Turkey	1
Europe	Belgium	1
	France	1
	Germany	1
Australia	Australia	1
Oceania	New Zealand	1

Educational Context

Table 6 provides an overview of the educational contexts where studies examining help-seeking strategies took place. Most studies (n = 29) occurred in higher education, followed by K–12 (n = 6). One study (Mundia et al., 2016) was conducted on teachers' help-seeking strategies as part of a professional development program.

Table 6

Educational Setting

Context	(n)	Studies
Higher Education	29	Al Hashini (2019); Algharaibeh (2020); Amador & Amador (2017); Astatke (2018); Bannier (2007); Brown et al. (2013); Butler et al. (2021); Çakiroglu & Öztürk (2017); Chao et al. (2018); Cheng et al. (2011); Cheng et al. (2013a, b); Ding & Er (2018); Er et al. (2015); Giblin & Stefaniak (2021); Giblin et al. (2021) Gleeson et al. (2019); Hao et al. (2016, 2017); Huet et al. (2011); Kitsantas & Chow (2007); Koc & Liu (2016); Lee et al. (2021); Linney (2017); Mahasneh et al. (2012); Reeevs & Sperling (2015); Schworm & Gruber (2012); Taplin et al. (2001); Vanslambrouck et al. (2019); Whipp & Loretz (2009)
K–12	6	Alvarado-Alcantar et al. (2018); Barbour et al. (2012); Daley et al. (2016); Lee et al. (2014); Roll et al. (2014)
Other	1	Mundia et al. (2016)

Research Methodologies

Table 7 provides an overview of the research methodologies used by the studies included in this review. Research methodologies were analyzed based on how they were presented in the methods and data collection sections of the articles. The majority of the studies were quantitative studies (55.6%) using questionnaires. Mixed studies (27.8%) reported using observations, interviews, social network analysis, learning management system logs, and questionnaires as data sources. Qualitative studies (16.7%) reported using open-ended surveys, interviews, and discussion posts.

Table 7

Types of Research Methodologies

Methodology	Data Sources	Studies
Qualitative (n = 6)	Open-ended surveys Interviews Discussion posts Video analysis	Al Hashimi (2019); Amador & Amador (2017); Barbour et al. (2012); Brown et al. (2013); Giblin & Stefaniak (2021); Vanslambrouck et al. (2019)
Mixed Methods (n = 10)	Observations Interviews Social network analysis LMS logs Questionnaire	Çakiroglu & Öztürk (2017); Er et al. (2015); Giblin et al. (2021); Koc & Liu (2016); Lee et al. (2021); Mahasneh et al. (2012); Reeves & Sperling (2015); Roll et al. (2014); Taplin et al. (2001); Whipp & Lorentz (2009)

Quantitative (n = 20)	Questionnaire	Algharaibeh (2020); Alvarado-Alcantar et al. (2018); Astatke (2018); Bannier (2007); Butler et al. (2021); Chao et al. (2018); Cheng & Tsai (2011); Cheng et al. (2013a, b); Daley et al. (2016); Ding & Er (2018); Gleeson et al. (2019); Hao et al. (2016, 2017); Huet et al. (2011); Kitsantas & Chow (2007); Lee et al. (2014); Linney (2017); Mundia et al. (2016); Schworm & Gruber (2012)

Types of Help-Seeking Sources Used in Online Environments

During our review of articles, we also categorized the types of help-seeking strategies they reported according to Karabenick and Knapp's (1991) categories: formal help-seeking, informal help-seeking, instructional activities, altering goals, and lowering performance aspirations. It is important to note that several studies reported more than one type of help-seeking source as presented in Table 8. The majority of studies emphasized formal help-seeking strategies (41.8%) and informal help-seeking strategies (41.8%), followed by instrumental activities (14.5%), and altering goals (1.8%). None of the studies included in this review reported lowering performance aspirations as a means to support help-seeking.

Table 8

Types of Help-Seeking Strategies Reported in Studies (According to Karabenick & Knapp, 1991)

Type	(n)	Studies
Formal Help-seeking	23	Algharaibeh (2020); Alvarado-Alcantar et al. (2018); Amador & Amador (2017); Bannier (2007); Butler et al. (2021); Çakiroglu & Öztürk (2017); Chao et al. (2018); Cheng & Tsai ((2011); Cheng et al. (2013); Er et al. (2015); Giblin & Stefaniak (2021); Giblin et al. (2021); Gleeson et al. (2019); Hao et al. (2016, 2017); Kitsantas & Chow (2007); Lee et al. (2014); Lee et al. (2021); Linney (2017); Mahasneh et al. (2012); Taplin et al. (2001); Vanslambrouck et al. (2019); Whipp & Lorentz (2009)
Informal Help-seeking	23	Al Hashimi (2019); Algharaibeh (2020); Amador & Amador (2017); Barbour et al. (2012); Butler et al. (2021); Çakiroglu & Öztürk (2017), Chao et al. (2018); Cheng & Tsai (2011); Cheng et al. (2013); Daley et al. (2016); Ding & Er (2018); Giblin & Stefaniak (2021); Giblin et al. (2021); Gleeson et al. (2019); Hao et al. (2016, 2017); Kitsantas & Chow (2007); Lee et al. (2014); Linney (2017); Mahasneh et al. (2012); Mundia et al. (2016); Taplin et al. (2001); Vanslambrouck et al. (2019)
Instrumental Activities	8	Al Hashimi (2019); Astatke (2018); Gleeson et al. (2019); Huet et al. (2011); Lee et al. (2021); Roll et al. (2014); Schworm & Gruber (2012); Whipp & Lorentz (2009)
Altering Goals	1	Lee et al. (2021)
Lowering Performance Aspirations	0	-

Note. Studies reported multiple types of help-seeking strategies. N > 36.

Several studies reported students' expressing their preference for seeking help from formal and informal sources (Koc & Liu, 2016; Reeves & Sperling, 2015). While a majority of studies reported students seeking traditional formal and informal help-seeking sources as described in Table 1, a few studies specifically noted the importance and need for instructors to take an active role in supporting their students' help-seeking abilities. In their study examining students' experiences in online learning environments in their first semester at college, Brown et al. (2013) noted that instructors can take an intentional role in helping their students seek help. They shared that instructors could support students by referring at-risk students to specific help sources.

Of the 36 studies included in this review, eight mentioned the use of instrumental activities to support help-seeking. Several studies recommended that additional studies exploring help-seeking in different instructional contexts were needed (Gleeson et al., 2019; Lee et al., 2021; Roll et al., 2014; Schworm & Gruber, 2012). Al Hashimi (2019) noted that time is a limitation in many help-seeking studies. Most of the studies included in this review occur within the confines of a semester. This was also recognized by several other researchers who recommended that educators' understanding of the use and prevalence of help-seeking could benefit from longitudinal studies to determine how students' help-seeking behaviors change over an extended period (Ding & Er, 2018; Giblin et al., 2021; Kitsantas & Chow, 2007; Lee et al., 2021).

Al Hashimi (2019) employed a *recycled* teaching format by integrating student-generated instructions, materials, and peer feedback. This promoted active learning in the classroom and integrated help-seeking as an instrumental construct within the course. Huet et al. (2011) found a positive relationship between students' mastery of goals and their perceptions of help-seeking in an interactive learning environment. Their findings revealed that high mastery goals were related to high perception of a threat to a learner's autonomy but not to the use of help. Lee et al. (2021) explored how students' help-seeking behaviors predicted their academic performance in asynchronous online discussions. They recommended that help-seeking behaviors could be further supported if instructors integrated instructional prompts to encourage students to engage in help-seeking strategies rather than answering specific questions posed by the students regarding the assignments. These recommendations also support Schworm and Gruber's (2012) suggestions to integrate instructional prompts to elicit students' elaboration during learning activities. Furthermore, these prompts could also be used to build upon recommendations by Yeh et al. (2019) to leverage students' goal orientations to specific help-seeking strategies.

Several studies suggested future research is needed to explore instructors' perspectives related to help-seeking (Er et al., 2015; Koc & Liu, 2016). In their study exploring help-seeking strategies used by students in K–12 environments, Alvarado-Alcantar et al. (2018) recommended that teachers be provided professional development opportunities to assist them with facilitating help-seeking strategies in their class activities. Giblin and Stefaniak (2021) recommended that additional studies be conducted to examine how students' age and experience impact their decision-making processes when selecting help sources.

Discussion

A Link Between Academic Achievement, Motivation, and Help-Seeking

Help-seeking strategies have been statistically linked to academic achievement as an intermediate variable between motivation and GPA (Barnard et al., 2008; Dunn et al., 2014). In a study exploring first-year college students' help-seeking tendencies, Astatke (2018) found a

significant correlation between students' help-seeking behavior and academic achievement. They recommend that future research clarify factors that may contribute to gender differences between students' emotional intelligence, self-efficacy, and help-seeking behaviors. These recommendations further support other studies that have found a correlation between students' self-efficacy regarding digital literacy and help-seeking behaviors (i.e., Cheng & Tsai, 2011; Ding & Er, 2018; Kuo et al., 2014; Liu, 2017).

The majority of these correlational studies have been conducted through the dissemination of questionnaires to students. Butler et al. (2021) stressed the importance of expanding help-seeking studies to include additional courses and disciplines to better understand the nuances of instructor and student relationships. In addition to expanding studies to include additional courses, qualitative research designs could help researchers contextualize what instructor and student relationships look like in an online environment. It's expected that the relationship between the instructor and students plays an important role in keeping students motivated. This may also help gain a better understanding of how Karabenick and Knapp's (1991) help-seeking categories such as instrumental activities, altering goals, and lowering performance aspirations (Table 8) can be used in online settings.

Environmental Affordances Impacting Students' Online Help-Seeking Practices

Compared with traditional face-to-face learning environments where students can receive instant feedback, the online learning environment poses challenges to potential learners who are shy, excessively autonomous, or possess limited computer skills. Studies have found that students who exhibit confidence in digital technology and information literacy skills are more likely to engage in help-seeking activities in online learning environments (Ding & Er, 2018; Hong et al., 2021; Liu, 2017).

Online learning environments provide opportunities for instructors to leverage a variety of technological applications to facilitate and support students' help-seeking behaviors. While several help-seeking strategies that are used in online learning environments can also be used in traditional face-to-face classrooms, there are opportunities to promote learner presence in asynchronous online venues among students who may not be as willing to participate in face-to-face settings with their peers. Chao et al. (2018)'s exploration of the use of online discussion boards to support students' help-seeking behaviors revealed that students were more open to engaging in seeking help from additional sources depending on their level of familiarity with the help providers. They recommended future studies examine additional factors that may impact learner performance and their avoidance of particular help-seeking sources.

Online learning environments provide opportunities for instructors to expand on the research that has been done by looking at instrumental activities to support help-seeking. Instructors should frame help-seeking mechanisms based on learners' diverse temperaments and the majority of opportunities brought by technological developments (Giblin et al., 2021). Instructors can take a more active role in their students' help-seeking efforts by managing educational technologies to alleviate technological difficulties students may incur (Barbour et al., 2012; Mundia et al., 2016). Further exploration into how instructors can integrate activities that promote digital literacy within their courses as an instrumental activity is needed. By weaving activities into coursework that are centered around promoting help-seeking strategies, students may be better positioned to engage in adaptive help-seeking techniques.

A Need for Concentrated Efforts on Adaptive Help-Seeking
It is difficult to discern the extent to which the studies included in this review distinguished between executive or adaptive help-seeking strategies. Karabenick (2004) found that learners adopting instrumental help-seeking prefer formal sources of help, such as the instructor. Due to the limitations with only eight studies reporting the use of instrumental activities as help sources in online learning environments, it is difficult to make assumptions that Karabenick's (2004) position applies to online education. With more autonomy being placed on the learner in online education, additional studies are needed to explore whether their preferences for different help-seeking sources may vary based on their adoption of instrumental activities.

Nine studies included in this review addressed altering goals and instrumental activities to support students' help-seeking. By expanding on research that examines the role that instrumental activities may have on students' learning experience in an online environment, instructors can support students' familiarity with help-seeking sources, increase their self-efficacy with navigating digital environments and promote the autonomy of their learning. To benefit most from the learning experience, a student should therefore employ instrumental help-seeking strategies (Giblin & Stefaniak, 2017, Giblin et al., 2021; Lee et al., 2021; Roll et al., 2014).

Limitations

The purpose of this systematic review was to explore the types of help-seeking strategies used in online learning environments. It is important to note that this systematic review captured a subset of studies that have been published on help-seeking. Since this review only included studies published in the English language, there is a possibility that additional studies exploring the use of help-seeking strategies in online environments were omitted.

A second limitation was that our search parameters focused solely on empirical studies. While these studies have provided insight into the breadth of research that has been conducted on help-seeking strategies in online learning environments, conceptual and theoretical pieces may have offered additional insights into challenges learners experience when seeking help. These conceptual publications could provide additional guidance for future research studies.

Recommendations for Future Research
The majority of studies included in this systematic review used a survey design to identify themes associated with help-seeking in online environments. Many correlational studies that examine the relationship between variables like academic motivation, help-seeking, achievement, and self-regulation have been done to examine students' academic performance in online environments (AI Fadda, 2019; Astatke, 2018; Cheng & Tsai, 2011; Kitsantas & Chow, 2007). Research on help-seeking in online environments could greatly benefit from the addition of qualitative research studies, particularly those employing a case study research design. These types of studies would be able to provide depth into how and why students use certain help-seeking strategies compared to others. Furthermore, case studies would help to understand the unique circumstances relevant to different areas of study (i.e., engineering, communications, business, etc.).

We recommend that future studies include more personal information, especially learners' digital competencies, which has been referred to as a new help-seeking strategy (Cheng & Tsai, 2011; Cheng et al., 2013). What's more, other personal variables, including gender, major, transfer status, self-efficacy level, and learning beliefs, are suggested to be included when

we examine the overall pattern for online learners' help-seeking behaviors. Additionally, instructors' perceptions of help-seeking should be further studied as an independent variable that affects learners' help-seeking selection. For example, how instructors support and react to learners' help-seeking requests has been experimentally proved to be directly and positively related to learners' use of adaptive help-seeking strategies (Kozanitis et al., 2007). Instructors' self-efficacy beliefs and the use of self-regulatory strategies should also be considered when understanding learners' help-seeking behavior in online settings (White & Bembenutty, 2013). This systematic review focused on studies published on ERIC and PsycInfo with restrictions on language, theme, and originality. Future studies are suggested to include more databases for a more systematic representation of the help-seeking patterns in online settings.

Based on online learners' help-seeking preferences and frequencies mentioned in this systematic review, future studies are suggested to take into consideration their avoidant help-seeking behavior. The negative influence of previous help-seeking experience or help-seeking perceptions including threat and benefit, ease of use, and cost on online learners' actual help-seeking selection seems a new direction for future studies (Huet et al., 2011). As indicated in our results section, future studies are suggested to focus more on K–12 settings given the large number of K–12 online learners.

None of the studies included in this review were conducted during the COVID-19 pandemic. At the time this review was conducted, no publications appeared in our searches addressing help-seeking strategies for online learning during a pandemic. We anticipate that there may be a subset of studies that will be published over the next three years that may offer new insights regarding the influence that environmental factors may impose on learners' help-seeking strategies when engaged in emergency remote learning.

Conclusion

This study attempted to further our understanding of learners' help-seeking behavior in online learning environments. All peer-reviewed English journal articles addressing specific help-seeking strategies were abstracted for further analysis from two databases (i.e., ERIC and PsycInfo). Key words such as help-seeking, online learning, distance education, online education, and e-learning were employed to navigate the screening process. All healthcare papers, conceptual framework papers, and literature papers were excluded from our analysis. Papers that dealt with only the relationship between aspects of motivation and help-seeking strategies without mentioning specific help-seeking strategies were also excluded. All the steps ensured that the remaining 36 papers focused exclusively on the help-seeking strategies used in online settings.

Findings revealed researchers' increasing attention to online learners' help-seeking behavior in the past decade all over the world, especially for researchers in North America and Asia. Higher education was the focal point of help-seeking in our review. Researchers used mainly quantitative research methods to investigate the overall help-seeking pattern for learners in online educational settings. Most researchers employed questionnaires as their main data sources because of the conveniences in data distribution, collection, and analysis. However, as indicated in the limitations part, more subjective methods should be employed to support the use of questionnaires. Given that most of the studies in our review focused specifically on formal help-seeking and informal help-seeking, we purport that more studies are needed focusing on the psychological situation of online learners when they made decisions about lowering or changing their previous learning aspirations. Learners bring unique characteristics to complex learning

environments, which means more detailed contextual analyses of learners, instructors, and the learning environment are needed in future studies.

Online learning has been playing a significant role in contemporary society due to the great potential it boasts. It has greatly reduced the cost of learning, thus making learning more accessible and equitable for learners in economically deprived areas. It has also satisfied the diversified needs of learners separated by time, space, and learning habits. To better facilitate online learners' help-seeking needs with hopes of promoting learning outcomes, researchers should seriously pay attention to their help-seeking pattern. Therefore, our review yields both theoretical and practical implications for online education. It reaffirms that help-seeking, as an important self-regulation strategy, is especially important in online education (Karabenick, 2011). It also offers insights as to the overall help-seeking situation for online learners, indicating the directions for future studies.

For online instructors, they should try to familiarize learners with all the diverse help-seeking sources available, increase learners' self-efficacy with navigating digital environments, and promote learners' awareness of relatedness, autonomy, and competence of the learning process (Newman, 2002c). In this way, instructors can help frame an interaction-friendly help-seeking mechanism where learners are willing and eager to seek help whenever they encounter problems they cannot deal with. Online learners should bear in mind the notion that seeking help is by no means an act related to dependency. It is an effective self-regulated learning strategy to overcome academic barriers. They may make full use of the help-seeking sources available and more importantly, they should overcome their perceived embarrassment and threat followed by help-seeking.

Declarations

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Passive Participation in Collaborative Online Learning Activities: A Scoping Review of Research in Formal School Learning Settings

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Abstract
This scoping review summarizes studies on passive participation in collaborative online learning activities that used computer-mediated communication tools in school settings. A total of 42 articles spanning about 20 years were explored. ERIC and three main journal indexes from Web of Science were used to locate articles. For each year searched, there were only one to five studies that investigated passive participation, indicating that not many researchers have examined this topic in general. Most studies used mixed methods and were conducted in higher education settings in asynchronous online discussions. Three terms have been used to discuss the notion of passive participation: lurking for read-only behavior, legitimate peripheral participation for low contribution, and free riding for no contribution. Studies on passive participation have mainly explored four topical areas: motivational factors and reasons, participation types and behavioral patterns, effect on learning outcomes, and pedagogical strategies for de-lurking. Most studies have investigated passive participation as one of the behavior patterns among various types of participation. A few studies have solely examined read-only behaviors. The notion of passive participation varies among researchers and should therefore be redefined. Overall, there have been few studies on the topic of passive participation and those that have been conducted reveal some inconsistencies in their findings, indicating the topic requires further investigation. Future studies on this topic are urgently needed due to the forced shift to online courses precipitated by the pandemic. While instructors are also responsible for supporting their learners in this unprecedented context, researchers should investigate ways to help instructors better understand passive participants and encourage active learner participation in collaborative online learning space.

Keywords: Passive participation, lurking, peripheral participation, free riding, scoping review, online collaborative learning activities, formal learning, school setting

Learning is both individual and social. In online learning space, students can learn individually by reading course materials or observing others' responses in online chat box or online discussion boards. This individual learning is called student-content interaction and is understood as a passive form of participation. Students can also learn by interacting with an instructor and with other students via computer-mediated communication (CMC) tools, such as email, online chats, and online discussion board. These types of social learning are called student-instructor and student-student interactions (Moore, 1989), and are viewed as active forms of participation. Therefore, both active and passive forms of participation are different types of normal participation. Regardless of their level of participation, students generally read alone more than they write for interaction due to transactional distance (Ebner et al., 2005; Xie, 2013). Transactional distance—the psychological and communication gaps between an online instructor and their students—exists due to the temporal and spatial separation (Moore, 1991). Nevertheless, active forms of participation have been considered more important than passive forms of participation in education for two reasons. First, active participation reduces transactional distance, which is greater in distance education than in face-to-face settings (Moore, 1991). Second, active participation helps students co-construct knowledge and develop higher mental functioning while interacting with others (Vygotsky, 1978). Therefore, researchers have extensively investigated active forms of participation in Computer Supported Collaborative Learning (CSCL), which has been implemented via CMC tools.

Students' reading or lurking behavior—a passive form of participation—has not been investigated as frequently as has posting behavior (Wilton, 2018), even though reading inevitably must precede students' engagement with others about a given topic. This dearth of studies on passive participation is mainly because reading is difficult to observe and measure, even with access to students' log data. Studies that have observed reading behavior have been conducted mostly in open online forums or through social media. In formal online learning (i.e., school settings), studies on passive participation are not limited to reading (i.e., read-only, non-posting, lurking, or invisible participation, in other words), but also often involve students' minimal posting behavior. This focus on posting behavior stems from the fact that posting is usually required in online courses to earn credits, and most students post to meet course requirements (Dennen, 2008). For this reason, researchers include low contribution or minimum participation when discussing passive participation in online courses. The term "legitimate peripheral participants" (LPP) has been used to describe students who are "less active but still engaged" and is exhibited by students who read more than they write (Honeychurch et al., 2017, p. 197).

As such, the definition and scope of passive participation have been inconsistent throughout the literature. Therefore, it is necessary to review the terms and concepts used to describe passive participation in existing studies. In this review, passive participation includes both reading (i.e., a non-posting behavior) and peripheral participation (i.e., a less active form of participation) in collaborative online learning activities within formal school learning settings (see Types 3 and 4 of passive participation in Figure 1).

Figure 1

Active and Passive Forms of Participation
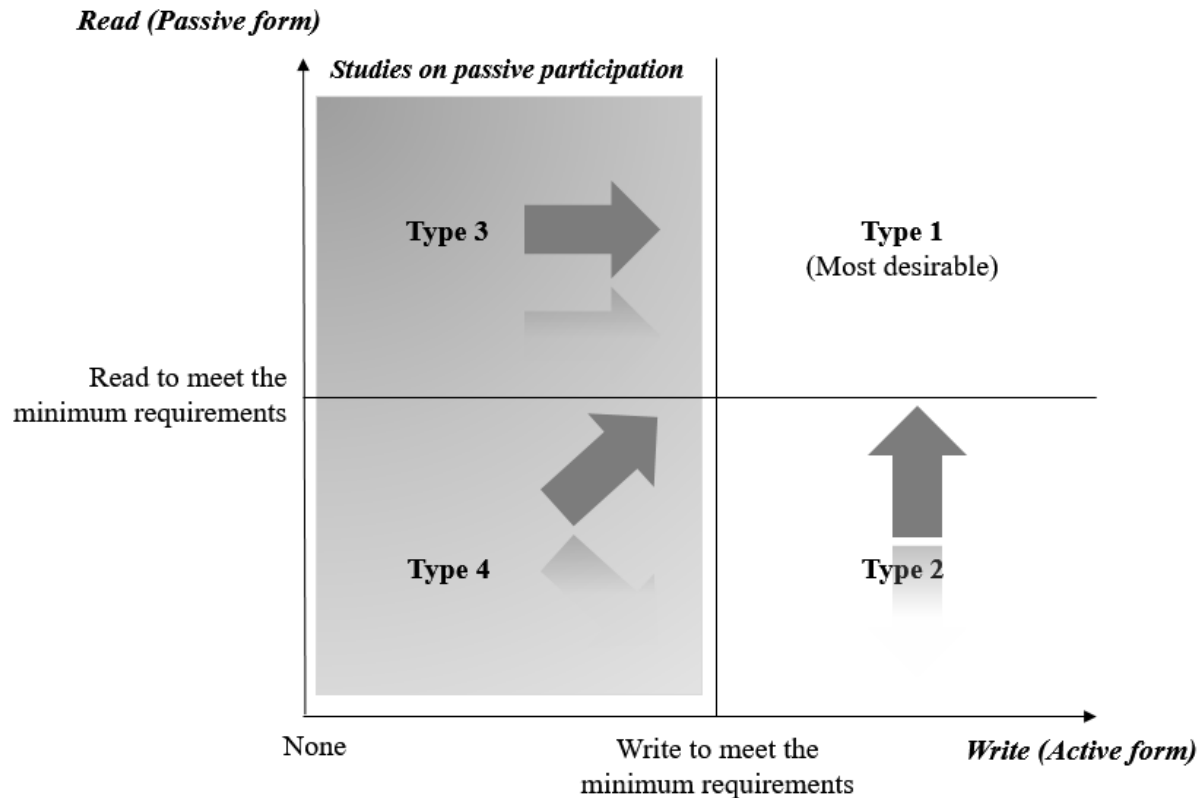
Note. This quadrant is only conceptual for the purpose of visualizing our definition of passive participation.

Generally, reading itself does not necessarily equate to a lack of engagement, as students read before and after they post (Wilton, 2018; Wise et al., 2013). Indeed, reading is often an indicator of student participation and learning. However, in the context of collaborative learning activities, passive participation is often considered free riding or low contribution. Free riding behaviors are considered undesirable because of the importance of active participation in collaborative learning. The different dynamics of student participation are usually dependent on course factors such as learning activity design, instructor facilitation, and learning community.

Many studies have investigated various course factors that affect students' engagement in online learning space (Martin et al., 2020; Zhou, 2015). However, only a few studies have specifically focused on students' passive participation. Understanding passive participation in various course situations will provide instructional designers and online instructors with practical implications on how to improve course design and facilitation strategies to encourage students' active participation and enhance their learning experiences in online settings. A review of the current studies on passive participation will help researchers identify the gaps and opportunities in the literature on passive participation. It will also add meaningful implications to the current findings resulting from studies on students' active participation in collaborative online learning activities.

Purpose and Research Questions

The purpose of this study is to provide an overview of research into passive participation in collaborative online learning activities in formal learning contexts from K-12 to higher education. Collaborative online learning activities are those that occur through computer-mediated communication (CMC) technologies such as online discussion forums and social media. We included passive participation in any modality (e.g., asynchronous, synchronous, hybrid learning) in our review but focused solely on text-based communication using CMC tools. We were specifically interested in passive participation in formal learning settings because user behaviors in formal and informal learning communities are distinct. Formal learning communities last only for a term and most students are extrinsically motivated. That is, students participate to receive credit towards their degree. In contrast, informal learning communities have longer durations and participation in these communities is voluntary in most cases. Since learner motivation is not the same in both environments, we chose to focus on students' participation in formal learning settings to highlight the current findings and needs for future research. We did not include massive open online courses (MOOCs), as MOOCs are usually informal, and participation is voluntary.

Additionally, we included both non-posting behavior and limited participation as forms of passive participation in our review, due to the fact that reading without posting is rare in formal learning settings where posting is usually mandatory. Therefore, our target behaviors include reading, lurking, free riding, peripheral participation, and low contribution in collaborative online learning activities. To fully understand students' passive participation and its consequences for their learning, it is useful to map and summarize the current state of knowledge and identify any gaps. Therefore, the research questions that guided this scoping review study are:

1. In formal school learning settings (e.g., K-12, higher education), what research has been conducted on passive participation in collaborative online learning activities?

   a. In what parts of the world has research been conducted?
   b. In what modalities has research been conducted?
   c. What CMC tools have been used?
   d. What methods have been used?
   e. What topics have been investigated?

2. How has the notion of passive participation been conceptualized by the researchers?

3. What has been found on passive participation in collaborative online learning activities?

Method

Research Approach

We employed a scoping literature review to provide an overview of current research and to identify gaps on the topic of "passive participation" in collaborative online learning activities. We also wanted to clarify the key concepts or definitions of passive participation used in the current research. The scoping review has been instrumental to researchers since it provides synthesized evidence of existing literature on a topic or field (Pham et al., 2014). This review method is especially useful for a topic or field that has not been comprehensively reviewed (Munn et al., 2018). We adopted the methodological framework suggested by Arksey and O'Malley (2005) for this scoping review.

We followed the first five steps of Arksey and O'Malley's framework; namely: (1) identify research questions; (2) identify relevant studies; (3) select studies; (4) organize data using a chart; and (5) report the results. We identified research questions and sampled relevant studies using selective databases from ProQuest and Web of Science. All articles were reviewed and filtered by relevance. We should point out that we considered a journal article to be relevant if the study was empirical and contained the component of passive participation in collaborative online learning activities in a formal learning setting. All relevant articles were coded by two researchers using a pre-defined coding scheme. After the coding was completed, we organized the data using tables and charts and summarized any important findings.

Search Strategies and Relevancy Criteria for Sampling

For this study, we employed two search systems: ProQuest and Web of Science. We selected these systems because the platforms give access to multiple databases simultaneously and provide advanced search options for easy refinement (Gusenbauer & Haddaway, 2020). Although ProQuest and Web of Science contain multiple databases, we used only ERIC from ProQuest and three main journal indexes—the Science Citation Index, Social Science Citation Index, and Arts and Humanities Citation Index—from Web of Science. Note that these selections were made because our target context was formal school learning within the social sciences. We determined that these four databases from two search systems provided a comprehensive set of education research. Further constraining this study, only peer-reviewed, scholarly articles written in English were included.

We conducted three sequential searches to sample enough articles. First, we used a narrow definition of passive participation and limited our search to title (TI), topic (TS), or abstract (AB) fields to increase relevancy in search results. In the narrow definition, passive participation included only non-posting behaviors such as reading and lurking. To set up our search parameters, we identified various terms from the literature that have been used to indicate non-posting behaviors. For example, lurking, invisible, non-posting, peripheral, passive, silent, quiet, listening, and free riding were entered for title search (TI). Participation and engagement were entered for topical or abstract search (TS or AB) depending on the search platform. Additionally, search terms related to online learning communities (e.g., online learning, online course, online forum, online community, e-learning, distance learning) were added to topical or abstract searches (TS or AB) to restrict the study context (see Table 1). These searches from two different platforms yielded 131 hits in total after excluding 15 duplicates.

Table 1

Databases and Search Terms

Step	Database	Search terms	Other search filters
Step 1	ERIC via ProQuest	TI(lurk* or invisible or silent or quiet or passive or peripheral or "listening behaviors" non-posting or nonposting or read-only) AND AB(online participation or online learning OR online forum OR online communit* OR social media OR e-learning OR distance learning OR online course* OR virtual course* OR distance education OR online education)	All dates English only Peer-reviewed
	Web of Science core collection	(TI=(lurk* or invisible or quiet or silent or passive or "listening behaviors" or non-posting or read-only or peripheral)) AND TS=(online learning or online forum or online communit* or social media or e-learning or distance learning or online course* or virtual course* or distance education or online education)	All dates English only Peer-reviewed
Step 2	ERIC via ProQuest	(participation OR engagement) AND ("passive participant" OR "passive participation" OR lurk* OR lurker* OR non-posting OR "silent participa*" OR "quiet participa*" OR peripheral OR "listening behavior*" OR "free ride" OR "free rider" OR "free riders" OR "free rides" OR "free riding")	All dates English only Peer-reviewed
	Web of Science core collection	((TS=(participation OR engagement)) AND ALL=("passive participant" OR "passive participation" OR lurk* OR lurker* OR non-posting OR "silent participa*" OR "quiet participa*" OR peripheral OR "listening behavior*" OR "free ride" OR "free rider" OR "free riders" OR "free rides" OR "free riding")) AND ALL=("online learning" or "online course" or "online education" or "distance learning")	All dates English only Peer-reviewed

We screened articles for relevance. Two researchers manually reviewed articles for a focus on passive participation in collaborative online learning activities such as online discussion and social annotation in school settings (see Table 2). Fifteen articles remained in our dataset after excluding 116 irrelevant and non-empirical studies. For example, studies using online chat or discussions to lead passive participants to fully participate in face-to-face classroom activities were excluded.

Table 2

Inclusion and Exclusion Criteria

| Category	Inclusion Criteria	Exclusion Criteria
Article type	Empirical, peer-reviewed	Conceptual, non-reviewed
Language	English	Other languages
Research context	Formal learning settings (e.g., K-12, higher education)	Informal learning settings (e.g., MOOC, open online forum, social media, etc.)
Subject	Students (e.g., K-12 learners, pre-service teachers, certificate students, etc.) interact to collaborate in online space.	In service teachers interact for professional development in online space.
Topic/focus	A study purpose, or one of the research questions or major findings relates to passive participation in collaborative online learning activities.	Passive participation is briefly mentioned in discussion or recommendation, or the study focus is on passive participation in face-to-face classroom activities.
Tool	Students use text-based CMC tools (e.g., online discussion, online chat, social media, etc.) for interaction.	Students use only video conference (e.g., Zoom, Microsoft Teams, etc.) or do not use CMC tools for interaction.

For the second search, we used the same parameters but did not limit our search to title (TI), topic (TS), or abstract (AB), expanding the search instead to full texts. The second search yielded 336 total hits after excluding six duplicates from two search platforms (322 from ERIC, 20 from Web of Science core collection). We screened articles for relevance; however, we used a broader definition of passive participation because passive participation often meant low contribution, including both invisible and visible participation. Two researchers manually screened for a focus and/or findings of articles that contained any meaningful implications about students' passive participation in collaborative online learning activities using CMC tools in formal learning settings. A total of 31 relevant articles were identified. After excluding eight articles that overlapped with the first search, 23 articles remained. Next, the search results based on both narrow and broad definitions were combined and one article was excluded that did not have full text. As a result, a total of 37 articles remained in our dataset. For the last search, we looked at the cited references in the articles about lurking and added five more articles. Four of them were conference proceedings. We conducted this additional citation search because too few articles about non-posting behaviors such as lurking in school settings were identified from our first database search. A total of 42 articles were selected for the final review (see Figure 2).

Figure 2

Article Selection Process
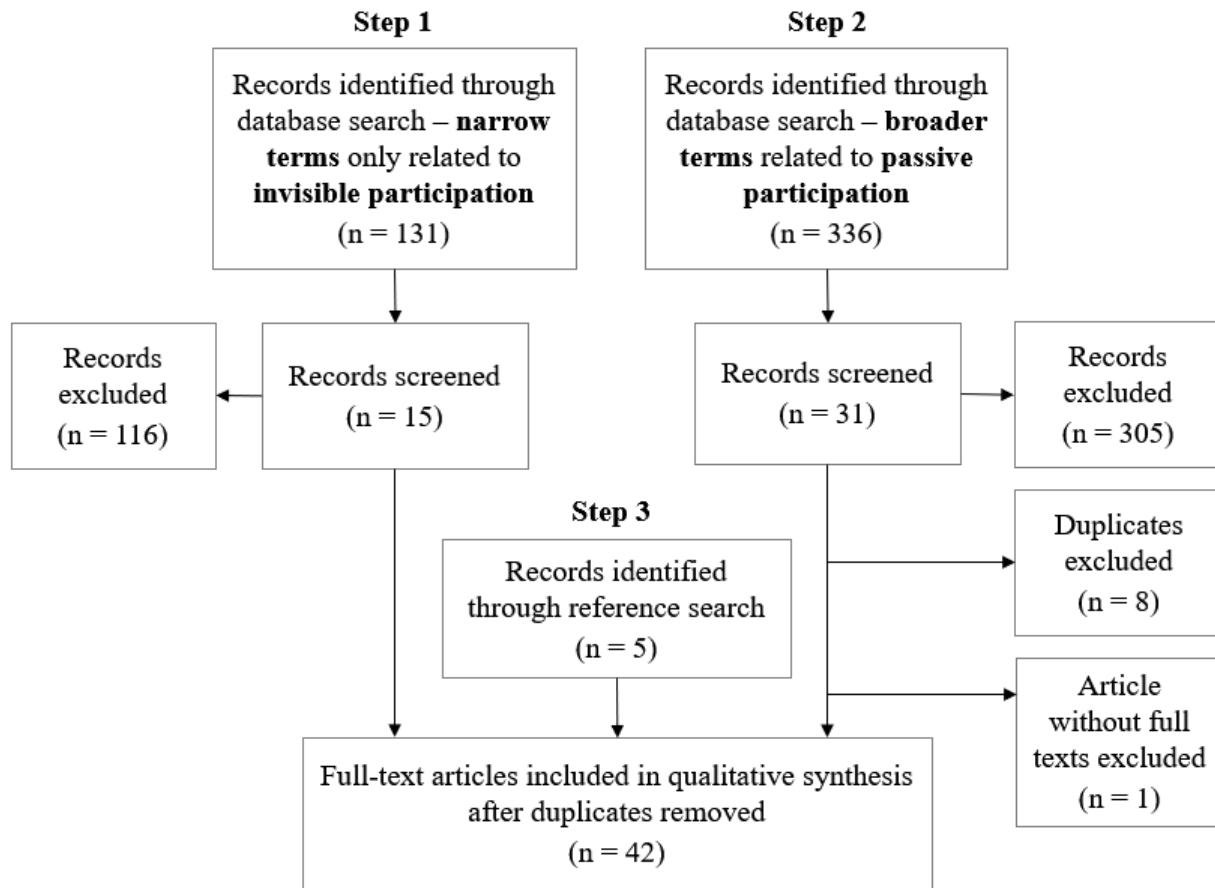
Our goal was to capture all relevant articles, so we did not limit our searches by publication date. The publication years of the articles in our final dataset ranged from 2002 to 2022 (see Figure 3).

Figure 3

Publication Year, 2002-2022
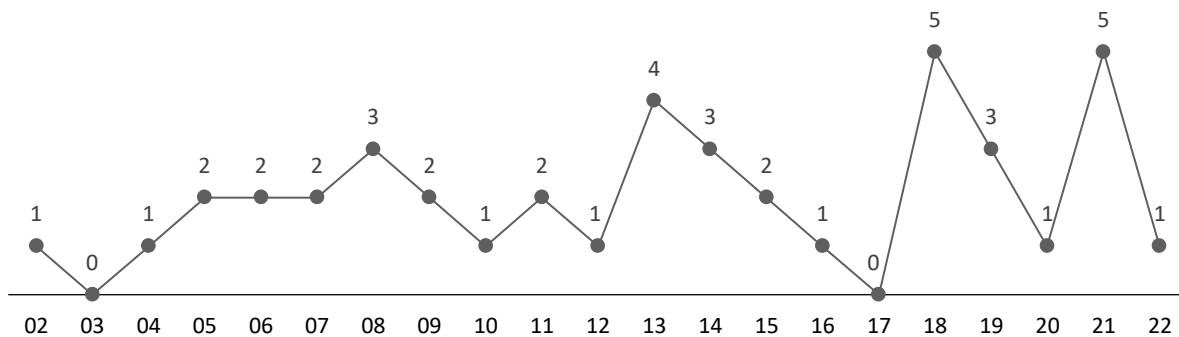
Coding

Two researchers logged and coded 42 relevant articles into the spreadsheet. The following dimensions were used for content analysis:

1. Author(s)
2. Year of publication
3. Empirical (continue only if empirical)
4. Geographic location of the study (country names)
5. Modality (asynchronous, hybrid)
6. CMC Tools for text communication (e.g., online discussion forum, social media)
7. Student level (elementary, middle, high, college)
8. Data type (quantitative, qualitative, mixed)
9. Data collection method (archive, log, interview, survey, observation)
10. Purpose of the study
11. Terms and concept/definition (e.g., lurking, peripheral participation, listening)
12. Topical focus of passive participation (e.g., behavioral pattern, motivational factors)
13. Key findings

A written protocol for coding was shared from the beginning but was refined several times by researchers after weekly meetings. All studies were situated in a formal school setting. Therefore, we coded modality according to the course format. If an asynchronous online discussion forum or social media was used for student-student interaction in a fully online course, it was coded as "asynchronous." If the same tools were used to complement in-person or remote learning, it was coded as "hybrid." Tools for text communication were coded using their original names but were later classified into several categories. For this study population, we focused only on students in a degree or certificate program. Therefore, we did not include teacher training for professional development. If in-service teachers or other adult learners took graduate level courses for their certificate or degree as a student, those learners were coded as college students.

Terms used to indicate passive participation were located from each article and coded with the concept or definition. If there was no explicit description, researchers inferred the meaning from the study context. The topical focus was only on passive participation. Both intended and unintended findings about passive participation were located and coded using a proper name of the topic. These topics were refined several times using open, axial, and selective coding methods. Key findings for each topic were coded in a separate spreadsheet for synthesis.

Results
RQ1. Research on Passive Participation in Formal Learning Settings

In What Parts of the World has Research been Conducted?
The articles were coded by geographic location to report terrestrial contexts where the study data were created and collected. If regions were not specified, the locations of authors' affiliations were counted and coded.

Table 3

Geographic Location of Studies

Continent	N	%
North America	18	42.8
Asia	11	26.2
Europe	6	14.3
Australia	4	9.5
Africa	2	4.8
Not specified	1	2.4
Total	*42*	*100*

Note. One article was left as "Not specified" due to a lack of information.

Most studies on passive participation were researched in North America, followed by Asia. Studies were heavily situated in the United States (14 out of 18). No articles that met our selection criteria were published in South America.

In What Modalities has Research been Conducted?

Researchers studied passive participation in different modalities: asynchronous and hybrid. Asynchronous courses are fully online without in-person or synchronous components. On the other hand, hybrid courses include both in-person and asynchronous components. About the same portion of studies were conducted in either asynchronous or hybrid contexts (see Table 4). One hybrid course encouraged students to join asynchronous and synchronous communication tools. The synchronous tool such as Zoom was designed to respond to COVID-19 (Ouyang et al., 2021).

Table 4

Course Modalities

Modality	N	%
Asynchronous	23	52.3
Hybrid	21	47.7
Total	*44*	*100*

Note. A few articles included multiple case studies/samples in different learning formats. Those learning formats were counted separately, making the total number 44 instead of 42.

What CMC Tools have been Used?

Most studies investigated passive participation in asynchronous online discussion forums. These included discussion forums in learning management systems (LMS), such as Canvas (Rubio et al., 2018), Moodle (Mazuro & Rao, 2011), or Blackboard (Prestridge & Cox, 2021). Eight articles examined courses that used Web 2.0 tools, which assist in providing a collaborative environment for knowledge sharing and social interaction (Boateng et al., 2010). The Web 2.0 tools used in publications include popular social media, such as Facebook and Twitter. Many studies using social media created and used closed groups where only instructors

and students can post and leave comments. In addition, researchers studied participation in Web 2.0 tools that specialized in social learning. These tools facilitated collaborative writing (Kim & Ketenci, 2019), sharing annotations and comments (Blau & Shamir-Inbal, 2021; Jones et al., 2021), and Q&A (Srba et al., 2019). Five articles explored participation in synchronous online chat (see Table 5).

Table 5

Participation Tools

Tools	N	%
Asynchronous Discussion Forum	31	70.4
Asynchronous Web 2.0 tools	8	18.2
Synchronous online chat	5	11.4
Total	*44*	*100*

Note. A few articles used multiple tools in the same study and those were counted separately.

What Methods have been Used?

The articles were coded to provide an overview of the study samples, frequently used research approaches, and data sources. Some articles examined various samples or case studies and employed multiple data sources. The majority of the articles studied college students in online courses (see Table 6). This finding is not surprising because online communications are rare in K-12 settings. Only two articles examined middle (Chen et al., 2022) and high school students (Chen & Chang, 2011).

Table 6

Participant Type

Subjects	N	%
Higher Education/College	40	95.2
Undergraduate	22	52.4
Graduate	11	26.2
Undergraduate & graduate	3	7.1
Certificate	1	2.4
Not specified	3	7.1
K-12	2	4.8
Total	42	100

As for the research approach, mixed methods were preferred to identify passive participants using numerical data (e.g., the number of postings) and obtain a deeper understanding of students' perceptions or motivation through qualitative data (see Table 7).

Table 7

Research Approach

Approach	N	%
Mixed	26	61.9
Quantitative	15	35.7
Qualitative	1	2.4
Total	42	100

Students' online participation, no matter whether it is visible or invisible, leaves trace data online. It is easy to obtain through LMS. In this regard, log data was the most common data source (see Table 8). Surveys and archives were also frequently used to collect data. To examine the quality of the posts, some researchers reviewed online discussions archives. Six articles included interview data, and they all adopted other methods along with the interviews.

Table 8

Data Collection Method

Data Source	N	%
Log Data	23	28.8
Survey	20	25.0
Text-based Archive	18	22.5
Interview	6	7.5
Observation	4	5.0
Other	9	11.2
Total	80	100

Note. An article may have used more than one data collection method and those were counted separately.

What Topics have been Investigated?

Each article was coded by multiple themes related to passive participation. These themes were grouped and regrouped several times and were finally organized into four major categories (see Table 9). The four emerging themes are: (1) participation types and behavioral patterns; (2) motivational factors and reasons for passive participation; (3) pedagogical strategies for de-lurking and active participation; and (4) passive participation on learning outcomes. An overview of these four main topics will be provided in the later section to answer the third research question (what has been found on passive participation?) of this study.

Table 9

Four Categories of Passive Participation

Topics	Articles (N = 42)
Motivational factors and reasons for passive participation	21
Participation types and behavioral patterns	20
Passive participation on learning outcomes	13
Pedagogical strategies for de-lurking and active participation	10

Note. The numbers added up to more than 42 because most articles discussed multiple topics.

RQ2. Terms and Notions of Passive Participation

The articles were coded by terms used to indicate passive participation and the terms described in each article. The articles were also coded and grouped by behavioral focus and motives, and by researchers' perspectives about viewing passive participation. Three main behavior foci have been discussed to understand the notion of passive participation: reading/non-posting, peripheral participation, and no contribution/free riding (see Table 10).

Table 10

Terms and Notions of Passive Participation

Behavioral focus	Description	Terms	Number of articles (%)
Reading/non-posting	Lurking as a non-posting behavior or a complementary/pedagogical behavior with posting on an engagement continuum	Lurking, non-posting, read-only, invisible/quiet/silent participation, listening behaviors	31 (73.8%)
Peripheral participation with low presence	Lurking and low contribution as novice's early learning trajectory moving from peripheral to center within a community of practice	Lurking, legitimate peripheral participation (LPP)	9 (21.4%)
No contribution/free riding	Low contribution as a rational behavior of self-interest when any gain goes to everyone in the group	Free rider, bench sitter	2 (4.8%)

Reading/Non-Posting Behaviors

A total of 31 (73.8%) articles discussed a non-posting and read-only behavior called "lurking." In these articles, lurking in an online course discussion forum or online chat was considered passive participation. This behavior was also called "invisible participation" (Beaudoin, 2002; Chyung, 2007). "Listening" was a term used to refer to active reading behavior among students or, in other words, reading that was necessary for subsequent behaviors such as responding and commenting (Wise et al., 2012; Wise et al., 2013). Among the 31 articles, 14 articles regarded non-posting behavior as generic reading and used the concept to discuss participation patterns. However, in 17 articles, researchers tried to differentiate active reading from generic reading by emphasizing the pedagogical roles of reading such as modeling and reflection. These researchers believed that lurking was just one type of behavior on an

engagement continuum (Dennen, 2008). Two articles cautioned against the positive view of non-posting behavior. Researchers underlined the social influence of such behavior and advocated for active contribution from all community members (Nigel et al., 2009; Russo & Benson, 2005).

Peripheral Participation with Low Presence

Nine (21.4%) articles focused on novice students' learning trajectory within a community of practice. In these articles, low contribution from students was considered passive but legitimate peripheral participation (LPP). Novice learners moved from the periphery to full participation with increasing social presence as they adjusted to the community and learned from more advanced learners (Carr et al., 2004).

No Contribution/Free Riding

Two (4.8%) articles used the concept of free riding to discuss issues of passive participation. An intervention was introduced to reduce free riders and increase learner contribution in computer-supported collaborative learning environments. Chen et al. (2022) introduced a system to visualize students' interaction through social network analysis. El Massah (2018) introduced a mobile system to monitor group discussions. In both studies, using an application to display students' participation and instructors' presence was effective in reducing passive participation and facilitating group work.

RQ3. Research Topics on Passive Participation and Overview of Articles

Motivational Factors and Reasons for Passive Participation

A total of 21 articles (50%) discussed reasons for lurking and the motivational factors that affected students' participation behaviors (see Table 11). Five articles highlighted pedagogical reasons for lurking. Researchers posited that students lurk before posting to understand the topic, get ideas from peers' posts, and avoid making redundant posts. They also argued that students lurk after posting to find appropriate posts to make comments on or to reply when they receive comments on their posts. Students usually scan through classmates' posts to find one they perceive is worthwhile to read more thoroughly and respond to (Dennen, 2008; Wise et al., 2012). Additional findings were that students generally select posts that provoke a question or with which they do not agree. Depending on the discussion design, students have been found to revisit a discussion board to lurk and prepare for examinations (Mikum et al., 2018).

Researchers have explored various factors that motivate students to participate in online communication actively or passively. Individual and situational factors such as course design, instructor facilitation, and community were found to affect the level of students' participation. First, students' individual differences such as goal orientation, personal preferences, and self-confidence influence their participation. For example, some students lurked simply because they preferred to read (Beaudoin, 2002). Second, discussion design and instructor facilitation affected the level of students' participation. When the participation was voluntary, a small number of students contributed and others participated as the audience or lurkers (Mikum et al., 2018). Group size also mattered. When class size increased, the level of active participation decreased and lurking behavior became noticeable (Ruthotto et al., 2020).

Table 11

Motivational Factors and Reasons for Lurking

Subtopics	Examples	Articles
Reasons for lurking	*Before posting* • Get ideas from peer posts (e.g., content, structure, etc.) • Avoid repeating the same ideas • Understand the topic and main ideas *After posting* • Check posts with no comments to respond to • Find worthwhile posts to read and respond to • Gain knowledge during the exam period	Dennen (2008) Ebner et al. (2005) Mazuro & Rao (2011) Mikum et al. (2018) Wise et al. (2012)
Factors affecting participation	*Individual factors* • Goal orientation • Personal preferences/interests/needs • Limited time/life needs • Cultural capital • Experience with online learning/self-confidence	Beaudoin (2002) Chyung (2007) Mikum et al. (2018) Ruthotto et al. (2021) Wise et al. (2012)
	Course design and instructor factors • Technical convenience • Group size • Structure of tasks (structured vs. unstructured) • Student moderation vs. instructor facilitation • Grade (credit) vs. voluntary participation	Gorsky & Blau (2009) Mikum et al. (2018) Norman et al. (2015) Park (2015) Ruthotto et al. (2021) Wijekumar (2006) Wise & Chiu (2014) Xie et al. (2014)
	Community factors • Demographic differences (e.g., gender, age, race, etc.) • Time for acclimation to a community • Peer feedback/reciprocity, social recognition • Peer engagement/social presence	Carr et al. (2004) Chyung (2007) Gorsky & Blau (2009) Guldberg (2008) Jones et al. (2021) Park (2015) Mikum et al. (2018) Nagel et al. (2009) Norman et al. (2015) Öztok (2016) Soroka & Rafaeli (2006) Xie (2013)

Note. Many articles discussed multiple factors at the same time.

Instructor facilitation both increased (Gorsky & Blau, 2009; Park, 2015) and decreased (Norman et al., 2015) the level of students' participation. This might be due to discrepancies between students' expectations and instructors' actual levels of facilitation (Dennen, 2011) and could also result from the timing of instructor comments, with late instructor posting signaling to students that it is acceptable to procrastinate in their participation also (Bonk & King, 1998). Of course, an instructor who dominates the online discussion forum or who always posts early in the discussion may inadvertently silence student voices and the overall degree of online activity (Bonk et al., 2003; Dennen, 2011).

Finally, community characteristics and behaviors influenced students' participation levels. Although lurking had pedagogical implications, lack of peer feedback and engagement discouraged students' overall levels of participation in the collaborative learning process (Guldberg, 2008; Park, 2015; Xie, 2013).

Participation Types and Behavioral Patterns

Twenty articles (47.6%) partially or fully discussed types of students based on their behavioral patterns. Five articles specifically discussed types and characteristics of lurking behaviors. Six articles used dichotomous criteria to distinguish types of participation and patterns. In these articles, visible forms of participation were classified as active participation or posting, and invisible forms of participation were classified as passive participation or non-posting. Eleven articles identified a range of types of participation by combining both passive and active participation in terms of quantity and quality (see Table 12).

Students' non-posting behaviors were also classified into different types by analyzing and clustering students' log data such as total views and length of time viewing (Wilton, 2018; Wise et al., 2013). However, most studies grouped students' participation behaviors into several categories by taking both posting and non-posting behaviors into consideration. For example, Wilton (2018) categorized students into three "cluster membership" groups based on their reading and writing behaviors: avid readers/prolific writers, avid readers/moderate writers, and moderate readers/moderate writers. Wise et al. (2013) also identified three "cluster membership" groups by examining the patterns of students' participatory behaviors in terms of breadth, depth, temporal contiguity, and reflectivity. They used "listening" instead of "passive participation" and "speaking" instead of "active participation." Researchers who adopted the notion of community of practice used stages of membership development to indicate different types of participation trajectories including peripheral participation. Peripheral participants are those who do not noticeably interact with peers but usually read others' posts.

Passive Participation on Learning Outcomes

A total of 13 (31.0%) articles discussed the relationship between student participation and learning outcomes. The examined learning outcomes included performance, perceived learning, and satisfaction (see Table 13). Eleven out of 13 studies showed passive participation related to learning in terms of performance and grades. Five studies examined students' perceptions of passive participation in their learning. Finally, using the community of inquiry framework, two studies discussed the importance of instructors' and students' social presence and the impact on learning and satisfaction.

Table 12

Participation Types by Behavioral Patterns

Behaviors	Participation Types	Articles
Lurking	• Low visibility vs. No visibility	Beaudoin (2002)
	• Type 1, 2, and 3 lurking	Chen & Chang (2011)
	• Temporary (situational, topical, peripheral) vs. Permanent	Dennen (2008)
	• Avid readers vs. Moderate readers	Wilton (2018)
	• Superficial vs. Concentrated vs. Broad listening	Wise et al. (2013)
Participation as dichotomous behaviors	• Active vs. Passive	Blau & Shamir-Inbal (2021) Mikum et al. (2018) Rubio et al. (2018) Ruthotto et al. (2021) Srba et al. (2019)
	• Posting vs. Non-posting	Ghadirian et al. (2018)
Participation as continuous behaviors	• Peripheral < inbound < full participation	Kim & Ketenci (2019) Carr et al. (2004) Guldberg (2008)
	• Peripheral < regular < mediator < influencer < starter < leader	Ouyang & Chang (2019)
	• Silent participants < audiences < advisors < contributors	Kim & Cavas (2013)
	• Lurker, member, expert, flamer, and joker	Orton-Johnson (2007)
	• Non < Passive < Average < Semi-active < Active	Park (2015)
	• Passive < Limited < Inactive < Active	Tsai et al. (2021)
	• Bench sitter < Hustler < Striker < Champion	Prestridge & Cox (2021)
	• Moderate readers/writers < Avid readers/ moderate writers < Avid readers/prolific writers	Wilton (2018)
	• Superficial listers/intermittent talkers < Concentrated listeners/integrated talkers < Broad listening/reflective talkers	Wise et al. (2013)

Table 13

Learning Outcomes

Category	Findings	Articles
Performance/ Grades	• High performance by observing others (social comparison).	Jones et al. (2021)
	• Performance/learning not much compromised by observation/pedagogical lurking (vicarious learning).	Beaudoin (2002) Dennen (2008) Ebner et al. (2005) Kim & Ketenci (2019) Tsai et al. (2021)
	• High performance and high level of cognitive engagement by active participation (posting).	Nagel et al. (2009) Ouyang et al. (2019) Palmer et al. (2008) Rubio et al. (2018) Russo & Benson (2005)
Perceived learning	• *Lurker's perception*: Still learn through observing others' opinions and works.	Beaudoin (2002) Dennen (2008) Jones et al. (2021) Wilton (2018)
	• *Poster's perception*: Learn better when there is high social presence (both instructor and peers).	Gorsky & Blau (2009)
Satisfaction	• Social presence (instructor, peers) → (perceived learning) → student satisfaction	Gorsky & Blau (2009) Russo & Benson (2005)

Historically, researchers have been interested in the relationship between students' levels of participation and their academic success. However, findings from earlier studies have not been consistent. Beaudoin (2002) found passive participation did not compromise learning, although active participation had a better influence on students' performance. Ebner et al. (2005) confirmed this finding, claiming that both active and passive participation occurred at the same time and that, in general, students read more than they write. Dennen (2008) also supported pedagogical lurking and its positive impact on learning. Nagel et al. (2009) challenged these claims by demonstrating the relationship between active participation and high performance. However, Nagel and colleagues did not deny the importance of reading others' posts. Instead, they maintained that reading and writing should occur together in a learning community to maximize successful learning. Notably, researchers in four other studies from this systematic review advocated the importance of active participation.

Furthermore, researchers from two studies claimed that social presence affected students' satisfaction and perceived learning (Gorsky & Blau, 2009; Russo & Benson, 2005). This finding is interesting because lurkers claimed that they still learned by observing others whereas their peers criticized lurkers' lack of social presence, which they claimed hindered their active participation and learning. Jones et al. (2021) showed that students improved their work and

increased their grades by viewing others' works and sharing feedback. This benefit of social comparison can be explained by the notion of vicarious learning in online discussion forums.

Strategies for De-lurking and Active Participation

A total of ten (23.8%) articles addressed pedagogical strategies for de-lurking or promoting active participation. These strategies included instructor presence, student moderation, and technological interventions that assist in online discussions (see Table 14).

Table 14

Pedagogical Strategies

Category	Strategies	Articles
Instructor roles	• Monitor & send a warning alert	El Massah (2018)
	• Increase teacher presence through active participation and facilitation in discussions	Gorsky & Blau (2009) Park (2015)
Student roles	• Assign students roles to moderate/facilitate or synthesize/summarize group discussions	Ghadirian et al. (2018) Öztok (2016) Wise & Chiu (2014) Xie et al. (2014)
Tools & technological interventions	• Provide instant feedback through Intelligent Discussion Board (IDB)	Wijekumar & Spielvogel (2006)
	• Visualize the levels of students' contributions and relationships using social network analysis	Chen et al. (2022) Ouyang et al. (2021)

While only three articles were identified from our search, the importance of instructors' roles in students' active participation in online learning has been discussed extensively (Martin et al., 2020; Zhou, 2015). Gorsky and Blau (2009) compared two instructors who received different evaluations and showed the extent to which the instructor's presence affected students' participation in online discussion forums. Although passive participants existed in both classes, passive participants in the class by the instructor with higher ratings visited the discussion board more often than those with the lower-rated instructor. El Massah (2018) described the instructor's role in a different way. The instructor oversaw students' group activities via mobile chat and sent warning messages to prevent free riding.

In addition to instructors' roles, researchers have been discussing the role of students in online discussions. Four articles from our search used student moderators to facilitate online discussions. The researchers assigned students active roles as peer moderators. These moderators were involved in multiple tasks from developing prompts, to facilitating, to summarizing discussions. In general, peer moderation had a positive impact on the overall level of student participation in terms of quantity. Öztok (2016) emphasized the improvement of quality rather than the quantity of discussion through peer moderation. Finally, researchers used technological interventions to facilitate learner participation in online discussions. These technologies included an intelligent discussion tool that provided instant feedback and visual artifacts that showed students the level of their contributions.

Discussion

Studies on passive participation in collaborative online learning activities in formal learning contexts have spanned twenty years, from 2002 to 2022. However, the number of studies on this topic is very low, with an annual maximum of only five studies. Studies on participation in online learning spaces are abundant (Martin et al., 2020, p. 7), but studies specifically investigating passive participation are limited. If a narrow definition is applied, the number of studies on passive participation is even lower. That is, only a handful of studies exist focusing on non-posting behaviors such as lurking in formal learning settings (Wilton, 2018). In formal school settings, it is difficult to find lurkers because participation is usually mandatory. This is likely one of the key reasons for the dearth of studies investigating students' non-posting behaviors.

When the definition of passive participation is expanded to include low contribution, studies on passive participation involve different types of participatory behaviors. These studies usually combine different levels of posting and non-posting behaviors. Some of these articles used a community of practice framework to explain learner behaviors within a community (Carr et al., 2004; Guldberg, 2008; Kim & Ketenci, 2019). In this case, researchers believed that passive participation was legitimate in the sense that some students need time to adjust to the community before moving to full participation. The term "legitimate peripheral participation" (LPP) has been used to indicate passive participation in this context. Some researchers equate non-posting behavior to free riding in the context of collaborative learning activities such as online discussion forums and team projects because active participation is expected for knowledge co-construction (Chen et al., 2022; El Massah, 2018).

Terms and Notions Inconsistent Across Studies

Since researchers have used different terms and provided their own definitions of passive participation, in this systematic review, we also attempted to understand how the notion of passive participation has been conceptualized in the existing literature. "Lurking" is the term originally used in open electronic forums (Nonnecke & Preece, 2001) such as social media, where participation is voluntary and membership lasts longer than the typical timeline for school settings of one semester. The term "lurking" has also been used in formal learning settings even though this behavior is usually temporary rather than permanent, as posting is required to earn credits in online courses. In most studies, passive participation within formal online learning contexts was temporary and situational since students usually read before and after posting. Additionally, students were cognitively active when they were reading others' posts, even if their behavior appeared to be passive and invisible.

Due to the negative connotation of lurking, alternative terms (e.g., listening behaviors, invisible/quiet/silent participation) were employed in studies to indicate these non-posting or read-only behaviors (Honeychurch et al., 2017). In some studies, passive participation meant not only students' non-posting behaviors but also their limited posting behaviors after meeting the requirements. In this case, legitimate peripheral participation (LPP) was used to describe passive participation as one of the five trajectories within a community of practice. When students rarely contributed by posting almost nothing because any gain went to everyone in the group, it was regarded as free riding. Therefore, various terms and notions have been used to conceptualize passive participation.

Studies Dominant in Higher Education Settings

Most studies on passive participation were conducted in higher education settings. This is most likely due to the fact that student interaction in online spaces is rare in K-12 settings. Studies used mixed methods to collect participatory data. The quantitative aspects of student participation were measured through log data or discussion archives. The qualitative aspects were investigated through interviews or observation. Given the fact that non-posting behaviors are difficult to observe and measure, surveys were used in many studies. Therefore, students' self-reported data were used to investigate the reasons for non-posting behaviors (Dennen, 2008; Mazuro & Rao, 2011; Mikum et al., 2018; Wise et al., 2012). In most studies, asynchronous online discussion forums were used for student-student communication, but other types of communication tools such as social media (Mikum et al., 2018; Norman et al., 2015; O'Bannon et al., 2013; Srba et al., 2019) and online live chats (Carr et al., 2004; Chen et al., 2022; El Massah, 2018) were also investigated in school settings.

Behavior Patterns and Motivational Factors Studied the Most

Topically, we found that half of the studies explored students' participation types and behavioral patterns, and the factors affecting those behavioral patterns. Although 74% of our sample focused on read-only behaviors, many of the studies attempted to understand students' overall behavioral patterns and the factors affecting those behavioral patterns rather than focusing solely on students' passive participatory behaviors. For example, Wilton (2018) classified participants into three clusters based on students' reading and writing patterns. The three motivational factors they identified were individual factors, course design factors, and community factors. Most articles discussed multiple factors affecting participation rather than focusing on a few specific factors. Among the three motivational factors, the community factor that relates to students' socioemotional ability to participate in group work has been discussed relatively less than the other two.

Some researchers were also interested in the consequences of students' passive participation by comparing the learning outcomes of active and passive participants (Kim & Ketenci, 2019; Tsai et al., 2021). Many researchers concluded that passive participation has some legitimate rationale if it is not free riding within a small group project situation. They posited that students' invisible participation has pedagogical relevance (e.g., modeling, read to respond, review, etc.) or can be explained with trajectories (e.g., peripheral, inbound, insider, etc.) within a community of practice. These researchers viewed participation as a continuous behavior on the engagement continuum rather than a dichotomous behavior such as "active vs. passive" or "posting vs. non-posting." However, the relationship between active participation and high performance has not been consistent among researchers. Nonetheless, most researchers were interested in ways to encourage students to actively participate in group activities by emphasizing instructor facilitation (Gorsky & Blau, 2009; Park, 2015) or peer moderation (Ghadirian et al., 2018; Xie et al., 2014).

Some tools and technologies were also introduced to prevent free riding by providing students with immediate feedback (Wijekumar & Spielvogel, 2006) or by visualizing students' level of contribution using social network analysis (Chen et al., 2022; Ouyang et al., 2021).

Conclusion

As reviewed in this study, passive participation has not been extensively explored during the past 20 years. The terms and notions of passive participation varied among researchers, with some studies focusing solely on read-only behaviors and others focusing on low contribution behaviors. Some researchers view passive participation as normal behavior on the engagement continuum. Others view this as undesirable behavior that should be corrected for students to be successful learners. Although many researchers approached passive participation when they studied online learner engagement and identified course factors that affect students' level of participation, more studies that specifically focus on passive participation are needed to better understand passive participants and help them actively participate in collaborative online learning activities.

This study will be a starting point for educational researchers seeking ways to encourage students to participate more actively in online courses, especially as more students are forced to take online courses due to the pandemic. Many students are not self-regulated enough for online coursework (Handoko et al., 2019; Hensely et al., 2022), but have no choice to engage in education otherwise during an emergency such as COVID-19. By examining the existing studies on passive participation, researchers can initiate future studies that could help practitioners to inspire students' active participation in collaborative online learning activities in any context.

Limitations

This review study has some limitations in terms of sampling. We restricted our search to peer-reviewed journal articles written in English, although we included some conference proceedings through a citation search. Our search terms were also limited because we could not include all the relevant terms even though we tried to use broad terms that could encompass possible online learning environments such as computer-supported collaborative learning. Furthermore, the keyword "passive" in our search strategy to find publications that placed emphasis on passive participation might have excluded articles that described students' general participation. Finally, there is a possibility that we missed some articles that used different terms for depicting passive participation. We included as many relevant terms as possible, but other studies that used unique terms for passive participation could have been missed.

Future Research

Through the scoping review, this study found gaps and potential directions for future research. First, the research was generally conducted in higher education contexts. Considering that COVID-19 forced K-12 to quickly move to online remote learning, further investigation on passive participation is needed in K-12 contexts. Second, more empirical research is required to validate the current findings in all four topics discussed in the articles on passive participation. This scoping review summarized and synthesized findings from the current studies, but study contexts and course designs varied greatly in all the articles. Third, current studies mainly investigated pedagogical reasons and the factors affecting students' passive participation. Although the importance of social presence was discussed in some studies, more studies need to focus on the socio-emotional factors that affect students' level of participation. For example, students may experience feelings of othering due to various reasons even in online spaces (Choi et al., 2021; Phirangee & Malec, 2017), which might result in withdrawal from class engagement (Houshmand et al., 2014).

From our study, we found that "no reading" and "no additional posting" beyond the minimum requirements are key problems or issues that need to be addressed, instead of focusing on "read-only" behaviors since most reading has pedagogical purposes in formal learning settings (Palmer et al., 2008). Therefore, studies investigating each factor on the passive participation continuum at all student levels are necessary, considering all the known factors affecting the level of participation. Those factors include both individual and situational motivations. However, situational motivations that are shaped through course design, instructor facilitation, and community are more urgent overall than individual motivation when personalized learning is still limited. Studies on pedagogical strategies to shape situational motivations to encourage students to read and write more than required are needed to support students' engagement in collaborative online learning and knowledge co-construction.

Declarations
The author(s) declare no potential competing interests with respect to the research, authorship, and/or publication of this article.

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A systematic Review of Research on Intersubjectivity in Online Learning: Illuminating Opportunities for Cohesion and Mutual Understanding in the Research Conversation

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Abstract

Many online learning experiences integrate some form of dialogic interaction among instructors and learners. However, the degree to which these individuals come to a mutual understanding of their task and topic, a phenomenon called intersubjectivity, often remains a question. This systematic review of online learning research examines 48 peer-reviewed journal articles published between 2004 and 2021, looking at the overall trajectory of the research conversation across time, disciplines, modality and learning activities; major trends in methods, and focus; and interconnectedness. Findings suggest a dispersed body of literature, with some small groups of interconnected work but little cohesion or traction as a research field. This review has implications for future researchers in this area, who are encouraged to synthesize across this body of research and work together to establish and pursue an agenda for the field that will not only further inquiry in this area but also lead to practical knowledge about learning activity design and facilitation that is useful to online instructors.

Keywords: intersubjectivity, mutual understanding, online learning, systematic review

"Do we agree that this is true?" Such a deceptively simple query defines intersubjectivity, according to Babbie (1986).

Intersubjectivity is a fancy word for a basic concept: People need to have a mutual understanding of a task to successfully participate in its completion. The task could involve a tangible product, such as a written report, or could be more ephemeral, such as a learning-oriented conversation. In everyday life, people can interact and complete tasks effectively when they have shared sociocultural understandings achieved through intersubjectivity. Intersubjectivity does not always exist, but rather is manifest "when interlocutors share some aspect of their situation definitions" (Wertsch, 1985, p. 159). In more common language, this definition means that two or more people engaged in some sort of interaction must share their perspective or knowledge with each other and engage in the collective task of negotiating that knowledge.

This description may sound as if intersubjectivity is a task to be accomplished unto itself, but really intersubjectivity is a byproduct of engagement. Intersubjectivity occurs in levels, with individuals needing to be more explicit in their communication where less intersubjectivity exists, and less explicit when a high level of intersubjectivity has already been established (Wertsch, 1985). Furthermore, intersubjectivity should not be confused with agreement; rather, intersubjectivity can also incorporate intentional disagreement that occurs when people engage in joint activities (Matusov, 1996). In this sense, intersubjectivity represents situations when people discuss *with* each other rather than *at* or *past* each other.

To make this complex concept more concrete, consider the following example: A group of three students are assigned to work on a group project together. They meet, discuss their vision of the final product, and divide the work. Each group member pulls their weight and produces a section of work about which they feel proud. When the whole group meets again a few weeks later to merge their work into a final submission they find that the parts do not fit together. They are surprised because they all put forth a strong effort, but it becomes clear that they lacked intersubjectivity. During this second meeting, they again discuss the vision and decide on modifications that will help produce a coherent project. In other words, through their discussion of the overall idea and what each member had produced, they now negotiated a common vision and intersubjectivity was achieved. Working independently again, they edit their prior sections. At their third and final meeting they are pleased to see that their separate sections now fit together well, and that they all shared an understanding of the work they were doing together.

Interaction alone is insufficient to develop intersubjectivity, and people frequently have experiences where they initially assumed mutual understanding with others but later discovered that it was lacking. In other instances, people may remain unconcerned about or unaware of their lack of mutual understanding with the people with whom they interact. Suthers (2006), who discussed intersubjectivity in the context of computer supported collaborative learning (CSCL), noted more research on intersubjectivity was needed because existing research in this area tended to be scattered and focused on counting interactions rather than elucidating the co-construction of knowledge. Whereas interactions are highly visible transactions, intersubjectivity is not. Still, educators are concerned not only with students exchanging words but rather the degree to which student engagement yields meaningful learning dialogues. These meaningful learning dialogues are built on a foundation of smaller, highly functional engagements including the introduction of content, social interactions, perspective sharing, repair sequences, and more (Stahl, 2006). In other words, through engagement in meaningful learning

dialogues, students can achieve intersubjectivity. However, student dialogues do not necessarily result in intersubjectivity. In this systematic review, we explore how intersubjectivity has been studied in online learning, focusing on how this area of research has evolved and the extent to which it has developed into a cohesive research conversation. Through this analysis, we aim to elucidate gaps and points of opportunity for future researchers. This review will also have implications for online learning practitioners by summarizing what is known about supporting intersubjectivity in online discussion.

Literature Review

Intersubjectivity has deep roots and applications in the fields of philosophy, sociology, and psychology (Hall, 2019). In education, the concept is most frequently tracked back to Vygotsky's (1978) sociocultural theory, with language and culture introduced as key parts of the developmental process, Vygotsky introduced the idea of collaborative dialogue in his discussion of children's relationships with parents or other caregivers (who play the role of more knowledgeable other) or tutor. The caregiver's interactions with the child represent a form of collaborative dialogue that contributes to the child's understanding of and ability to engage in different tasks.

Adults similarly rely on mutual understanding, or intersubjectivity, developed through collaborative dialogue. Within educational circles, intersubjectivity is a concern whenever interactions among learners and between learners and instructors occur. Without intersubjectivity, misunderstandings readily occur—even when interaction levels may be high. Intersubjectivity is of particular interest in online learning because of the increased capacity for misunderstanding across what Moore (1993) termed transactional distance, which is the perception of distance between individuals interacting in a computer-mediated setting. Additionally, the availability of written transcripts from asynchronous learning environments, and increasingly from auto-transcribed synchronous ones, facilitates the process of capturing and analyzing data about how learners interact and negotiate discursive meaning.

Because intersubjectivity is manifested through interactions, it is often confused with or used synonymously with terms like interaction, engagement, collaboration, and knowledge construction. Two definitions might be useful in establishing the differences between interaction and intersubjectivity. While interaction has been defined in many ways, a useful definition of interaction within the context of online learning is suggested by Gunawardena et al. (1997, p. 407): "the process through which negotiation of meaning and the co-creation of knowledge occurs." Intersubjectivity within online learning is an outcome of the synergistic progression from individual contributions to sequences of interdependent contributions (Belcher et al., 2015). While interaction represents a learning process, intersubjectivity represents a potential (but not automatic) outcome of that process.

Whereas in education intersubjectivity refers to a psychological construct, the definition of that construct reflects core elements of the initial definitions of intersubjectivity presented in philosophy, psychology, sociology, and linguistics, which may be unfamiliar to many instructional designers and educators. Still, the intersubjectivity family tree is important to consider if one is to fully grasp the meaning behind this psychological construct. In philosophy, intersubjectivity emerged from phenomenology, representing an interactional achievement between independent subjectivities (Husserl, 1931), which include people or personal experiences. Intersubjectivity expanded from philosophy to psychology through the relationship between the psychoanalyst and the client (Stolorow & Atwood, 2014). In sociology,

intersubjectivity was recognized less as a static intersection of individuals and more as the dynamic interplay between two participating subjective systems (McMahon, 1999). In linguistics, the field has drawn upon phenomenology to consider intersubjectivity at the intersection of cognition and interaction (Etelämäki, 2016). These definitions across foundational fields have implications for education, where the cognitive synergy and interdependence associated with intersubjectivity may serve as hallmarks of learning progression.

Some educational researchers and practitioners may question why it is important for people to share perspectives, negotiate knowledge, and construct socially oriented outcomes. In response, social constructionists explain how meaningful realities and valuable actions exist only when we socially construct such realities and actions. In the words of Gergen (2015), "*everything we take to be real, rational, or good—everything we hold dear—finds its origins in our processes of relating* … our worlds and our traditions are held together by *nothing stronger* than what we share *together*" [emphasis in original] (p. 13). Nothing—not even self—exists outside of the social relationships in which an individual is one part. Such thinking harkens back to Mead and Schubert's (1934) argument that there is no thinking outside of social processes along with Vygotsky's (1978) emphasis on culture and the recognition everything that exists within the mind is a reflection of something already present in society. For Vygotsky in particular, learning occurs within relationships, which suggests that at a baseline level, it is important for students to interact. Ideally, that interaction leads to the development of intersubjectivity.

Interaction and related topics have been of great interest to online learning researchers. A systematic review of research on online teaching and learning focused on the decade from 2009 to 2018, Martin et al. (2020) found more than one-fourth of their sample focused on engagement (*n* = 179), with 43 articles more narrowly focused on interaction. Additionally, there have been several review articles specifically focused on interaction. Earlier reviews focused on strategies to increase interaction (Berge & Mrozowski, 2001; Sherry, 1996), whereas later ones have explored connections between community and interaction (Hung, 2012; Zawacki-Richter et al., 2009). These systematic reviews provide a broad overview of the range of research focused on interaction, yet none of these reviews explicitly discusses research on intersubjectivity. A search for systematic reviews on intersubjectivity in online learning yielded no results.

Although typically mentioned in connection with intersubjectivity, interaction is not the same as intersubjectivity. Interaction is global term for a variety of activities including discussion, negotiation, and collaboration. Intersubjectivity, however, is not a form of interaction. Rather, it represents a psychological state in which two or more people share a deep mutual understanding that allows them to smoothly engage in interdependent dialogues and tasks. In this sense, interaction is the gateway to intersubjectivity, as it is necessary for intersubjectivity to develop (Dennen & Wieland, 2007). Learners can post messages on the same forum and respond to each other nominally or via threading and it would count as interaction. However, learners must take this interaction a step further and engage with each other's thoughts, finding common ground and negotiating or affirming meaning, in order to achieve intersubjectivity. Intersubjectivity is necessary to achieve a deep discussion in which knowledge is co-constructed (Bober & Dennen, 2001), and although researchers have been able to identify intersubjectivity, designing for and fostering intersubjectivity among online learners remains a challenge.

Group work is an obvious example, and learners are often frustrated by group work because of a failure to foster intersubjectivity. Instead of representing true collaboration, which occurs "through joint activity related to the process of solving complex problems or engaging in

authentic tasks during which any knowledge, skill, attitude, or attribute is acquired or any product or idea is discovered or created" (Hall, 2014, p. 56), group work tends to reflect what students accomplish as individuals, including their effort, initiative, and sense of responsibility (Joo & Dennen, 2017).

Rather than focusing on collaboration, students may focus on distribution of work (Welsh & Slack, 2022) amid fears that classmates will be social loafers. Even within discussions, where student interdependence and grades may be less directly connected, students still may take a transactional approach to their participation (Dennen, 2008). The result is that after more than two decades of online learning, learners continue to feel distanced from each other which, in turn, affects their learning experience (Baber, 2021; Baker & Moyer, 2018).

Rationale and Research Questions

Clearly interaction has been an important topic in online learning research—but what about intersubjectivity, which has been hailed as a goal of online discussion? This systematic review focuses narrowly on intersubjectivity, characterizing the nature of work done by researchers who attend directly to the concept in their work, examining participant-generated discourse artifacts for the evidence of presence and level of intersubjectivity in learning dialogues.

The research questions guiding this review are:
1. What are the trajectories of research on intersubjectivity in online learning across time, discipline, modality, and learning activities?
2. Through what approaches and foci have online learning researchers studied intersubjectivity?
3. How is the empirical research on intersubjectivity in online learning interconnected?

In other words, this systematic review seeks to map the field of research and determine whether the researchers themselves are iterating toward intersubjectivity.

Method

Sampling

The PRISMA guidelines for systematic reviews (Page et al., 2021) were followed for this study. Figure 1 provides an overview of the entire process, showing the number of records at each stage of the search and screening process.

A search was conducted in January 2022 using the ProQuest Education Collection. ProQuest was deemed an appropriate primary database for use in systematic reviews by Gusenbauer and Haddaway (2020) based on a comparative test of several databases. The specific search string required that the term "intersubjectivity" or a variant (e.g., intersubjective) appear anywhere in the article record including the full text.

The search was not broadened to include often-related terms such as interaction, engagement, and knowledge construction because, as noted in the literature review, these are not synonymous with intersubjectivity. The terms may co-occur in a manuscript due to their relationship within the dialogic learning process, but the focus of this systematic review was specifically research that engaged with the psychological process of intersubjectivity and not any of its possible activity manifestations or possible outcomes.

The search string also required that one of the following terms appear anywhere in the article record except for the full text:

- asynchronous discussion
- asynchronous learning
- chat
- distance education
- distance learning
- e-learning
- online discussion
- online learning
- synchronous discussion
- synchronous learning
- virtual learning

A full text search was excluded for this part of the search string because of the large number of irrelevant articles netted in a full-text search. Additional search parameters required that articles were written in the English language and published in peer-reviewed journals, and the search was set to automatically exclude duplicates. This initial search yielded 178 records. A similar search was conducted in Web of Science as a means of verifying the appropriateness of the search strategy, yielding 172 records that were duplicates.

Figure 1
Overview of Screening Process
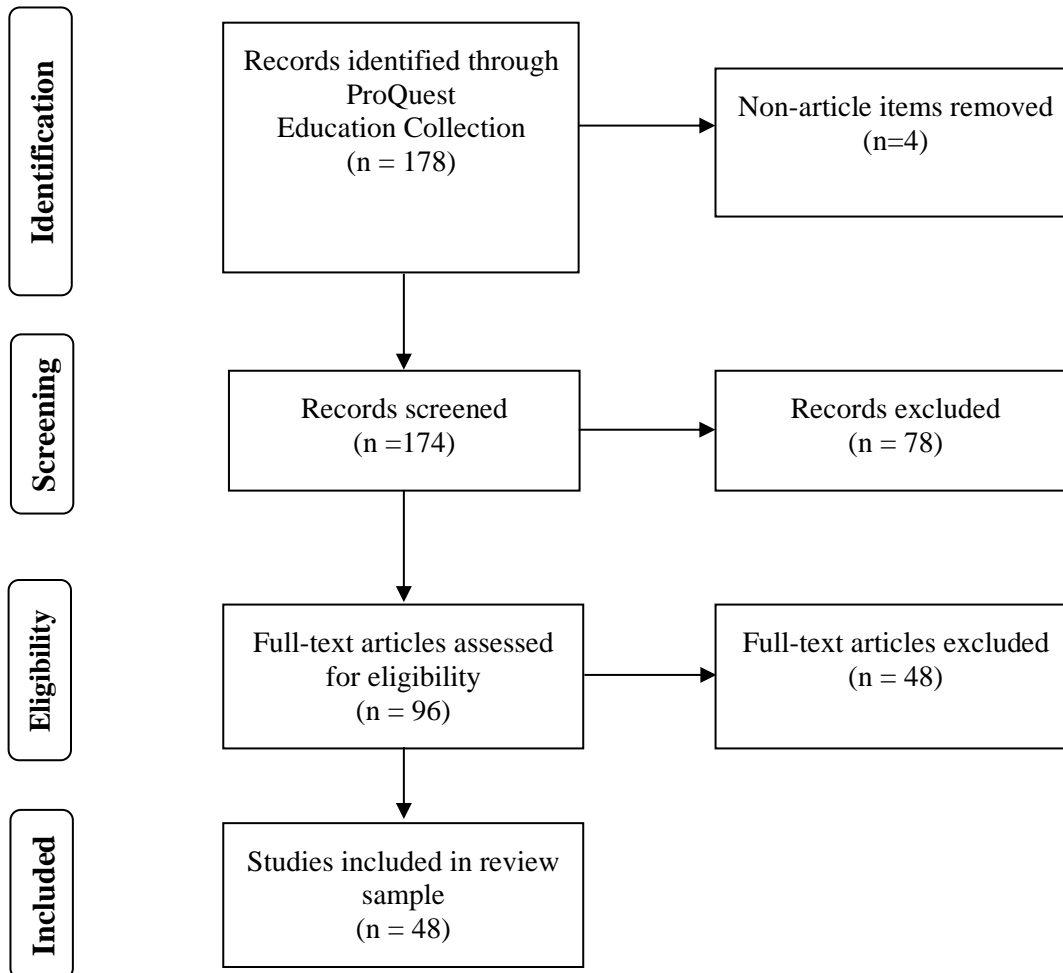
Refining the Dataset

Search results were imported into EndNote. There were no duplicates, but four records were immediately removed because they did not have any data in the author field and, upon closer inspection, represented non-article publications (e.g., journal tables of contents, editorials). The remaining 174 articles were screened at the title and abstract level by two researchers, which eliminated an additional 78 articles. The articles eliminated during this screening process had clear indicators that they did not fit the four inclusion criteria, which were:

1. Report of original empirical research;
2. Intersubjectivity as a primary or secondary focus of the study;
3. Study is situated in a computer-mediated or online learning context; and
4. Dataset includes authentic, participant-generated discourse artifacts.

To be included in the sample, all four criteria must be met. In other words, neither a systematic review of online learning nor a study of intersubjectivity in a face-to-face conversation would be included. During the review of titles and abstracts it was possible to eliminate articles that were obviously theoretical or philosophical or that were situated in contexts outside of education and learning. When in doubt, an article was left in the sample for further eligibility screening.

For the full-text screening process, the remaining 96 articles were imported into rayyan.ai (Ouzzani et al., 2016). Two researchers independently reviewed the full text to determine eligibility, with the blind screening option turned on. These researchers agreed in 89 instances (92.7%). The third researcher entered the conversation for determining inclusion for the seven articles in dispute, resulting in six being included. These articles were ones that skirted the boundary of one of the inclusion criteria or that lacked clarity in their description of purpose or method.

Data Coding and Analysis

Articles were coded in rayyan.ai by two researchers for the following elements:
- Level of education (e.g., K–12, Higher Education)
- Academic discipline (e.g., education, humanities, social sciences, etc.)
- Modality (asynchronous, synchronous)
- Type(s) of participant-generated discourse artifacts (e.g., discussion board, blog wiki)
- Type(s) of learning activity (e.g., discussion, groupwork, feedback)

These codes were used to develop frequency counts. Additionally, frequencies were calculated for publication years and journals. These data were used to help answer the first research question.

To answer the second research question, each article was reviewed in depth, with two researchers reading the research questions, method, and findings. During this review, articles were coded for type of data analysis and the focus of the study. In terms of data analysis, three types of analysis were anticipated to be in the codebook:

1. Content analysis, most clearly defined by Berelson (1952) as a means of "objective, systematic, and quantitative description of the manifest content of communication" (p. 18). While some researchers might argue against the quantification of qualitative data, Krippendorff (2019) offers a reminder that the reading of all texts is subjective and therefore qualitative, even if the characteristics of those texts are later converted to numbers (Neuendorf, 2017).
2. Conversation analysis, a technique for analyzing naturally occurring conversations, is used by social scientists in the disciplines of psychology, communication, and sociology (Sudnow, 1972). The goal of conversation analysis is to examine the sequences of interaction—how the conversation proceeds through each turn taken.
3. Discourse analysis, which like conversation analysis attends to the properties of how language is actually used, but focuses on a much broader level considering, for example, the social purpose of an entire passage of text.

Other forms of data analysis were added to the codebook as they appeared in the articles. The codes for topical focus were established inductively. One researcher coded the articles initially, establishing the categories. A second researcher then used the categories to code independently. There were no discrepancies between their codes.

To answer the third research question, citations from the articles were cross-referenced, looking for articles within the sample that cited other articles in the sample as well as commonly cited foundational articles. Additionally, a citation count from Google Scholar was retrieved for all the articles.

Findings

Research Question 1: Research Trajectories

The first studies in the sample were published in 2004, with a slow but steady trajectory of studies being published through 2021 (see Figure 2). Annual publication totals ranged from zero in 2002 to a high of six in 2013, and a cluster of fifteen articles (32.5%) published in the three-year period from 2011 to 2013. Although year of publication provides a general sense of temporal trends, it is important to remember that these publication dates do not represent when the data were collected or when the analyses completed.

Figure 2
Temporal Distribution of Articles
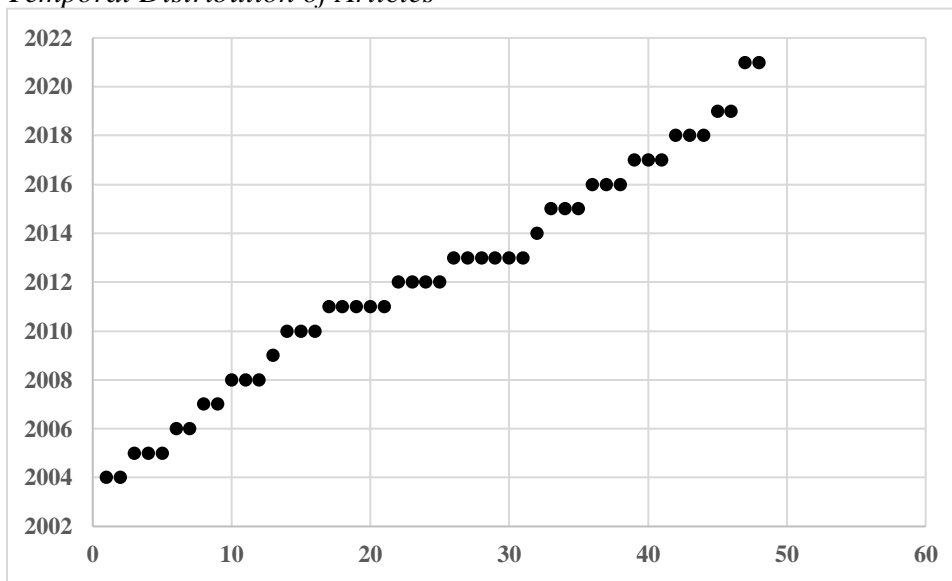
Note: Each dot represents a single article published in the year along the y axis. The x axis represents the cumulative number of articles published.

Most of the articles in the sample (42; 87.0%) involved research in higher education settings. Four were situated in K–12, and one in a teacher professional development context. The final article did not give a clear indicator of level. In terms of teaching discipline, the most common areas were education (20; 41.7%) and language (13; 27.1%), collectively accounting for more than two-thirds of the sample, followed by articles in the social sciences (10; 20.8%) and hard sciences (3; 6.3%). The remaining four articles were from the humanities, fine arts, and professional programs. In one of the articles (Dennen, 2005), multiple classes from more than one teaching discipline were studied.

The articles appeared in 20 different journals, with six journals publishing more than one article on intersubjectivity (see Table 1). The thirteen language education articles all were

published in journals focused explicitly on language education. Notably, *ReCALL* and *CALICO* Journal each included multiple intersubjectivity articles. Additionally, there were article clusters in journals related to CSCL (14 articles, all in *International Journal of Computer-Supported Collaborative Learning*) and Distance Learning (nine articles, including four each in *Distance Education* and *Quarterly Review of Distance Education)*. The remainder of the articles appeared in journals with more general educational technology scopes.

Table 1
Journals With More Than One Intersubjectivity Article

Journal	Number of Articles
International Journal of Computer-Supported Collaborative Learning	14
ReCALL: The Journal of EUROCALL	6
CALICO Journal	4
Distance Education	4
Quarterly Review of Distance Education	4
Education and Information Technologies	2

Intersubjectivity has been studied in both synchronous and asynchronous modalities. The sample was almost evenly split between studies of synchronous (12; 43.8%) and asynchronous (23; 47.9%) learning, with four articles (8.3%) studying learning contexts that incorporated both modalities. Asynchronous learning interactions included discussion boards, wikis, and blogs, whereas synchronous learning interactions included videoconferencing, audioconferencing, real-time text chat, and games and simulations.

Unsurprisingly, most of the articles explicitly studied intersubjectivity as it occurred within course discussions (see Figure 3). In 29 (60.0%) of the articles, small group work was studied, ranging from isolated learning activities to semester-long group projects. The group work often included discussion as a component of the work process. Additionally, in a small number of articles, the focal point included feedback or collaborative writing. Collectively, these different activities allude to the broad range of learning activities to which intersubjectivity is relevant.

Figure 3
Pedagogical Activities Studied in the Articles
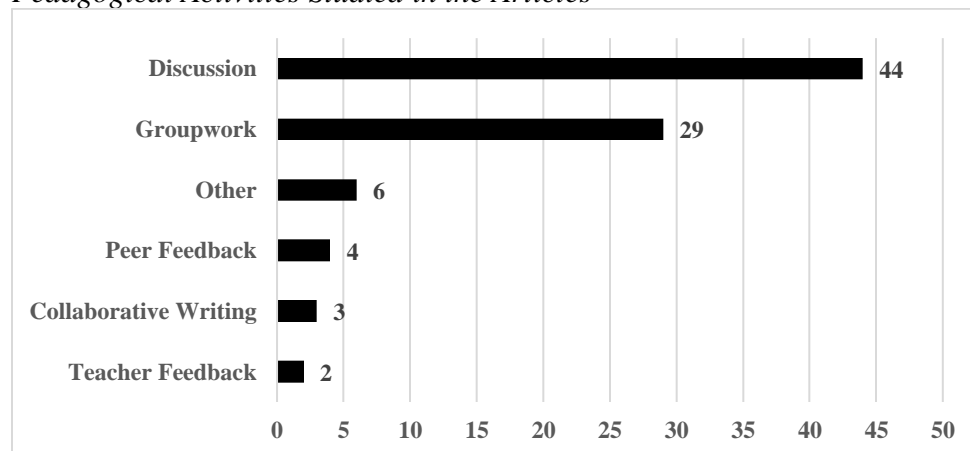
Note: Articles could examine more than one type of activity.

All the studies used participant-generated discourse artifacts as a data source, and additional forms of data were used in 21 studies. Surveys (used in 14 studies) and interviews (used in eight studies) were the most common additional data sources. They were used together in six studies. Surveys and interviews were typically used to elicit student and teacher perceptions of pedagogical activities and interactions. Grades were only included as a data source in three articles.

Research Question 2: Research Approaches and Foci

The second research question examined how intersubjectivity has been identified and studied by online learning researchers. By looking at the questions different researchers ask and their analytic approaches to answering those questions, it is possible to search for overall trends and progression of knowledge over time.

Types of Analysis

To explore types of analysis, this review focuses solely on the approaches researchers used to analyze participant-generated discourse artifacts. In other words, approaches used to analyze interview, survey, and grade data were not examined. In many instances, the researchers clearly named the analytic approach that they used in their article, and that statement was accepted at face value. There were instances in which authors stated that they used discourse analysis but the findings suggest that a more fine-grained conversation analysis approach was used. This is not surprising given their commonalities, such as the use of natural data and social actions along with the search for their underlying meaning (Antaki, 2008). Although Hammersley (2003) notes that the two approaches, discourse analysis and conversation analysis, have different underpinnings that make them distinct, they nonetheless tend to be presented together in textbooks and articles; in some research circles the term *discourse analysis* has been used as an overarching term inclusive of conversation analysis (Ten Have, 2006).

When researchers did not label their approach in the method section, the approach was classified based on details provided in the findings section, except for three articles in which the specific analytic approach was unclear.

We accepted researchers' statements about the types of analyses used, though some articles may have stated discourse analysis when their analyses more accurately reflected conversation analysis, which is only one part of discourse analysis. When articles did not specify their analyses, we classified the analyses ourselves based on information in the article except in the case of three articles in which the types of analyses were unclear.

As illustrated in Figure 4, 25 articles used content analysis more than any other type of analysis, followed by discourse analysis and conversation analysis. Four articles used more than one type of analysis. Each incorporated content analysis in their study, and the second analytic approaches were social network analysis (Eryilmaz et al., 2021; Oh et al., 2018), discourse analysis (Alterman & Larusson, 2013) and conversation analysis (Kenning, 2010). Semiotic analysis was the sole form of analysis when present (Satar, 2013, 2015).

Figure 4

Types of Data Analysis
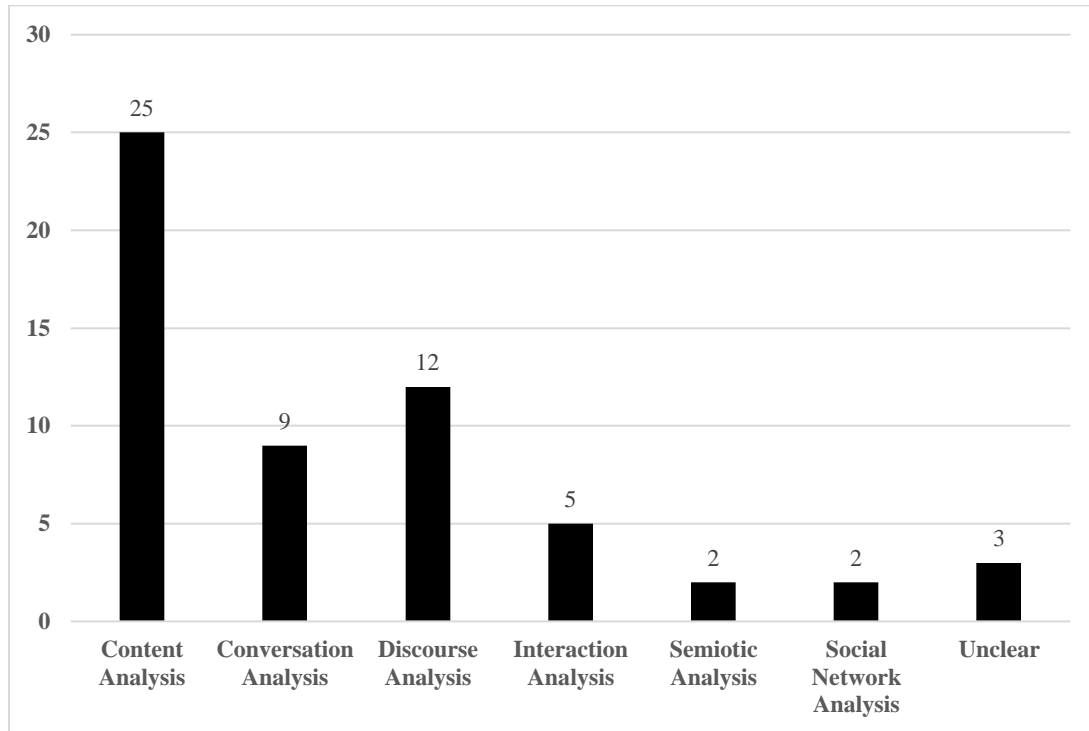
Titles and Research Questions

Titles ideally provide a distilled overview of an article's topical focus. In this sample, the word *intersubjectivity* appeared in the title of six articles and another ten article titles used the word *interaction*. The words used most within article titles included *collaboration* or *collaborative* followed by *discourse*, and *dialogue* or *dialog*.

An examination of research questions and statements of purpose demonstrates that this is a diverse collection of studies. The word *collaboration* and its variations as well as the words *group* or *team* commonly appeared, as one might expect in research about the negotiation of meaning in online learning.

Topical Similarities. While there were no distinctive patterns, there were some topical similarities. For example, several articles used specific frameworks or models, such as elements of Garrison et al.'s (2000) Community of Inquiry framework (Kaul et al., 2018; Oh et al., 2018; Satar, 2013, 2015), Gunawardena et al.'s (1997) Interaction Analysis Model (Eryilmaz et al., 2021; Lim & Hall, 2015; Lim et al., 2017), Poole and Holmes (1995) functional category system (Mahardale & Lee, 2013), Mercer's typology (Pifarré & Cobos, 2010), Stahl's (2006) CSCL frame (Johnson, 2016), and Pena-Shaff and Nicholl's (2004) Knowledge Construction Category System and Indicators (Gibson, 2013). van Heijst et al. (2019) proposed and tested their own framework focused on socio-cognitive openness. Other articles did not anchor their analysis around a specific framework, but nonetheless referred to taking systems perspective (e.g., Ligorio et al., 2008; Vogler et al., 2017), or focused on issues of quality (Eryilmaz et al., 2021; Nandi et al., 2012; Schneider & Pea, 2013; Sykes, 2005). These frameworks are evidence of the varied ways that researchers have sought to elucidate intersubjectivity within a data set.

Although most of the articles were situated in small classes and examined either discussion boards as a means of asynchronous learning and text or video chat tools as a means of synchronous learning, there were also articles that examined various other tools and less common course configurations through which discourse and thus intersubjectivity might occur. Wikis (Antoniadou, 2011; Larusson & Alterman, 2009; Pifarré & Kleine Staarman, 2011) and blogs (Alterman & Larusson, 2013) serve as platforms for co-writing and commenting, whereas Second Life (Blankenship & Kim, 2012) provides avatar-based, real-time interaction. One study was situated in a massively open online courses (MOOCs) (Kaul et al., 2018), considering how intersubjectivity might be apparent in learning experiences that occur at scale. Although the sample size for this study (n = 78) is not large in the context of MOOCs, it is, nonetheless, larger than the samples for most individual courses across the rest of the articles examined in this review. Another study was unique in that it explored the connection between students participating on-site and other students attending remotely (Stewart et al., 2011). Interestingly, three other studies looked not only at what was said, but also the role of student gaze (Satar, 2013, 2015; Schneider & Pea, 2013).

Other articles considered course design elements as key components that shape intersubjectivity. The structure of the course and discussions were prominent in several articles (Barbera, 2006; Lim & Hall, 2015; Lim et al., 2017), including one that compared cooperative and collaborative group styles (Rose, 2004). Other studies focused on facilitation (Dennen, 2005; Gibson, 2013; Szabo, 2015), and reviewed the roles of teachers and instructors (Dennen & Wieland, 2007; Onrubia & Engel, 2012), especially when those roles are compared with peer roles (Barbera, 2006; Oh et al., 2018; Pifarré & Cobos, 2010; Szabo, 2015). Similarly, scripts were considered as a device that helps both instructors and students have productive interactions in mediated environment (Mahardale & Lee, 2013; Onrubia & Engel, 2012).

Language Contexts. As noted above, about one-third of the overall sample focused specifically on the discipline of language and linguistics. All thirteen articles in this subset had participants who were language learners. Ten (77%) of these articles examined synchronous learning interactions, and five (38%) used conversation analysis. The research questions in the language articles varied from a general assessment of the effectiveness of computer-mediated communication (CMC) for English as a Foreign Language (EFL) (Chen & Chen, 2008) to specific questions about translanguaging (Canals, 2021) and social and linguistic interaction in multiplayer games for EFL students (Peterson, 2012). Other articles in this language-focused group looked at specific linguistic acts, including speech moves (Sykes, 2005), openings and closings (Abrams, 2008), and the use of repair in native and non-native text chats (Vandergriff, 2013). Further, many of the articles considered negotiation of meaning at the level of a learning task (Chen & Chen, 2008; Cho, 2016; Kenning, 2010; Sert & Balaman, 2018; Yu & Zeng, 2011). Two articles by Satar (2013, 2015) focused on multimodal social presence, particularly gaze in videoconferencing. While gaze is not discursive per se, eye gaze does influence discursive practices and, therefore, the potential for intersubjectivity.

Research Question 3: The Research Conversation

The third research question asks about the interconnectedness of this body of research. Figure 5 depicts the articles that cite others within the sample. Within-sample citations were sparser than expected, with only 22 (45.8%) of the articles somehow interlinked. There were four

clusters of interlinked articles. Two were otherwise-isolated dyads, in which an author cited their own work (Satar, 2013, 2015) and Matusov et al. (2005) cited Rose (2004). A third cluster of six articles has four articles by Alterman, beginning with Larusson and Alterman (2009). The other two articles in this cluster are Schneider and Pea (2013), which is cited by Vogler et al. (2017) in addition to Alterman and Harsch (2017). The final cluster of twelve interlinked articles is primarily composed of articles citing Dennen (2005; three citations) and Dennen and Wieland (2007; seven citations).

Figure 5

Citations within Articles in the Sample
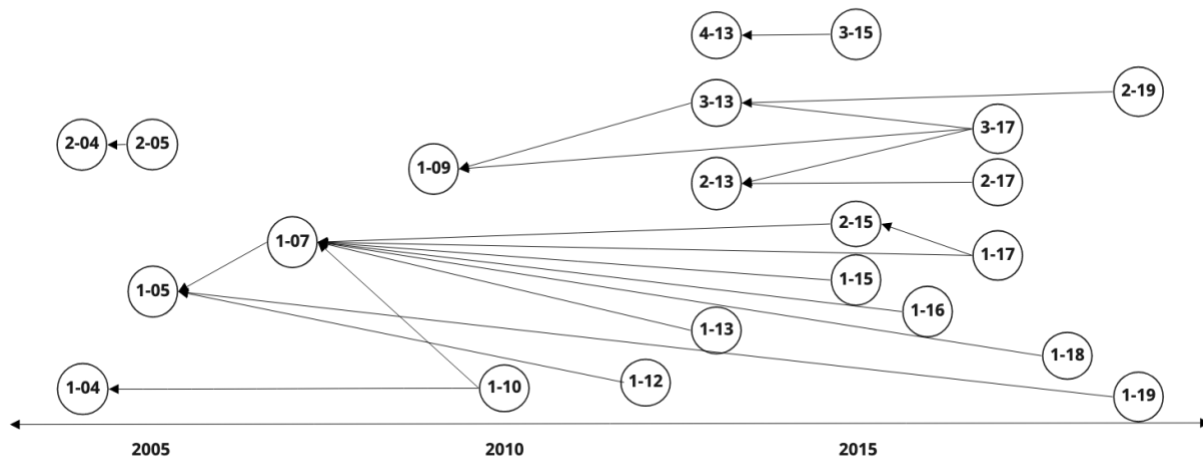
Note: 1-04 McAlister et al. (2004); 2-04 Rose (2004); 1-05 Dennen (2005); 2-05 Matusov et al. (2005); 1-07 Dennen and Wieland (2007); 1-09 Larusson and Alterman (2009); 1-10 Bures et al. (2010); 1-12 Nandi et al. (2012); 1-13 Gibson (2013); 2-13 Schneider and Pea (2013); 3-13 Alterman and Larusson (2013); 4-13 Satar (2013); 1-15 Szabo (2015); 2-15 Lim and Hall (2015); 3-15 Satar (2015); 1-16 Johnson (2016); 1-17 Lim et al. (2017); 2-17 Vogler et al. (2017); 3-17 Alterman and Harsch (2017); 1-18 Oh et al. (2018); 1-19 van Heijst et al. (2019); 2-19 Altebarmakian and Alterman (2019)

This sample of articles also has broader impact in the field as evident by overall citation counts. In other words, citation counts demonstrate the degree to which other researchers are drawing on this work. Figure 6 shows the number of citations different articles have received, per Google Scholar, and Table 2 lists the 13 articles with more than 100 citations. The articles in Table 2 were all published eight or more years ago, and it is likely that as time passes more of the sample will cross this citation threshold.

Figure 6
Google Scholar Citations by Publication Year
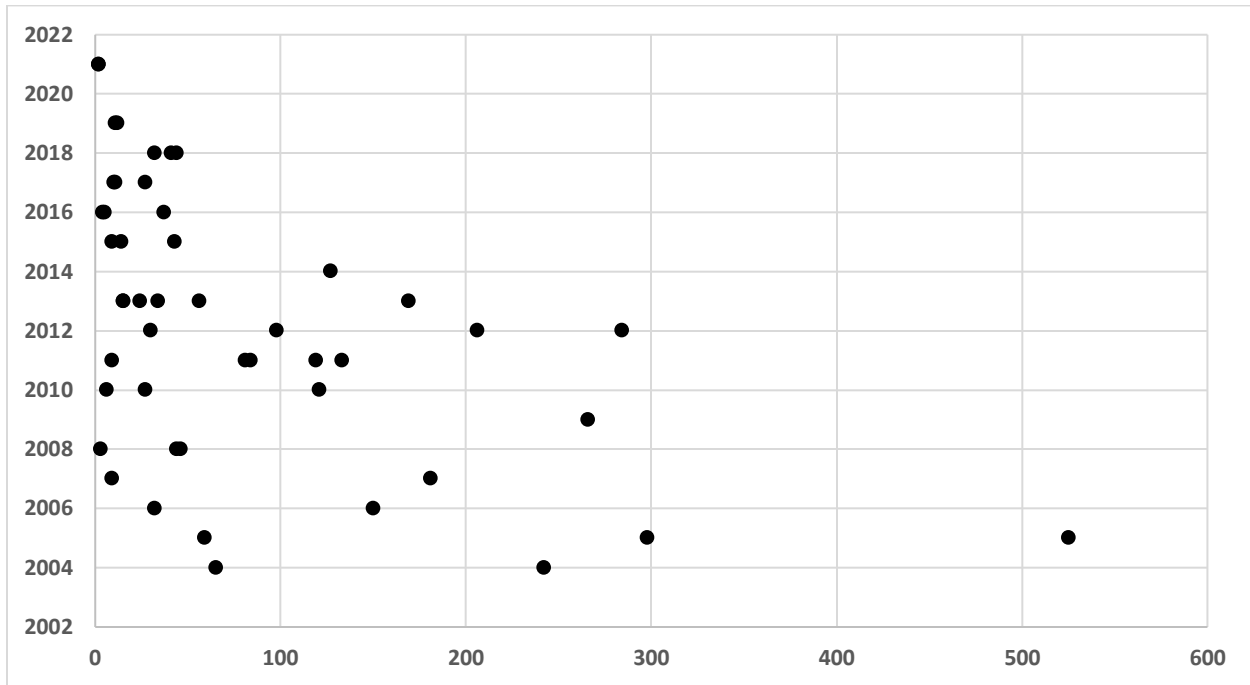
Note: Each dot represents a single article. The y-axis is the year of publication and the x-axis is the number of citations the article has received.

Table 2
Articles With More Than 100 Google Scholar Citations (May 2022)

Citations	Article
525	Dennen (2005)
298	Sykes (2005)
284	Nandi et al. (2012)
266	Larusson and Alterman (2009)
242	McAlister et al. (2004)
206	Peterson (2012)
181	Dennen and Wieland (2007)
169	Schneider and Pea (2013)
150	Thompson and Ku (2006)
133	Stewart et al. (2011)
127	Damsa (2014)
121	Pifarré and Cobos (2010)
119	Pifarré and Kleine Staarman (2011)

Within-sample cross-referencing is not the only way to identify conceptual connections among this body of research. An examination of commonly Across the studies, the most cited foundational work included Vygotsky (1978), Wertsch (1991), and Rogoff (1990), as shown in Table 3. Vygotsky, of course, is the educational theorist who is affiliated with the introduction of sociocultural theory and intersubjectivity educational psychology during the 1920s and 1930s. Wertsch and Rogoff are both contemporary scholars who have built on Vygotsky's work, albeit in

face-to-face settings. Other commonly cited articles relate specifically to the study of online discourse, such as Henri's (1992) often-cited coding system that offered early guidance for the content analysis of online discourse. Additionally, Stahl (2006) laid a foundation for studying distributed cognition in computer-supported environments, whereas Suthers (2006) specifically argued for the study of intersubjective learning, and offers direction on the issues, method, and unit of analysis for such studies. Finally, Bober and Dennen (2001) provide insights into the relationship between online interfaces and the development of intersubjectivity from an instructor's perspective. Beyond these works, the articles demonstrate foundations in fields like linguistics, sociology, communication, instructional design, and learning sciences, with many notable scholars referenced.

Table 3

Shared Research Foundations

Article or Book	Cited by (number)	Cited by (articles)
Vygotsky (1978)	20	Altebarmakian & Alterman, 2019; Alterman & Larusson, 2013; Antoniadou, 2011; Bures et al., 2010; Damsa, 2014; Evans et al., 2011; Hui & Russell, 2007; Larusson & Alterman, 2009; Lee & Song, 2016; Ligorio et al., 2008; Mahardale & Lee, 2013; McAlister et al., 2004; Onrubia & Engel, 2012; Peterson, 2012; Pifarré & Kleine Staarman, 2011; Satar, 2013, 2015; Schneider & Pea, 2013; Vogler et al., 2017; Yu & Zeng, 2011
Wertsch (1991)	7	Alterman & Harsch, 2017; Alterman & Larusson, 2013; Barbera, 2006; Damsa, 2014; Hui & Russell, 2007; Peterson, 2012; Pifarré & Kleine Staarman, 2011
Wertsch (1985)	5	Dennen & Wieland, 2007; Evans et al., 2011; Hui & Russell, 2007; Johnson, 2016; Yu & Zeng, 2011
Stahl (2006)	8	Altebarmakian & Alterman, 2019; Alterman & Harsch, 2017; Bures et al., 2010; Cho, 2016; Dennen & Wieland, 2007; Evans et al., 2011; Johnson, 2016; Mahardale & Lee, 2013
Henri (1992)	7	Barbera, 2006; Dennen & Wieland, 2007; Gibson, 2013; Hui & Russell, 2007; Lim & Hall, 2015; Lim et al., 2017; Rose, 2004
Suthers (2006)	7	Altebarmakian & Alterman, 2019; Alterman & Harsch, 2017; Alterman & Larusson, 2013; Lim & Hall, 2015; Mahardale & Lee, 2013; Onrubia & Engel, 2012; Vogler et al., 2017
Rogoff (1990)	5	Cho, 2016; Hui & Russell, 2007; Pifarré & Cobos, 2010; Pifarré & Kleine Staarman, 2011; Yu & Zeng, 2011
Bober and Dennen (2001)	4	Lim & Hall, 2015; Lim et al., 2017; Stewart et al., 2011; Thompson & Ku, 2006

Discussion

Research Trajectories

Temporally, the trajectory of intersubjectivity research in online learning has been slow and steady. The strongest cluster of articles appears between 2010–2013 but then, rather than continuing to grow, the body of research settles in at a slower, somewhat stable publication rate. During this same time, research on engagement continued to grow at a more rapid pace, but with quantitative research outpacing qualitative research (Martin et al., 2020). Additionally, this body of research is dispersed in terms of disciplinary focus and journals, within limited focus on areas such as social sciences and sciences. These represent areas of opportunity for researchers, and could be connected to other bodies of research outside of education. For example, studies of intersubjectivity in online science courses might be considered alongside conversation analysis studies about the process of scientific discovery, seeking similarities and differences between novices and experts, modality, and pedagogical activities.

The reason for the slow growth of intersubjectivity research when other areas of online learning research have received greater attention is uncertain. One potential explanation could be the parallel rise of learning analytics, with steadily growing research on topics like dashboards (Matcha et al., 2020) and use in higher education (Ifenthaler & Yau, 2020). Whereas identifying and measuring intersubjectivity remains a somewhat elusive pursuit, a wide variety of student analytic data can easily be collected from learning management systems and used to identify patterns related to successful course outcomes (Kew & Tasir, 2021). The stories told by analytic data lack the rich insights into how to design, scaffold, and facilitate learning interactions in order to foster mutual understanding, but in the current era of educational accountability, the focus on objective measures of student activities and outcomes may be more attractive.

Research Approaches and Foci

In this sample, researchers used content analysis more than any other type of analysis. The predominance of content analysis is likely due to its flexibility across research settings and purposes, although it suffers some disadvantages, too. Returning to Suthers' (2006) work toward a research agenda for CSCL, his critique of quantitative analysis methods as potentially reducing rich interactions to counts holds true today. Across the studies using content analysis, researchers worked with various coding frameworks designed to capture interaction or engagement. However, the lack of a common framework—which may not even be desirable or feasible— makes it difficult to confidently synthesize findings across studies.

Researchers who study intersubjectivity using discourse and conversation analysis face a different set of challenges. These methods facilitate close examination of negotiation and meaning making in learning interactions (or, conversely, can demonstrate the absence of such). To establish trustworthiness, researchers need to provide rich examples from their data. Many journals that publish distance-learning articles have strict word and page count limits, often prohibiting the inclusion of transcripts or substantial examples. Alternately, researchers might opt to include more examples, thereby skimping on detail in other parts of their manuscripts such as the conceptual framework or method. In short, current journal publication guidelines effectively discourage this kind of work and make it difficult to produce in a typical-length manuscript. At the same time, as our study revealed, many researchers persist and make the necessary tradeoffs between breadth and depth to publish their work.

There is also an ethical dimension to be considered when these methods are used. When verbatim transcripts of online discussions are shared, participant anonymity is inherently

compromised. Discussions that occur in public online spaces are easily searchable. Even when participants provide consent, they may not fully connect consent to the analysis and public sharing of all their interactions over time in an online space (Yadlin-Segal et al., 2020). Although relatively few people may be able to identify individuals from these transcripts, instructors and students who were class members may either recall specific conversations or be able to revisit course archives and search for them. It is human nature for research participants to be curious about the outcomes of studies to which they contributed (Brettell, 1996), and would be unsurprising if research participants read the final report and either felt discomfort at the portrayal of their words or returned to the archived course to identify specific participants. Although the practical risk of harm to participants in most situations is likely to remain low, nonetheless, there is the potential for discomfort among participants whose vulnerable learning moments are published for a wider audience to see and dissect.

In terms of topical focus, there appear to be several articles that match what Borko (2004) referred to as existence proofs: studies that demonstrate how intersubjectivity can be present in a specific technological context. While these studies are important in their own way, showing that transactional distance (Moore, 1993) does not prevent intersubjectivity, their one-off nature is not surprising. More robust are the studies examining course design and facilitation, which were among the cluster of articles from the sample that cited each other. These studies demonstrate the field's ongoing desire to learn how to foster intersubjectivity. In other words, intersubjectivity researchers are not only concerned with identifying moments when intersubjectivity occurs, but also with using that as a starting point for generating knowledge that will help instructional designers and educators better support intersubjectivity. The topical cluster of language learning articles, although not connected to the other design and facilitation-focused articles, similarly sought to find ways of improving instruction.

These findings provide an interesting overlap with Paulus et al.'s (2016) review of research on conversation analysis and online talk. They found that studies tended to focus on four key topics, comparisons with face-to-face talk, coherence, repair, and accomplishment of tasks in asynchronous settings. Although the intersubjectivity studies in this sample do not focus on comparison, the other three topics are present, suggesting that conversation analysis is an appropriate method. Paulus et al. also had similar issues with distinguishing conversation analysis from other similar methods in their sample as well as concerns with the accuracy and clarity of authors' self-labeling.

The Research Conversation

Intersubjectivity in online learning is a research area that has yet to develop into a cohesive research conversation. Individual researchers are studying intersubjectivity in their own research contexts, with isolated studies or study dyads situated in the much larger body or research on online learning. The presence of many isolated studies and individual cases in the sample is fitting with the nature of the phenomenon being studied (i.e., it is micro-level and highly situated) but leads to two final questions:

1. Should there be a more coherent research conversation in this area?
2. If so, how might this conversation be developed?

The need for a more coherent research conversation is suggested in various ways. For example, researchers continue to find themselves drawn to intersubjectivity, either as a main topic of their studies or through citing studies of intersubjectivity. Although the body of research is small and dispersed, it is not ignored. Other studies of student group work have recognized the

importance of intersubjectivity, citing research in this area while discussing how students negotiate when working collaboratively (Kuo et al., 2017). In other words, intersubjectivity provides the psychological and conceptual foundation for fully understanding why learners are successful or unsuccessful when engaged in discursive, interdependent learning activities.

Another rationale for developing a more robust research conversation on intersubjectivity is evident in practice, specifically how the field of online learning still suffers from stilted student discussion. Students post messages, but may focus more on meeting requirements (e.g., word counts, deadlines, and message counts) than on developing a dialogue with one or more classmates. Researchers continue to explore this topic at the activity level, seeking insights into structures and supports that will help students have productive learning dialogues and achieve desired collaborative outcomes.

Students who lack a clear sense of discussion goal or purpose tend to produce perfunctory replies and topical threading (Dennen, 2008), which can be frustrating to an instructor or peers who uphold co-construction or collaboration as an ideal (Capdeferro & Romero, 2012). Some students and instructors may find it normal that rich dialogues fail to occur in their classes, as if this is what one should expect from online learning. Others may orient to the instructor for affirmation, and not value contributions from and interactions with their peers. As Matusov (2020) demonstrates, students are accustomed to teachers interjecting themselves into learning conversations, either affirming or redirecting students, and, in the process, cutting off the ability for students to follow through on their developing thoughts and negotiate knowledge with peers. To combat these forces, instructors need to know how to design for intersubjectivity, how to facilitate it, and how to assess it.

The field's ability to improve practice will be intertwined with continued research developments in this area. Although there is no shortage of research on online discussion forums and learner engagement, the field has yet to be able to confidently and reliably measure intersubjectivity in online learning, or to foster online intersubjectivity development through activity design and facilitation. Perhaps putting intersubjectivity at the center of research and practice, upholding it as an ideal and building empirical support for how to identify and develop it, would provide researchers and practitioners with a solid foundation for promoting online learning through discursive learner interactions.

Limitation

A potential limitation of this review is the way the sample was constituted, focusing specifically on articles that make overt use of the term intersubjectivity. There is a larger body of research that examines online activities related to intersubjectivity, such as interaction, negotiation, and co-construction. These articles would have been included in the sample if they used the term intersubjectivity and focused on the underlying psychological state rather than activities that may lead to it. The connection between these articles and intersubjectivity is unknown. Researchers familiar with the psychological state should use the term and cite the relevant literature when studying it. However, some researchers who lack a background in educational psychology may not be familiar with the term and the related literature base. To go through the entire body of research on interaction, negotiation, co-construction and similar activities seeking evidence that the research extends beyond the visible mechanics of the activity and investigates the underlying cognitive elements would be a daunting task, like searching for needles in haystacks. We believe that the likelihood that these articles exist yet were not captured in our search serves as further evidence of the dispersed and disconnected nature of this body of

research which this article sought to address. Of course, this limitation could be turned into a future research opportunity, in which the degree to which connections between intersubjectivity and specific activities related to developing intersubjectivity could be established.

Conclusion and Future Research

This systematic review demonstrates that over the last twenty years researchers have laid the initial groundwork for studying intersubjectivity in online learning by exploring different analysis methods and frameworks. However, the research base is still dispersed and small despite the foundational importance of intersubjectivity to online pedagogy. Online instructors need to be attuned to intersubjectivity in the same way that they attend to sense of community (Rovai, 2000), social presence and identity (Lowenthal & Dennen, 2017), and transactional distance (Moore, 1993), to name a few others. The articles included in this review provide insights into different ways to draw upon interdisciplinary foundations in the service of better understanding what intersubjectivity looks like in online dialogue across learning modalities.

This study has several implications for researchers and practitioners. For researchers, it provides potential indicators of where the research on intersubjectivity might head. There are opportunities to compare the various frameworks that have been applied across different studies, and standardize analytic approaches for different disciplines, modalities, and learning activities. Intersubjectivity researchers should synthesize across this literature base, and in the process develop a new foundational platform for research and practice. This synthetic platform could help future researchers start their inquiry from common ground. In essence, this recommendation is that the intersubjectivity researchers seek intersubjectivity among themselves and the work that they do. Additionally, researchers studying interaction and related learning activities more generally should consider the role that intersubjectivity plays in the phenomena that they study.

For practitioners, these findings suggest a need to consider intersubjectivity when designing and facilitating courses. The studies in this review consistently demonstrate how critical it is to allow time for students to develop intersubjectivity. Instructors should be aware that interaction does not automatically lead to intersubjectivity. Discussion activities that fall flat (i.e., yield outcomes that look more like threaded message posting than responsive learning dialogues) are generally those in which intersubjectivity was not achieved. Although often blamed for an activity's interactional shortcomings, asynchronous discussion as a learning modality is not at fault. Instead, activity design and facilitation are the culprit, along with learner motivation and online learning norms established in other classes. Online instructors seeking to engage students in rich, meaning-making processes need to consider how their learning activities will motivate and scaffold learners to establish intersubjectivity and not merely post messages.

The future holds opportunities to connect research on intersubjectivity across modalities and disciplines. Although intersubjectivity may be manifest differently across modalities, learning tasks, and even topical areas, the underlying psychological construct is the same. Given what is known about the relationship between the development of humanistic connections and student satisfaction in online courses (Bickle et al., 2019), if researchers, instructors, and, eventually, students collectively identified intersubjectivity as a target learning outcome whenever and however online dialogues are required, perhaps an overall increase in student satisfaction and learning outcomes also might occur.

Declarations
The author(s) declare no conflicts of interest or external funding.

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Online Assessment in Higher Education: A Systematic Review

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Abstract

Online assessment is defined as a systematic method of gathering information about a learner and learning processes to draw inferences about the learner's dispositions. Online assessments provide opportunities for meaningful feedback and interactive support for learners as well as possible influences on the engagement of learners and learning outcomes. The purpose of this systematic literature review is to identify and synthesize original research studies focusing on online assessments in higher education. Out of an initial set of 4,290 publications, a final sample of 114 key publications was identified, according to predefined inclusion criteria. The synthesis yielded four main categories of online assessment modes: peer, teacher, automated, and self-assessment. The synthesis of findings supports the assumption that online assessments have promising potential in supporting and improving online learning processes and outcomes. A summary of success factors for implementing online assessments includes instructional support as well as clear-defined assessment criteria. Future research may focus on online assessments harnessing formative and summative data from stakeholders and learning environments to facilitate learning processes in real-time and help decision-makers to improve learning environments, i.e., analytics-driven assessment.

Keywords: online assessment, feedback, systematic review, formative assessment, summative assessment, learning analytics

Tracing the history of educational assessment practice is challenging as several diverse concepts refer to the idea of assessment. Our recent search in scientific databases identified an increase in research publications focusing on assessment from the 1950s to the 2020s by over 380%. Despite an intense debate over the past seven decades, the distinction between formative and summative assessment has not resulted in a precise definition and the distinction between the two remains blurry (Newton, 2007). The nature of formative and summative assessment and the difficulties of characterizing their differences and interrelationships have been discussed extensively in the literature (Black & Wiliam, 2009). Further, other terms have been introduced such as learning-oriented assessment emphasizing the development of learning elements of assessment (Carless, 2007), sustainable assessment, proposing the support of student learning beyond the formal learning setting (Boud, 2000), or stealth assessment denoting assessments that take place in the background without the user noticing it (Shute et al., 2016). More recently, the use of online assessments has been increasing rapidly, as they offer the promise of cheaper ways of delivering and marking assessments as well as access to vast amounts of assessment data from which a wide range of judgments might be made about students, teachers, schools and education systems (Webb & Ifenthaler, 2018). However, the various opportunities of online-enabled assessment also resulted in conceptual inconsistencies concerning the formats, modes, and types of online assessment.

In this article, online assessment is defined as a systematic method of gathering information or artifacts about a learner and learning processes to draw inferences about the person's dispositions using information and communication technology (Baker et al., 2016). We argue that the future of assessment faces major challenges including, perhaps most importantly, the extent to which assessments, when realized in online environments, can serve simultaneously the needs of learners and those of teachers as well as the educational organization. Gikandi et al. (2011) emphasized the opportunities of online assessments for enabling meaningful feedback and providing interactive support for learners. Further empirical research concerning online assessment highlights possible influences on the engagement of learners and learning outcomes (Nguyen et al., 2017). With the increased usage of online learning environments, such as MOOCs (Massive Open Online Courses) (Bonk et al., 2015), and the stronger presence of distance education programs (Moore & Kearsley, 2011), empirical studies have focused on different implementations of online assessments: for instance, online formative assessments (Baleni, 2015), digital game-based assessments (Kim & Ifenthaler, 2019), or online peer- and self-assessments (Admiraal et al., 2014). Attention has also been paid to best practice examples of embedding assessments in online learning environments (Martin et al., 2019). Further, developments in data analytics increased the awareness of Machine Learning and related algorithms for (semi-)automated assessment approaches (Lee et al., 2021), or analytics-enhanced online assessment (Ifenthaler et al., 2018; Gašević et al., 2022). A promising line of research emphasizes the opportunities of learning analytics and online assessments for providing (near) real-time informative feedback to learners and teachers (Martin & Whitmer, 2016; Gašević et al., 2022; Ifenthaler & Greiff, 2021; Tempelaar et al., 2018).

Given the controversial findings and discussions on online assessment, especially the conceptual inconsistencies of online assessments, the purpose of this systematic literature review is to identify and synthesize original research studies focusing on online assessments in higher education. The systematic review follows the PRISMA guideline for reporting systematic reviews (Page et al., 2021). We provide a functional platform for the scientific community to better understand differences in the design of online assessments, highlight the affordances for

technological implementation of online assessments, and identify new research areas focusing on online assessments. Implications for pedagogical practice emphasize the requirement of a design framework for online assessments in higher education.

Online assessment in Higher Education

Black (1998) defined three main distinctions of assessment: (a) formative assessment to aid learning; (b) summative assessment for review, transfer, and certification; (c) summative assessment for accountability to the public. Pellegrino et al. (2001) extend this definition with three main purposes of assessment: (a) assessment to assist learning (formative assessment), (b) assessment of individual student achievement (summative assessment), and (c) assessment to evaluate programs (evaluative assessment). To facilitate learning through assessment, Carless (2007) emphasizes that assessment tasks should be learning tasks, that are related to the defined learning outcomes and distributed across the learning and course period.

Online Assessment

Online assessment describes the assessment of students learning with methods including information and communication technologies (Conrad & Openo, 2018). This does not restrict online assessment to fully online courses and can also be implemented in a blended learning format (Gikandi et al., 2011). Online assessments may take on different pedagogical functions as part of online learning environments (Webb & Ifenthaler, 2018), for example, scaffolding students to complete a task and measuring how much support they need (Ahmed & Pollitt, 2010), or providing students with semantic rich and personalized feedback, as well as adaptive prompts for reflection (Ifenthaler, 2012; Schumacher & Ifenthaler, 2021). Other examples of online assessments include a pedagogical agent acting like a virtual coach tutoring learners and providing feedback when needed (Johnson & Lester, 2016) as well as an analysis of a learner's decisions during a digital game or simulation (Bellotti et al., 2013). Other online assessments use multimedia-constructed response items for authentic learning experiences (Lenhard et al., 2007) or provide students with an emotionally engaging virtual world experience that unobtrusively documents the progression of a person's leadership and ethical development over time (Turkay & Tirthali, 2010). Thus, online assessments offer a broad range of pedagogical functions including a medium for communication, a learning assistant, a judge, a test administrator, a performance prompt, a practice arena, or a performance workspace (Webb et al., 2013). Online assessment can be performed formatively throughout the learning progress or in a summative way at the end of a learning segment (Gikandi et al., 2011).

Types, Modes, and Formats of Online Assessments

In the course of drawing inferences about students' learning process, online assessment can include different types of assessments, ranging from single- and multiple-choice quizzes, written exams or essays, and oral presentations to authentic assessments including project-based cases, games and simulations, or e-Portfolios (Conrad & Openo, 2018). (Audience Response Systems are not included in our definition of online assessment.)

The assessment process can be performed by different individuals or groups, i.e., different modes of assessment. Peers have the potential to take on the role of the assessor and provide each other with feedback (Admiraal et al., 2014). Learners might also self-assess by evaluating their learning process and outcome themselves or by reflecting on their learning

(Conrad & Openo, 2018). Furthermore, the possibilities in online assessment also allow for automated assessment providing automated feedback (Gamage et al., 2019).

In this systematic review, an online assessment format can either be formative or summative. An online assessment mode may be self-assessment, peer-assessment, teacher-assessment, or automated-assessment (system-based). An assessment type refers to the implemented task of the assessment. This might include for example quizzes, essays, e-Portfolios, project-based tasks, or others.

Previous Systematic Reviews

The above-noted increase in assessment-related publications also set forth several systematic reviews concerning the field of assessment. The work by Dochy et al. (1999) emphasized the relationship between learning and assessment. The review included N = 63 studies suggesting that different assessment forms, such as self-, peer, and co-assessment support learners in becoming more responsible and reflective. With the advent of online technologies, assessment-related research included new approaches, especially online assessments. Gikandi et al. (2011) provided the first comprehensive overview of online formative assessment. The findings of the N = 18 key studies suggested that effective online formative assessment can foster formative feedback and enhanced learner engagement. Furthermore, the field has undergone many developments in the last few years. In a more recent publication, Wei et al. (2021) reviewed N = 65 studies that focused on MOOCs and the different assessment types related to learning outcomes. Montenegro-Rueda et al. (2021) focused on the implementation of assessment with consideration of the impact of the COVID-19 pandemic on higher education. Therefore, this review of N = 13 articles did not provide a comprehensive overview of how online assessment is developed and used, irrespective of the necessity due to the worldwide exceptional situation. The rationale behind this review was to provide an updated, broad overview of variations of online assessment in higher education and to analyze how they are designed and implemented as well as their potential in supporting learning and teaching in emergency situations.

Purpose of the Study and Research Questions

Given the renewed awareness of online assessments (Gašević et al., 2022), the purpose of this systematic literature review is to identify and synthesize original research studies focusing on online assessments. Three main research questions guide the systematic review process: (1) Which modes (e.g., self-assessment, peer-assessment, teacher-assessment, automated-assessment) are used in online and blended learning and for each assessment mode, what formats (formative or summative), and types (e.g., quiz, essay) and feedback are implemented in higher education? (2) What are the objectives of online assessments in higher education? (3) What are the success factors for accepting and using online assessments in higher education?

Method

This systematic review followed the PRISMA guideline for reporting systematic reviews (Page et al., 2021).

Data Sources and Search Strategies

The research process is outlined in Figure 1 and involves a systematic search of international research databases including ScienceDirect, Web of Science, ACM Digital Library,

DBLP, Google Scholar, ERIC, etc. Additionally, relevant journals in the field of Learning Sciences and Educational Technology were used in the research process and are listed in the next section. The search includes articles published since January 2010 (marking the increased availability of empirical findings focusing on online environments such as MOOCs) until June 2022 to ensure that there were enough publications to capture different research trends. Keywords for the literature search in titles, abstracts, keywords, and full texts include combinations of "assessment," "online," "higher education," "learning outcomes," "MOOCs," plus additional keywords based on a first scan of results.

Identification and Screening Process

Initial screening of articles followed specific inclusion criteria: The study (1) presents empirical findings, (2) examines online assessments, (3) is in the field of higher education, (4) is published between 2010 and 2022, (5) is written in English, (6) is published in a peer-reviewed scientific journal, and (7) has an abstract available. The methodology strictly followed the use of a pre-defined research protocol and included a rigorous validation process involving human raters. The research protocol included a detailed description of the identification, screening, and inclusion criteria (see Figure 1 for a description of main criteria). For example, the screening process followed exclusion criteria such as the language of the article not being English, the articles not including empirical findings, or the research was not focused on higher education. The key insights from these publications were synthesized into the final findings reflecting the state of research on online assessments for supporting learning and teaching in higher education as well as highlighting implications for pedagogical practice.

Figure 1

Diagram of the Systematic Literature Review Process
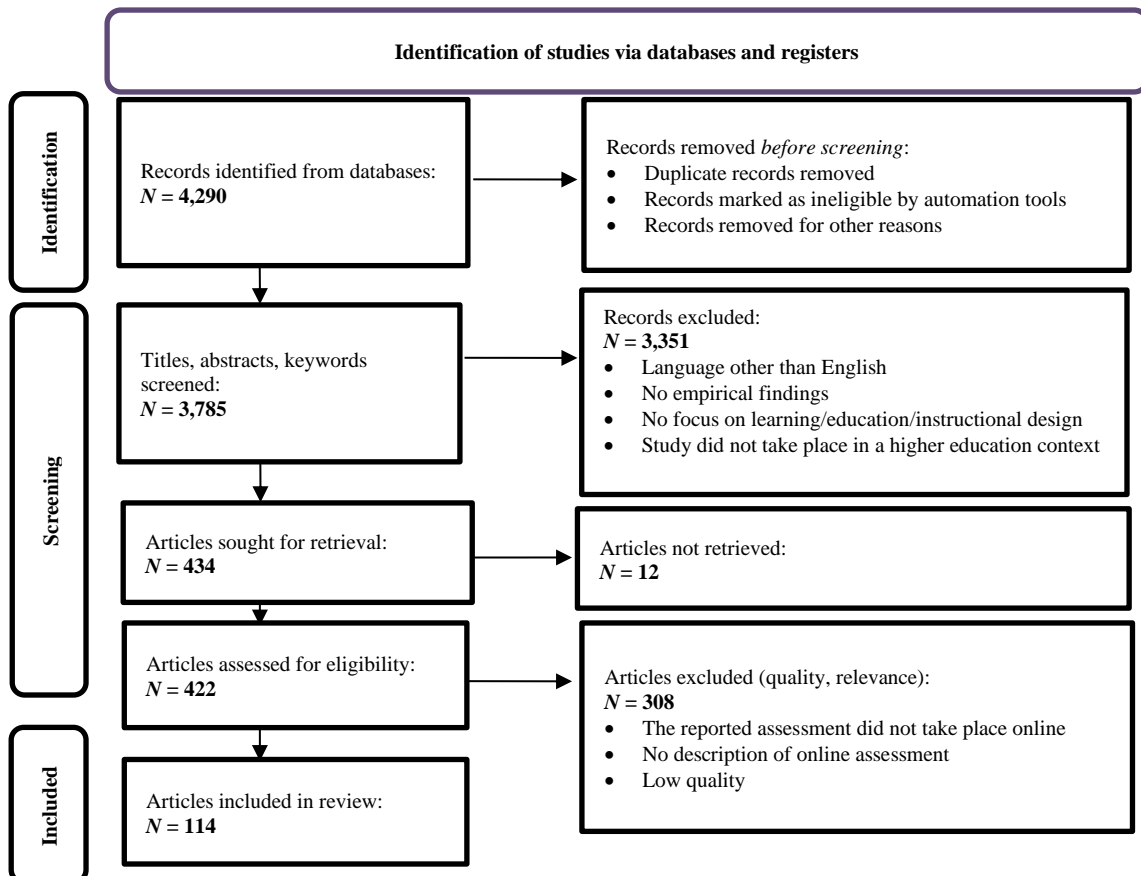
The predefined identification and screening process included five major steps as follows: Identification of international databases: GoogleScholar, ACM Digital Library, Web of Science, Science Direct, ERIC, and DBLP.

Specific search in relevant peer-reviewed scientific journals, according to the top 20 journals on educational technology in Google Scholar to cover the most impactful contributions in the field. These are: *Australasian Journal of Educational Technology*, *British Journal of Educational Technology*, *Computer Assisted Language Learning*, *Computers & Education*, *Education & Information Technologies*, *Educational Technology Research & Development*, *IEEE Transactions on Learning Technologies*, *Interactive Learning Environments*, *International Journal of Artificial Intelligence in Education, International Journal of Educational Technology in Higher Education*, *International Journal of Emerging Technologies in Learning*, *International Journal of Instruction*, *Journal of Computer Assisted Learning*, Journal of Educational Computing Research, *Journal of Educational Technology & Society, Language Learning & Technology*, *TechTrends*, *The International Review of Research in Open and Distributed Learning*, *The Internet & Higher Education*.

The search was conducted using the terms: "assessment," "online," "higher education," "learning outcomes," and "MOOCs." Based on this search, N = 4,290 publications were found. After the removal of duplicates, the sample included N = 3,785 publications. A title search removing publications with irrelevant topics leads to N = 1,401 and an in-depth abstract search to a final N = 434 publications. After a full-text search, 114 publications were identified and included in this systematic review.

Data Coding

The selected publications were open-coded. The coded items included as descriptive information the authors and the year of publication. Concerning the reported assessment, formats, modes, types, and feedback were coded. Relating to the context of the assessment of the course, its type (blended vs. online) as well as the domain, country, and educational level were classified. Additionally, the objective of the study was analyzed and summarized.

Data Analysis

The data analysis was conducted in the form of qualitative content analysis. Based on the coded data, central concepts were identified, summarized, and synthesized in an inductive format. The data was then analyzed quantitatively as well as qualitatively.

Results

Summary of Publications

Out of the 114 publications, the majority came from the United States (N = 30; 26%) as well as from Australia (N = 18; 16%), the United Kingdom (N = 13; 11%), Spain (N = 10; 9%) and Germany (N = 6; 5%). Out of these studies, 42% (N = 48 researched online assessments in blended learning scenarios, while 33% (N = 38) investigated assessments in fully online courses. Five studies (4%) included blended and online scenarios, and 23 (20%) studies did not state the learning and assessment scenario. Eight publications investigated assessments that took part in Computer Science, Education Science, or Teacher education, as well as in Mathematics, seven in Business Education, five in English Second Language Learning, four in Psychology, and three in both Pharmacy and Statistics & Biology. Ten studies investigated multiple domains.

Most studies included participants from undergraduate courses (N = 65; 57%), ten from graduate, and one from postgraduate. A further 18 studies included participants from multiple educational levels, twelve studies researched MOOCs, in which the educational level of participants was not assessed and eight did not clearly state. Most publications included in the final sample were published in the year 2018 (N = 23); 13 were published in 2021 and in 2020, 12 in 2019, 11 in 2016, 10 in 2017 as well as in 2014, 6 in 2015, 2013, and 2012, 2 in 2022 and 1 in 2011 as well as in 2010.

Types of Online Assessment in Higher Education (RQ1)

Assessment types are diverse and include a broad range of possible implementations. Additionally, many publications included multiple types. Some main categories of types could nonetheless be identified. N = 42 (37%) publications reported some type of quiz, N = 18 (16%) essays or other writing tasks, N = 15 (13%) ePortfolios, and equally N = 15 (13%) publications included in their work other tasks such as programming, calculations, translation etc. N = 12 (10%) cases described a type of project-based learning and N = 11 (9%) short- or open answer questions. N = 4 reported students working on a Wiki, N = 2 learner-generated questions and N = 2 journaling. N = 13 (11%) did not clearly state the actual type of assessment.

Modes of Online Assessment in Higher Education (RQ1)

The modes of online assessment were identified as peer-assessment, automated-assessment, teacher-assessment, and self-assessment. Concerning assessment formats, the publications included N = 49 (43%) studies that described solely formative assessment, N = 34 (30%) studies that examined formative as well as summative assessment, N = 26 (23%) only summative, and N = 4 did not clearly state the format of assessment. One publication focused on pre-class assessment. Figure 2 provides an overview of the included assessment modes by year of publication.

Figure 2
Summary of publications identifying the focus of assessment modes
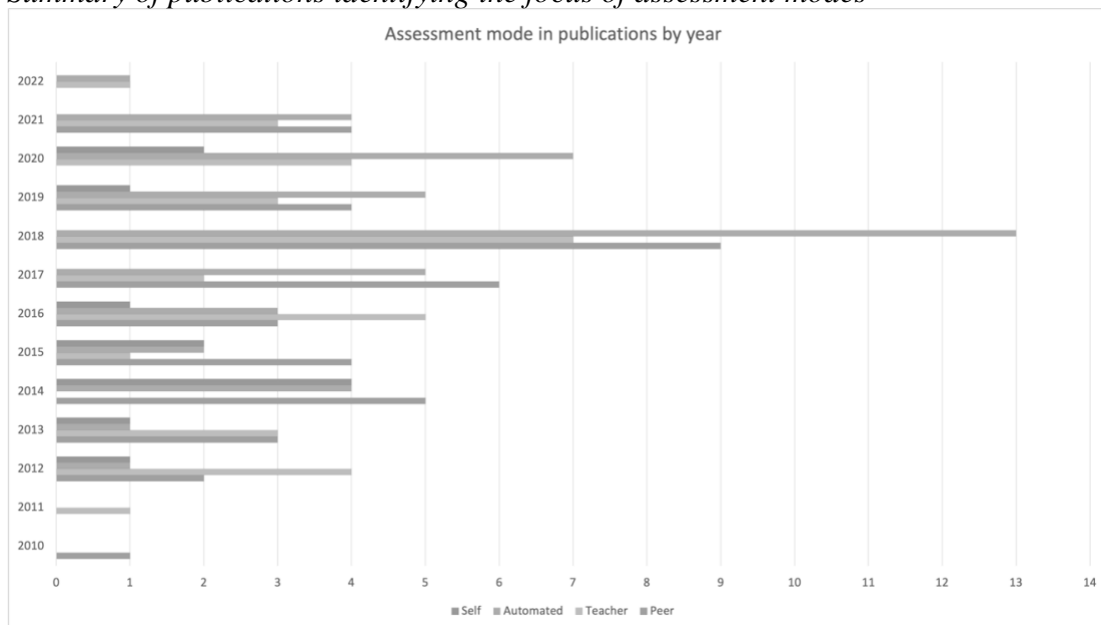
Assessment Mode: Peer Assessment

Out of the 114 publications, N = 41 (36%) included some mode of peer assessment.

Implementation type: Peer assessment was frequently realized using essays (Admiraal et al., 2015; Chew et al., 2016; Formanek et al., 2017; Huisman et al., 2018; Luaces et al., 2017; Meek et al., 2017; Sullivan & Watson, 2015; Zong et al., 2021). But also other writing types were reported, such as creative writing (Ashton & Davies, 2015), scientific writing (Herzog & Katzlinger, 2017; Mao & Peck, 2013), creating entries in a shared wiki (Hickey & Rehak, 2013; Sampaio-Maia et al., 2014), translation tasks (Ortega-Arranz et al., 2019), or letter-writing (Liu et al., 2018). Peer assessment also included types such as e-Portfolios (Chew et al., 2016; Vaughan, 2014; Xiao & Hao, 2018), or e-Journals (Zhan, 2021). In addition, peer assessment was implemented in the context of project-based learning. For example in tasks of creating plans, such as business plans (Sekendiz, 2018) or teaching plans (Li et al., 2010; Li & Gao, 2016). Others focused on educational projects (Wadmany & Melamed, 2018), research projects (Liu & Lee, 2013; Wu et al., 2014), art (Tucker et al., 2014), or design projects (McCarthy, 2017). Peer assessment was also implemented as team projects (Tucker, 2014), or on shorter project tasks in linguistics (Rogerson-Revell, 2015). Other types of assignments that were assessed through peers included mathematical calculations (Kristanto, 2018), or statistical exercises (ArchMiller et al., 2017). Further, oral assignments in language learning (Chen et al., 2021), diagram exercises (Pinargote-Ortega et al., 2021), discussion entries (Wang, 2019), and question generation (Yeh & Lai, 2012) were implemented assessment types.

Assessment format: In N = 15 (13%) articles, peer assessment was implemented in the format of formative assessment (Chen et al., 2021; Elizondo-Garcia et al., 2019; Filius et al., 2018; Filius et al., 2019; Hickey & Rehak, 2013; Kristanto, 2018; Mao & Peck, 2013; McCarthy, 2017; Ogange et al., 2018; Rogerson-Revell, 2015; Sekendiz, 2018; Tucker et al., 2014; Vaughan, 2014; Xiao & Hao, 2018; Zong et al., 2021). In 14 cases, peer assessment was implemented for solely summative assessment format (ArchMiller et al., 2017; Ashton & Davies, 2015; Formanek et al., 2017; Li et al., 2010; Luaces et al., 2017; Pinargote-Ortega et al., 2021; Sampaio-Maia et al., 2014; Sullivan & Watson, 2015; Tenório et al., 2016, Tucker, 2014; Wadmany & Melamed, 2018; Wang, 2019; Wu et al., 2014; Zhan, 2021). A combination of formative as well as summative assessment formats was reported in 12 learning scenarios (Admiraal et al., 2015; Chew et al., 2016, Herzog & Katzlinger, 2017; Huisman et al., 2018, Li & Gao, 2016; Liu & Lee, 2013; Liu et al., 2018; McCracken et al., 2012; Meek et al., 2017; Nguyen et al., 2017; Ortega-Arranz et al., 2019; Yeh & Lai, 2012).

Feedback: In most cases, peer feedback was provided in a written format and if graded, included reasoning for a given grade. Grades and feedback were frequently based on some form of a pre-defined grid, such as a rubric, for students to align with when creating their feedback and giving grades to their fellow students (Admiraal et al., 2015; ArchMiller et al., 2017; Ashton & Davies, 2015; Chen et al., 2021; Chew et al., 2016; Elizondo-Garcia et al., 2019; Formanek et al., 2017; Herzog & Katzlinger, 2017; Huisman et al., 2018; Liu & Lee, 2013; Li & Gao, 2016; Liu et al., 2018; Luaces et al., 2017; Mao & Peck, 2013; McCarthy, 2017; Meek et al., 2017; Pinargote-Ortega et al., 2021; Tenório et al., 2016; Tucker et al., 2014; Tucker, 2014; Wadmany & Melamed, 2018; Wu et al., 2014; Xiao & Hao, 2018; Zhan, 2021; Zong et al., 2021). Other cases, in which written feedback was given without a rubric, included reviews (Sampaio-Maia et al., 2014), feedback in a narrative form (Sullivan & Watson, 2015), constructive criticism (Wang, 2019; Sekendiz, 2018; Rogerson-Revell, 2015, Kristanto, 2018), or comments on the

work of other students (Yeh & Lai, 2012; Ogange et al., 2018). Other modalities of peer feedback were examined in studies, such as dialogue peer feedback, including the responses of the assessed students on the feedback (Filius et al., 2018; Hickey & Rehak, 2013), providing peer feedback in an audio format (4/27/2012 9:34:00 AM; Herzog & Katzlinger, 2017) or with a gamified approach (Ortega-Arranz et al., 2019).

Assessment Mode: Automated Assessment

Some variation of automated assessment mode was included in N = 46 (40%) studies.

Implementation type: Automated assessment was mostly used on quizzes. Quizzes included all sorts of tasks that did not require students to write longer answer, such as multiple-choice questions, single-choice questions, blank-filling or crossword-type tests (Admiraal et al., 2015; Azevedo et al., 2022; Babo et al., 2020; Bacca-Acosta & Avila-Garzon, 2021; Bekmanova et al., 2021; Carpenter et al., 2017; Chaudy & Connolly, 2018; Davis et al., 2020; Dermo & Boyne, 2014; Förster et al., 2018; Gamage et al., 2019; Gámiz Sánchez et al., 2014: Guerrero-Roldán & Noguera, 2018; Hughes et al., 2020; Huisman et al., 2018; Kühbeck et al., 2019; López-Tocón, 2021; Mao & Peck, 2013; Meek et al., 2017; Mora et al., 2012; Ortega-Arranz et al., 2019; Reilly et al., 2016; Ross et al., 2018; Sancho-Vinuesa et al., 2018; Schaffer et al., 2017; Shaw et al., 2019; Stratling, 2017: Taghizadeh et al., 2014; Tempelaar, 2020; Thille et al., 2014; Wilkinson et al., 2020). Automated assessment, including Natural Language Processing, was also used on short-answer questions (Carnegie, 2015; Chen et al., 2018; Ellis & Barber, 2016), or tasks including longer texts (Reilly et al., 2016; Santamaría Lancho et al., 2018; Xian, 2020). Other implementation types included mathematical exercises (Acosta-Gonzaga & Walet, 2018; Yang et al., 2016), programming tasks (Polito & Temperini, 2021; Thille et al., 2014), or interactive activities (MacKenzie, 2019; Turner & Briggs, 2018). Additional automated assessments included the assessment of language proficiency (Fratter & Marigo, 2018).

Assessment format: Automated assessment was mostly used for formative assessment and rarely for summative. In 23 cases, an automated assessment was used in the context of solely formative assessment (Acosta-Gonzaga & Walet, 2018; Bacca-Acosta & Avila-Garzon, 2021; Bekmanova et al., 2021; Carpenter et al., 2017; Chen et al., 2021; Förster et al., 2018; Gámiz Sánchez et al., 2014; Hughes et al., 2020; Kühbeck et al., 2019; López-Tocón, 2021; MacKenzie, 2019; Meek et al., 2017; Ogange et al., 2018; Polito & Temperini, 2021; Reilly et al., 2016; Sancho-Vinuesa et al., 2018; Santamaría Lancho et al., 2018; Scalise et al., 2018; Schaffer et al., 2017; Stratling, 2017; Tempelaar, 2020; Wilkinson et al., 2020; Xian, 2020). A total of 15 cases included formative as well as summative assessments (Admiraal et al., 2015; Azevedo et al., 2022; Babo et al., 2020; Carnegie, 2015; Davis et al., 2020; Dermo & Boyne, 2014; Gamage et al., 2019; Guerrero-Roldán & Noguera, 2018; Huisman et al., 2018; Mora et al., 2012; Nguyen et al., 2017; Ortega-Arranz et al., 2019, Wells et al., 2021; Yang et al., 2016, Turner & Briggs, 2018) and only six cases used automated assessment exclusively as summative assessment (Chaudy & Connolly, 2018; Ellis & Barber, 2016; Ross et al., 2018; Shaw et al., 2019; Taghizadeh et al., 2014; Mao & Peck, 2013). In one case it was used pre-class (Fratter & Marigo, 2018).

Feedback: Feedback provided through automated assessment mostly included some form of corrective feedback (Bacca-Acosta & Avila-Garzon, 2021; Carpenter et al., 2017; Chen et al., 2018; Förster et al., 2018; Gámiz Sánchez et al., 2014; López-Tocón, 2021; MacKenzie, 2019; Meek et al., 2017 , Ross et al., 2018; Sancho-Vinuesa et al., 2018; Stratling, 2017; Wilkinson et al., 2020; Davis et al., 2020). Other types of automated feedback included guidance in case of

wrong answers towards the correct solution (Acosta-Gonzaga & Walet, 2018; Carnegie, 2015; Guerrero-Roldán & Noguera, 2018), explanation for common mistakes (Gamage et al., 2019), retrieval cues (Shaw et al., 2019) or explanations & worked solution (Scalise et al., 2018). More elaborated, personalized feedback included tailored feedback on personal proficiencies (Hughes et al., 2020; Ellis & Barber, 2016; Thille et al., 2014; Stratling, 2017; Taghizadeh et al., 2014), and recommendations on topics to further study (Yang et al., 2016). Feedback was also provided to students as automatic comments on writing (Xian, 2020), or a report on the students' performance (Schaffer et al., 2017). The potential of automated feedback was also used to develop visual representation of the retrieved data, such as histogram about students' proficiencies (Fratter & Marigo, 2018), or graphical representations of accuracy of answers (Santamaría Lancho et al., 2018). One approach included feedback in alignment with the learning behavior (Tempelaar, 2020). In other cases, feedback was given by means of gamification, such as badges and rewards (Polito & Temperini, 2021; Ortega-Arranz et al., 2019).

Assessment Mode: Teacher Assessment

Assessment of students through a teacher was identified in N = 34 (30%) studies. Teacher assessment mode in this context includes tutors, graduate assistants, a teaching team, or the instructors of the classes.

Implementation type: The assessment by teachers was incorporated in a variety of cases. For instance, teacher assessment was frequently used on e-Portfolios (Birks et al., 2016; Farrelly & Kaplin, 2019; Jarrott & Gambrel, 2011; McNeill et al., 2012; Nicholson, 2018; Wang & Wang, 2012; Xiao & Hao, 2018), and in other cases on essay tasks (Law, 2019; Milne et al., 2020; Reilly et al., 2016; Sarcona et al., 2020; Turner & Briggs, 2018; Luaces et al., 2017; Chew et al., 2016), as well as on other forms of writing exercises, such as scientific writing (Herzog & Katzlinger, 2017; Mao & Peck, 2013), wiki entries (Hickey & Rehak, 2013), or writing exercises in language learning (Xian, 2020). Teacher assessment was also used for statistical programming tasks (ArchMiller et al., 2017) as well as in modeling exercises (Garcia-Peñalvo et al., 2021). Concerning more practical tasks, teacher assessment was also used for cases of skill demonstration in medicine (Hay et al., 2013). Shorter forms of assessments, such as quizzes (Guerrero-Roldán & Noguera, 2018; McNeill et al., 2012), or interactive activities (Gonzalez-Gomez et al., 2020; Turner & Briggs, 2018) were also assessed by teachers. Other implementation forms included exam questions in an essay format (Turner & Briggs, 2018; Senel & Senel, 2021), conceptual questions (Scalise et al., 2018), question generation by students (Yeh & Lai, 2012), and e-tivities including audio und written tasks (Rogerson-Revell, 2015).

Assessment format: Teacher assessment was used in seven cases in context of only summative assessment (ArchMiller et al., 2017; Birks et al., 2016; Chew et al., 2016; Luaces et al., 2017; Schultz et al., 2022; Tawafak et al., 2019; West & Turner, 2016), however, 16 times in a formative assessment format (Gonzalez-Gomez et al., 2020; Jarrott & Gambrel, 2011; Kim et al., 2021; Law, 2019; Mao & Peck, 2013; Milne et al., 2020; Nicholson, 2018; Ogange et al., 2018; Reilly et al., 2016; Rogerson-Revell, 2015; Sarcona et al., 2020; Scalise et al., 2018; Senel & Senel, 2021; Wang & Wang, 2012; Xian, 2020; Xiao & Hao, 2018). Additionally, ten cases included formative as well as summative assessments (Farrelly & Kaplin, 2019; Garcia-Peñalvo et al., 2021; Guerrero-Roldán & Noguera, 2018; Hay et al., 62013; Herzog & Katzlinger, 2018; Hickey & Rehak, 2013; McCracken et al., 2012; McNeill et al., 2012; Turner & Briggs, 2018; Yeh & Lai, 2012).

Feedback: Teacher assessment included corrective feedback (Yeh & Lai, 2012), classifying submissions as suitable or not suitable (Gonzalez-Gomez et al., 2020), or scores on draft (Mao & Peck, 2013). More elaborated feedback by teachers included feedback guiding students towards correct answers (Guerrero-Roldán & Noguera, 2018), or suggestions for the learning process (Garcia-Pealñvo et al., 2021). Similar to peer assessment, teacher feedback was frequently provided based on a rubric (ArchMiller et al., 2017; Chew et al., 2016; Herzog & Katzlinger, 2017; Law, 2019; Luaces et al., 2017; Milne et al., 2020; Reilly et al., 2016; Senel & Senel, 2021; West & Turner, 2016; Xiao & Hao, 2018). Other forms of written feedback included written reviews (Jarrott & Gambrel, 2011; Rogerson-Revell, 2015), comments on portfolios (Nicholson, 2018; Wang & Wang, 2012; Farrelly & Kaplin, 2019), or comments on writing (Xian, 2020). Sometimes other modalities of teacher feedback were investigated, such as the form of discussion (Hickey & Rehak, 2013), in a video format (Hay et al., 2013, West & Turner, 2016), or audio format (Sarcona et al., 2020).

Assessment Mode: Self-assessment

Some mode of self-assessment was reported in N = 12 (11%) studies. In these cases, a self-assessment mode is defined as assessing the proficiency of oneself not including automated assessment components.

Implementation type: Self-assessment was often implemented in the form of electronic portfolios (Amhag, 2020; Faulkner et al., 2013; Hains-Wesson et al., 2014; Hwang et al., 2015; Mason & Williams, 2016; Vaughan, 2014), on essays (Admiraal et al., 2015), or wiki entries (Vaughan, 2014). Self-assessment was also implemented in projects, such as technical and design group projects (Tucker, 2014) or research projects (Wu et al., 2014). In one case, students were asked to assess their own level of self-control (Bohndick et al., 2020).

Assessment format: Two cases used self-assessment for summative assessment (Tucker, 2014; Wu et al., 2014), five for formative assessment (Amhag, 2020; Bohndick et al., 2020; Hwang et al., 2015; Mason & Williams, 2016; Vaughan, 2014), and three for formative as well as summative assessment (Faulkner et al., 2013; McCracken et al., 2012; Admiraal et al., 2015).

Feedback: Self-assessment was used as a form of reflection (Amhag, 2020; Faulkner et al., 2013; Hains-Wesson et al., 2014; Hwang et al., 2015), or measuring the own performance by comparing it to a rubric or guideline (Admiraal et al., 2015; Mao & Peck, 2013; Tucker, 2014; Vaughan, 2014; Wu et al., 2014).

Summary of Results for RQ1

Concerning research question one, the results of this systematic review indicate that studies focused on online assessment in higher education used the modes self-assessment, peer assessment, automated assessment, as well as teacher assessment. Peer assessment was used on the assessment types of writing tasks, e-Portfolios, or projects and was frequently used in formative as well as in summative assessment, often in combination. Automated assessment on the other hand was used on quizzes, short text answers, or standardized exercises, such as programming tasks. It was used frequently in formative assessment form only and seldomly in summative assessment. Teacher assessment was used on a broad variety of types such as e-Portfolios, essays, or project-based tasks. Teachers assessed mostly in a formative format or formative and summative in combination. Self-assessment was realized through e-Portfolios, essays, wikis, or projects and mostly in a formative format as a reflection of the current learning

process. Overall, the formative format was used more often than summative and automated the most used mode, followed by peer and teacher assessment and ultimately self-assessment. Objectives of online assessment in higher education (RQ2).

The purposes of the publications in this systematic review can be divided into two categories: (1) the objective of the presented form of online assessment and (2) factors influencing the effectiveness of the online assessment.

First, regarding the objective of the presented form of online assessment, multiple studies of this review looked at the effect of feedback on latent factors of the learning process of students such as motivation, self-regulation, engagement, reflection, and others. Accordingly, the key publications investigated how aspects of formative feedback might influence the motivation of students. Approaches included effects of repeated questions on motivation (Stratling, 2017), adaptive quizzes improving motivation and engagement (Ross et al., 2018), positive or negative feedback on self-assessment influencing the motivation of students (Bohndick et al., 2020), the influence of formative peer essay grading on motivation (Formanek et al., 2017), and formative teacher assessments in a science context influencing the motivation of students (Gonzalez-Gomez et al., 2020). Other studies focused on the self-regulation of students. Methods for increasing self-regulation by assessing students formatively included question generating and giving students responsibility for their assessment (Caspari-Sadeghi et al., 2021), possible interaction of students with formative questions (Chen et al., 2018), as well as the influence of journaling, self-assessment, and peer-sharing on cognition regulation strategies of students (Hwang et al., 2015). Other key publications focused on the increase of students' engagement through formative assessment, including online assessment through formative quizzes (Holmes, 2018; Hughes et al., 2020), formative portfolio assessment (Nicholson, 2018), or peer assessment (Chen et al., 2021; Sullivan & Watson, 2015; Vaughan, 2014). Another group of studies focused on increasing engagement and satisfaction based on different forms of formative assessment (Nguyen et al., 2017) and influencing students' engagement through gamified formative assessment (Tenório et al., 2016; Polito & Temperini, 2021). Studies that included assessment through ePortfolios frequently focused on the positive impact that formative assessment could have on the ability of students to reflect their own learning process (Mason & Williams, 2016; Hains-Wesson et al., 2014; McWhorter et al., 2013; Jarrott & Gambrel, 2011; Amhag, 2020) or giving students the possibility to reflect themselves meeting possible professional requirements (Faulkner et al., 2013). Other factors which have been influenced by the usage of formative assessment, were the sense of community (Kim et al., 2021), collaborative learning (Sampaio-Maia et al., 2014), an attitudinal change (Watson et al., 2017), reading comprehension (Yeh & Lai, 2012), critical thinking (Zhan, 2021), and usage of educational technology (Acosta-Gonzaga & Walet, 2018).

Second, a great share of the key publications in this systematic review described the goal of the presented online assessment as to increase learning success using variations of formative assessment. Formative quizzes were used to improve the final learning outcome of students and the achievement of their learning goals (Carnegie, 2015; Carpenter et al., 2017; Kühbeck et al., 2019; Gamage et al., 2019; Gámiz Sánchez et al., 2014; Wilkinson et al., 2020) as well as supporting their learning process (Tempelaar, 2020). Formative feedback was also shown to improve accuracy in second-language writing (Xian, 2020). Additionally, not only formative but also summative assessment lead to increase of academic performance (Tawafak et al., 2019). E-Portfolios were used to foster higher-order thinking skills (Wang & Wang, 2012), to increase the creative thinking ability (Xiao & Hao, 2018), or to generally increase the final learning outcome

(Hickey & Rehak, 2013; Farrelly & Kaplin, 2019). In the context of providing formative feedback to improve the final learning outcome, peer feedback was often an essential part, such as formative peer feedback to improve on writing skills (Mao & Peck, 2013; Huisman et al., 2018), improve projects (Li & Gao, 2016; Li et al., 2010; Liu et al., 2018; Sekendiz, 2018), or to foster deep learning (Filius et al., 2018). Other publications focused on using online assessment to improve the educational process. One of the goals was to enable personalization and adaptivity of learning processes with means of online assessment, such as creating an adaptive learning path based on the results of formative assessment (Bekmanova et al., 2021; Hashim et al., 2020), or more personalized feedback (Thille et al., 2014). Another advantage that online assessment could bring to the learning scenarios is the possibility to assess larger groups of students at the same time through quizzes (Mora et al., 2012; Gleason, 2012), but also on longer answers through means of automated essay scoring (Reilly et al., 2016; Santamaría Lancho et al., 2018). Online assessment was also attributed as giving the opportunity to correctly place students in the foreign-language learning (Fratter & Marigo, 2018; Taghizadeh et al., 2014), assessing different levels of understanding (Küchemann et al., 2021) and peer feedback for enhancing assessment and feedback experience for international students (Chew et al., 2016). The transformation of face-to-face courses to online courses showed that online assessment created possibilities for peer assessment that went beyond paper-based peer methods (Wu et al., 2014). Last, in some cases, the objective of the assessments was to be used as part of an approach to analyzing students learning behavior and providing them feedback on their learning process. Analyzing behavior together with grade outcome such as assessing the behavior of students (Wells et al., 2021), using assessment data for diagnosing learning problems (Yang et al., 2016) or providing assessment feedback in combination with learning analytics feedback (Tempelaar, 2020) were methods used for this process. Other approaches focused on connecting assessment with the sentiment of discussion (Tucker et al., 2014) or a gamified analytics approach (Chaudy & Connolly, 2018).

Summary of Results for RQ2

Concerning research question two, the objectives of online assessment can be found in supporting learning as well as teaching processes in higher education. The impact of formative assessment was reported not only on the final learning outcome but also on factors influencing the learning process such as motivation, self-regulation, engagement, or reflection. Additionally, a goal of using online assessment can lie in enhancing the learning and assessment process such as assessing greater courses, providing learners more elaborate feedback, and creating adaptive learning paths.

Success factors of online assessment in higher education (RQ3)

Design principles for online assessment were extracted from the publications by examining the experienced acceptance of students and the reported success of online assessment scenarios. Authentic assessments, presenting students with tasks they would likely face in a real-world setting, were found to be central to successful online assessments (Martin et al., 2019; McCracken et al., 2012; Dermo & Boyne, 2014; Schultz et al., 2022). Additionally, online assessments are expected to be well-aligned with the course materials and competencies for the desired learning outcome as well as the prerequisites of the students (McCracken et al., 2012; Guerrero-Roldán & Noguera, 2018; McNeill et al., 2012). The online assessment criteria need to be made as transparent as possible (McCracken et al., 2012; Martin et al., 2019) and, from the teacher's side, availability and communication with the students were found to be essential

success factors (Martin et al., 2019). Additional factors from the student's perspective were perceived ease of use and perceived usefulness of online assessments (Bacca-Acosta & Avila-Garzon, 2021).

Concerning peer assessment in particular, multiple factors are identified in their influence on the quality of peer assessment. Findings support a discussion-based assessment training, leading to more accurate peer feedback (Liu et al., 2018). Additionally, factors of the respective courses' instructional design are seemingly supporting the quality of peer feedback, as aligning the guidance of the students and tasks with the amount of students (Herzog & Katzlinger, 2017) and increasing the level of guidance through providing the students a rubric as the base of their assessment process (Elizondo-Garcia et al., 2019; Ashton & Davies, 2015; ArchMiller et al., 2017). Other key publications recommended to provide guidelines (Wadmany & Melamed, 2018) as well as explaining to students the rationale of the online peer assessment (Meek et al., 2017). Concerning the format of peer feedback, longer, rather than many, comments and comments aiding for revision were preferred by students (Zong et al., 2021). Approaches including natural-language processing proposed using sentiment analysis on feedback to detect inaccuracies in peer feedback between the given feedback and the given score have been highlighted (Pinargote-Ortega et al., 2021). Other findings advocate for using peer assessment mostly for formative and not summative assessment (Admiraal et al., 2015).

Concerning the design of formative online assessment through quizzes, the key publications suggest that quizzes should not only include true or false questions but a mixture of types (López-Tocón, 2021). Other studies found that quizzes are a well-suited form of online assessment for theoretical knowledge, but not necessarily for practical knowledge and should therefore be combined with other forms of online assessment, such as project-based learning or further homework tasks (Babo et al., 2020). While a higher correlation between final exam performance and the performance on formative quizzes with limited time and attempts was found (MacKenzie, 2019), unlimited attempts in general lead to a higher performance in the final exam (Davis et al., 2020).

Concerning summative online assessment, the key publications emphasize that end-of-module assessments in the form of essays, practical reports and/or applied assessments, were preferred by students over exams and led to higher completion rates (Turner & Briggs, 2018). Timely feedback (Martin et al., 2019; McCracken et al., 2012) was considered an essential success factor for online assessment. The key publications also considered the effects of the modality of peer and teacher feedback, the support of video feedback, and the positive reception by students (West & Turner, 2016). Other studies found a preference by students for an audio format by peers (Filius et al., 2019) or a written format by teachers (Sarcona et al., 2020) In general, feedback in online assessment should be part of a broader approach and not only seen as part of one task (Milne et al., 2020).

Summary of results for RQ3

Concerning research question three, success factors for implementing online assessment include instructional support as well as transparent pre-defined grading criteria. Especially for peer assessment rubrics, guidelines and explaining the rationale to the learners are important for a successful implementation. Additionally, the overall design of the assessment should be chosen depending on the respective learning objective and potentially different modes, types, and formats combined.

Discussion

Online assessments enriched standard or paper-based assessment approaches, some of which hold much promise for supporting learning (Webb et al., 2013). A range of different online assessment scenarios have been the focus of educational research and development, however, often at small scale (Stödberg, 2012). Still, the complexity of designing and implementing online assessment and feedback systems has been discussed widely over the past few years (Sadler, 2010; Shute, 2008). Current research findings suggest that online assessment systems meet several specific requirements, such as (a) adaptability to different subject domains, (b) flexibility for experimental as well as learning and teaching settings, (c) management of huge amounts of data, (d) rapid analysis of complex and unstructured data, (e) immediate feedback for learners and educators, as well as (f) generation of automated reports of results for educational decision-making. This systematic review investigated the renewed awareness of online assessments (Gašević et al., 2022) by identifying and synthesizing original research studies focusing on online assessments in the context of higher education.

Summary of Key Findings

Modes and formats of online assessments. Regarding research question one (RQ1), the findings of this systematic review suggest that online assessment is widely implemented, varying in the design and intended goals of the respective learning scenario. The four main modes of assessment were identified as peer-, teacher-, automated-, and self-assessment (e.g., Hickey & Rehak, 2013; Law, 2019; Luaces et al., 2017; Xian, 2020; Xiao & Hao, 2018). Frequently, various assessment modes are combined in assessment design, especially peer- and teacher-assessment as well as a combination of automated-, peer-, and teacher-assessment. While peer- and teacher-assessments are mostly provided on longer texts or project tasks, automated-assessments mostly take place on shorter assignments and self-assessments on reflection tasks. Concerning the assessment format, automated- as well as self-assessments were mostly implemented formatively and rarely in summative format (e.g., Acosta-Gonzaga & Walet, 2018; Bacca-Acosta & Avila-Garzon, 2021; Bekmanova et al., 2021; Förster et al., 2018; Gámiz Sánchez et al., 2014; Scalise et al., 2018; Schaffer et al., 2017). Peer- and teacher-assessments frequently were applied for both formative and summative formats. The scope of the feedback also differs depending on the assessment mode. While peer and teacher feedback included transparency measurements such as rubrics and provided numeric as well as more elaborated feedback, automated feedback was provided as correction, albeit the results from this review also suggest that there are also advances to provide more detailed feedback aiding students (e.g., Acosta-Gonzaga & Walet, 2018; Carnegie, 2015; Guerrero-Roldán & Noguera, 2018). Objectives of online assessments. Regarding research question two (RQ2), the findings of this systematic review suggest that online assessment has promising potential in supporting and improving online learning processes (e.g., Mason & Williams, 2016; Jarrott & Gambrel, 2011; Amhag, 2020). Formative assessment has the potential to support the student's learning process by either influencing learning success factors or leading to an increase in the final learning outcome. Furthermore, online assessment can also be used as an analytical approach to provide more advanced feedback to students and teachers on learning processes. Additionally, to improve the learning environment through means of new opportunities created through technological enhancement such as personalization, adaptivity, or gamification (e.g. Tempelaar, 2020; Wells et al., 2021).

Success factors of online assessments. Regarding research question three (RQ3), the findings of this systematic review suggest that a successful implementation of online assessment is based on instructional support as well as clear-defined assessment criteria (Martin et al., 2019; McCracken et al., 2012; Dermo & Boyne, 2014; Schultz et al., 2022). The main factors examined by the key studies were the alignment of the assessment format, mode, and type with the targeted learning outcomes. Another takeaway from this systematic review is the benefits of implementing authentic tasks in online assessment (Conrad & Openo, 2018). On the side of teaching staff, transparency, communication, and timely as well as detailed feedback were found as main contributors to success. Similarly, when implementing peer-assessment, guidelines, such as rubrics, communication, as well as providing feedback useful for revision, are essential factors.

Implications for Theory and Practice

The findings of this systematic literature review pose implications for theory as well as practice. A major takeaway is the broad opportunities created through online assessments and their influence on learning processes as well as outcomes. Instructional practice in higher education might consider the potential of formative online assessment for supporting students' learning. Additionally, online assessment, in general, creates new possibilities such as elaborated productive feedback, assessment of greater groups, or adaptive learning. For designing online assessment certain success factors should be considered such as clear communication of pre-defined guidelines, support of the teachers and learners as well as timely feedback. Additionally, a combination of different modes, formats, and types could be chosen depending on the targeted learning objectives.

Concerning theory in this field, it appears to be important to further research the differentiation between automated- and self-assessment as well as determine a clear distinction between formative and continuous assessment. Clear definitions regarding assessment formats, modes, and types seem to be key to a substantial scientific discussion. In the future, research should focus on leveraging the objectives and potentials of online assessment for supporting learning as well as teaching in higher education. Furthermore, designing a coherent framework for the interaction and design of online assessment modes, formats, and types would be beneficial for creating guidelines on the effective design, development, implementation, and evaluation of online assessments. Another factor will be how to further develop the online assessment techniques while addressing the identified challenges.

Limitations and Future Research

This systematic review is subject to limitations that provide implications for future research. First, even if keywords are applied, databases approached, and specific journals searched, some important research studies may still have been neglected in this systematic review. In addition, this systematic review only included articles published in the English language. Hence, important findings from articles published in other languages may have been overlooked. Second, the systematic review covers a limited time period. While writing this systematic review, further studies may have been published that could provide additional insights into the impact of online assessments on learning and teaching. Accordingly, a continuing meta-discussion of findings is required while the research area matures. Thus, additional research shall

cover a wider time period to consider more publications focusing on online assessments with a specific emphasis on the historical development of online assessments.

Future research may address the multiple challenges identified in this systematic review when implementing online assessments. For example, the increased risk for academic misconduct (Tsai, 2016) and challenges due to higher initial investment (Azevedo et al., 2022). To enable equal opportunities, challenges include implementing an ICT infrastructure and reliable connectivity (James, 2016), equal internet access of the students (Hains-Wesson et al., 2014), and new study habits that students need to develop (Azevedo et al., 2022). Other challenges in creating fair online assessment include the heterogeneous educational background of learners (McCarthy, 2017) as well as multiple possible graduate destinations (Schultz et al., 2022). Additional concerns were raised on the fairness of peer-assessment, especially in group tasks (ArchMiller et al., 2017) as well as technological and logistical challenges in the widespread implementation of e-Portfolios in higher education (Birks et al., 2016).

Looking forward, online assessment harnesses formative and summative data from stakeholders and learning environments to facilitate learning processes in real-time and help decision-makers to improve learning environments. Therefore, future research may focus on distinct features of online assessments, for instance providing semantic-rich feedback for written assignments in near real-time using natural-language processing (Bektik, 2019; Gottipati et al., 2018; Ifenthaler, 2023; Whitelock & Bektik, 2018), generating progress reports toward curricular required competences or learning outcomes including intra-individual and inter-individual comparisons (Ifenthaler at al., 2023; Lockyer et al., 2013), supporting peer-assessments focusing on specific learning outcomes or general study skills (e.g., learning strategies, time management) (Gašević et al., 2019; Gašević et al., 2017), or including pre- and reflective prompts highlighting persistence of strengths and weaknesses of specific learning events and assessment results (e.g., recurring errors, misconceptions, learning habits) (Schumacher & Ifenthaler, 2021).

Conclusion

Given the variety of online assessments documented in the 114 studies of this systematic review, the formative assessment format was used more often than the summative assessment. Implementations mainly used the automated-assessment mode, followed by peer- and teacher-assessment modes, while the self-assessment mode was used scarcely. Online assessments impact not only students' learning outcomes but also influence motivation, self-regulation, engagement, or reflection. The successful implementation of online assessments requires instructional support, transparent guidelines and regulations, as well as an alignment of possible assessment formats, modes, and types with expected learning outcomes.

Declarations
The authors declare no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The data that support the findings of this study are available on request from the corresponding author. (joana.heil@uni-mannheim.de)

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A Systematic Review of Research on Moderators in Asynchronous Online Discussions

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Abstract
This systematic review examined research on moderators in asynchronous online discussions (AODs) through a review of 52 sources published over the past four decades. Areas of interest included conceptual frameworks cited in research, publication trends, instructional contexts, research methods and characteristics, and descriptions of the role of the moderator with implications for practice. Results indicate: (1) nearly half of the publications did not cite a conceptual framework focused on moderation; (2) the field is diverse with a wide variety of themes for research designs, outcomes, foci, and questions; (3) half of reviewed publications involved case studies or similarly limited study designs; (4) the majority of publications collected data on students in higher education, but there was a lack of consistency in the reporting of demographic information; (5) research foci tended toward investigating peer moderators or the role of the instructor; (6) research questions tended to focus on strategies of moderators or student performance and discussion quality; (7) most definitions or expectations of a moderator included discussion and social management duties. We conclude by discussing the implications of some of the findings and future research options.

Keywords: moderator, facilitator, asynchronous online discussion, distance education, peer moderator

It has been over 40 years since the term "moderator" was first used to describe a leadership role in computer-based discussions in educational contexts (Hiltz & Turoff, 1978). Over multiple decades of research involving computer based, computer-mediated, or asynchronous online discussions (AODs), the term "moderator" and the roles it describes have been defined inconsistently, with four conceptual frameworks offering differing positions on the responsibilities and functions of a moderator. Our analysis of literature revealed several key characteristics and factors related to discussion moderation, including the identity, duties and roles, and training or background skills of a moderator.

While there has been literature produced on moderation in online and computer-mediated discussions, there has not been a systematic review of this research. With the dynamic growth of online courses, moderators can play a major role in engaging and supporting learners in asynchronous discussions. In addition, the conceptual frameworks about moderation are dated and may not be sufficient to guide practitioner implementations in the future. This systematic review addresses this gap and highlights important areas where the lack of research evidence limits the ability to make informed decisions for both researchers and practitioners (Robinson et al., 2013) and can be a potent resource for researchers and practitioners, connecting conceptual frameworks with practices for the selection of moderator duties, appropriate training, and necessary support.

Three objectives drove this systematic review. First, we analyzed which conceptual frameworks about moderation have guided researchers and practitioners. Second, we analyzed empirical findings to understand the current state of research, particularly the role of moderators, their duties, and their training and support. Finally, we identified implications for practice and the most important gaps in the field to help guide the direction of future studies. The research questions are:

1. What conceptual frameworks have been adopted in investigations of moderators in AODs?
2. What are the publication trends, instructional context, research design, research outcomes, and research focus of the studies reviewed?
3. How has the role of moderator been described, how has it evolved, and what are implications for practice in AODs?

Literature Review

We provide a description of technological change in the four decades of this systematic review and review two key concepts, the identity of a moderator and the roles a moderator may play in an AOD. We present four conceptual frameworks for moderation, synthesized into a taxonomy of moderator roles. Our methods section describes the systematic process used to review articles for inclusion in our study. In the results and discussion section, we analyze data collected relevant to the three research questions.

Rapid Pace of Technological Change

The four decades covered by this systematic review coexist with massive changes in the technology commonly available to instructors and students. The early period (1978 through the early 1990s) was characterized primarily by institution-only or slow dial-up access using text-based or graphical interfaces. The 1990s saw market dominance of graphical interfaces, the introduction of web browser software, and the creation of the modern internet in 1995. Through the 2000s, persistent and higher-speed access in the form of cable modems and digital subscriber

lines overtook dial-up access, with wireless communications becoming persistent and expected in public spaces such as universities by the 2010s. Similarly, moderated AODs became supported by built-in functions of learning management systems (LMSs) that began in the late 1990s and became industry-dominant in the 21st century. Computer screen sizes evolved from low-resolution 5-inch cathode ray tubes (CRTs) in the 1980s, to 13–19-inch CRT monitors or liquid crystal display (LCD) panels by the 1990s–2000s transition, to widescreen monitor formats in mainstream use by 2010, and eventually to the coexistence of large, high-resolution monitors and smaller-screened devices such as cell phones and tablets by the later 2010s.

Identity of a Moderator

The identity of a moderator can vary considerably. For example, a moderator might be the actual course instructor (Galikyan & Admiraal, 2019; Leinster et al., 2021; Ouyang & Scharber, 2017) or an assistive individual such as a graduate teaching assistant, tutor, or facilitator (Douglas et al., 2020; Kim et al., 2020). In situations where instructors implement peer moderation strategies, moderators may be students (Chen et al., 2019; Kim et al., 2020; Sansone et al., 2018). These identities represent differing levels of social status, power status, expert knowledge, and implied experience as applied to the moderator role. The identity of the moderator may carry important implications for research, since this identity may affect the effectiveness of student moderators, the separation of moderator duties among discussion members, and the training and resources needed for effective moderation.

Roles of a Moderator

Moderators have varying roles in AODs, ranging from social hosting duties (Berge, 1995; Foo, 2021) to leadership and organizational responsibility (Feenberg, 1989; Sajdak-Burska & Koscielniak, 2019; Xie et al., 2018). A moderator may act as a facilitator, assisting the group by coordinating rather than dominating the discussion (Evans et al., 2017; Salmon, 2003). Moderators may fill multiple roles and functions requiring a wide skillset (Vasodavan et al., 2020), and some duties could be split amongst participants, including students (De Wever et al., 2010b; Yilmaz & Karaoglan Yilmaz, 2019; Zhong & Norton, 2018). Scholars differ on the need for and methods of moderator training, but key themes relate to the importance of designing effective online discussion activities (Baran & Correia, 2009), providing robust preparation for individuals who will serve in moderator roles (Tolley, 2003), and clarifying the requirements of the role for prospective moderators (Vlachopoulos & Cowan, 2010b). Training varies from the simple provision of reading materials (Ghadirian, Salehi, et al., 2018) to much more involved formats such as workshops (De Wever et al., 2010b).

Conceptual Frameworks for Moderation

A conceptual framework is a set of systematic conceptual structures used to organize data for purposes of effective inquiry and practice (Dewey, 1938). Frameworks are important in communicating an argument for a study's importance, rigor, and implications for both research and practice (Antonenko, 2015). In our scoping process for this systematic review (Authors, 2022), we found four conceptual frameworks for moderation in AODs: Feenberg's (1989) moderating functions, Berge's (1995) necessary conditions, Salmon's (2003) five-stage model, and Vlachopoulos and Cowan's (2010b) ring-fence. We examined the descriptions of a moderator in each framework and synthesized a taxonomy separated into managerial, monitoring, pedagogical, technical, and social roles. The managerial role involves managing the

AOD, with duties such as opening topics or controlling the agenda. The monitoring role involves duties closer to the discussion, such as recognizing participation or prompting contributions. The pedagogical role covers direct support of learners' understanding and pursuit of ideas, with duties such as meta-commenting and summarization. The technical role involves support for participants' technical knowledge and comfort in participating within the AOD system. The social role involves managing social interactions, supporting participants' social relationships, and maintaining cohesiveness in the discussion group. Figure 1 provides a visual representation of this taxonomy.

Figure 1
Taxonomy of Moderator Roles

	Managerial Role Creates the agenda, sets norms for behavior and participation, shows leadership	**Monitoring Role** Recognizes contributions, reassures commenters, prompts continued participation	**Pedagogical Role** Focuses discussion, weaves threads, summarizes, supports learning, combats information overload	**Technical Role** Addresses technical problems and concerns, supports users' comfort with the system	**Social Role** Promotes social relationships, encourages group cohesiveness and networking
Feenberg's Moderating Functions (1989)	Contextualizing	Monitoring	Meta-communicating Weaving		
Berge's Necessary Conditions (1995)	Managerial		Pedagogical	Technical	Social
Salmon's Five-Stage Model (2003)	Stage 3		Stage 4 Stage 5	Stages 1-5	Stage 1 Stage 2
Vlachopoulos and Cowan's Ring-Fence (2010)			Inside the ring-fence		

Methods

The methodology for this systematic review followed the steps of analyzing systematic review data suggested by multiple authors (Boland et al., 2017; Gough et al., 2017; Petticrew & Roberts, 2006). In this section, we discuss the five stages involved in the review process: scoping, search, filtering, full article review, and synthesis. Like Moore and Miller (2022), we hope that providing details of our process will establish trustworthiness (Page et al., 2021) and enable others to replicate our study. Figure 2 provides a visual representation of our systematic review process, which determined 52 sources to include for data extraction and synthesis.

Figure 2

Systematic Review Process
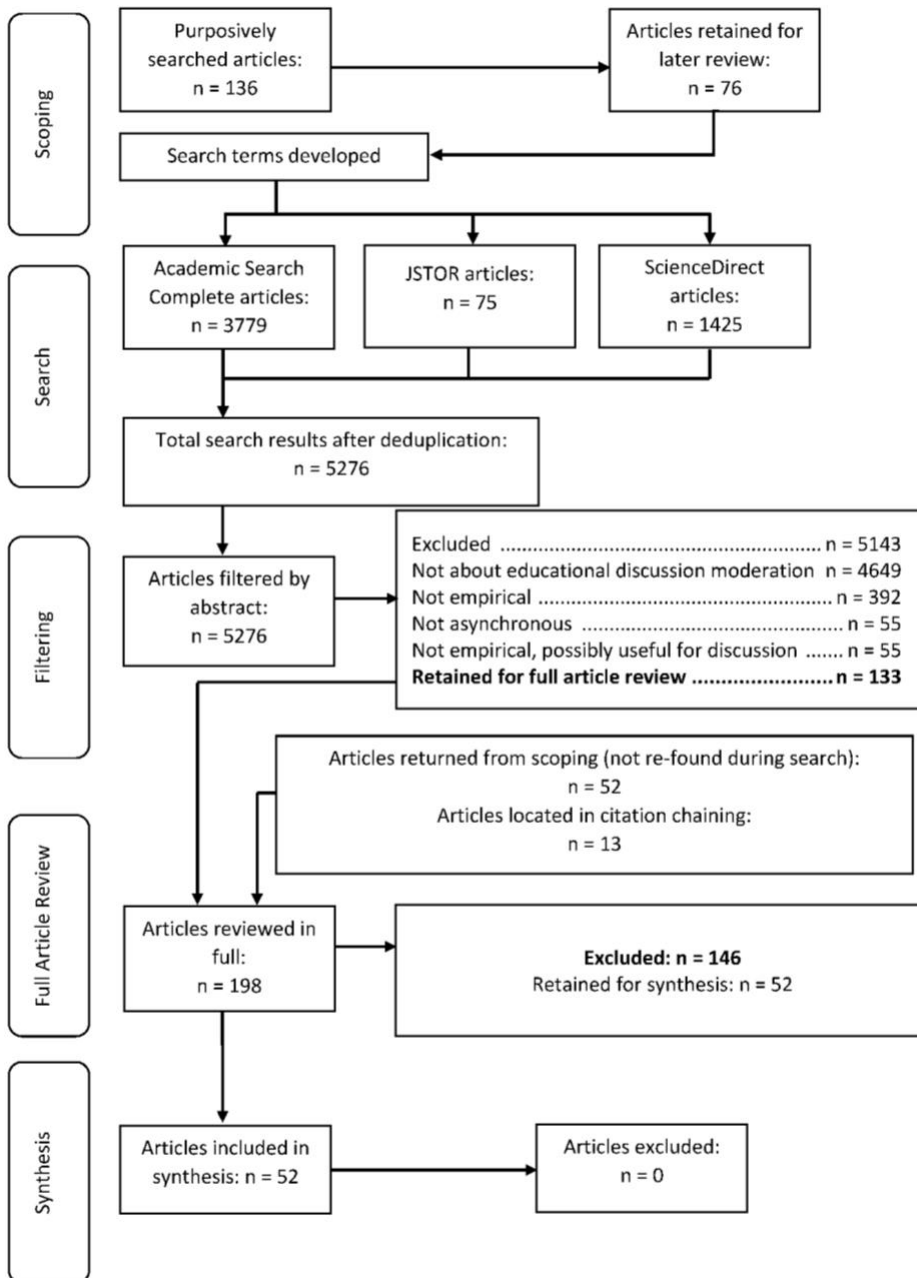
Scoping

We chose to begin with scoping for three reasons. First, scoping is a best practice in the preparation of systematic reviews (Petticrew & Roberts, 2006). Second, we had concerns regarding possible complications with the term "moderator" as both a term for persons with leadership roles in discussions and as a term used in statistical analysis. The scoping process allowed us to determine appropriate alternative primary search and secondary search terms to limit the impact of alternative uses of "moderator" in this review. Finally, we were mindful of the pace of change and the tendency for terms to shift over time in the educational field (Bonk et al., 2004). Our scoping process involved multiple probing searches and refinement passes to refine the parameters for the systematic review. We used this iterative scoping process to determine inclusion/exclusion criteria, search terms, time period, and search engine requirements, based on recommendations from Boland et al. (2017).

Inclusion/Exclusion Criteria

Table 1 provides the inclusion/exclusion criteria applied to all papers examined at the full article review stage.

Table 1

Inclusion/Exclusion Criteria

Criterion	Inclusion	Exclusion
Time Period	1978 through 2018	Studies published outside this range
Publication Type	Peer-reviewed journal or book	Publications of other types (including grey literature)
Language	English	Non-English and not translated to English in full.
Search Acquisition	Meets search terms via abstract-only searching in determined search engines, retained from scoping review, or located via citation chaining	
Moderator Duties	Participants in the research must have performed moderator duties.*	Moderator duties were not clearly defined or were limited to a single activity by each participant without further interaction.**
Moderator Role	At least one moderating role must be discussed in the paper.	The term "moderator" was exclusively used as a statistical term.
Evidence	Most empirical evidence must be specifically related to moderation or moderator duties and roles.	Paper lacked empirical evidence related to moderators or moderator duties.
Research Environment	Discussions must have taken place in an asynchronous online environment.	
Moderated Discussion Duration	Moderated AOD activity must have occurred for at least 45% of the class or event duration.***	

* Moderator duties could be split among multiple participants.
** An example would be moderators only posting an opening post or conversation starter, without further moderator duties.

*** We felt that studies where moderation was used in a large portion of instructional time would provide robust insights and evidence into the phenomena involved. Moderation time could be split among multiple participants, such as a rotation in which each student performed moderator duties for one week.

Search

We set the systematic review search to the following parameters. The search period was set from 1978 to 2018 to allow for a four-decade span from the first use of the term "moderator" regarding AODs. Search engines were chosen (Academic Search Complete, JSTOR, ScienceDirect) for their ability to handle the number of search terms, with abstract-only searching, and a minimal number of split passes to be deduplicated. Table 2 provides the primary and pairing search terms used for this review.

Table 2
Search Terms Used in this Systematic Review

Primary search terms	Secondary search terms
Moderator (moderating, moderation, moderated)	Online Discussion
Facilitator (facilitating, facilitated)	Online Education
Tutor	Online Learning
Teacher	Distance Education
Instructor	E-Learning
	E-Learning Courses
	Asynchronous
	Asynchronous Discussion

Filtering and Full Article Review

The review process was conducted in tandem between two reviewers. Author 1 filtered initial results of the search by abstract, confirming the filtering and discussing any articles flagged for further analysis with Author 2. Articles retained through abstract filtering were then evaluated as full articles against the inclusion/exclusion criteria independently by both authors, with disagreements between authors resolved via discussion. We applied a second phase of citation chaining to all articles selected for inclusion, to locate potential articles not found through the search engines; articles located through citation chaining were evaluated through abstract filtering and then the same full-article review process. An important part of the inclusion criteria was that the articles had to include empirical research results, not solely anecdotal analysis, or recommendations. Although the search period had been set for 1978–2018, the earliest article to meet criteria for inclusion was from 1989; other articles prior to this point were excluded for reasons such as not containing empirical research, not involving asynchronous communications, or not being related to discussion moderation. After the full article review phase, a total of 52 sources met criteria for inclusion in data extraction and synthesis.

Data Extraction and Synthesis

Appendix B provides a table listing each of the 52 articles included for synthesis in this review. Author 1 evaluated each article against a previously defined Qualtrics data entry form that included fields for bibliographic data and descriptive characteristics required for coding and synthesis, with confirmation provided in oversight by Author 2.

Data for synthesis were exported to a Microsoft Excel document and then separated into discrete documents by Author 1 for coding and analysis, with continual revision and discussion between Author 1 and Author 2. Both authors coded each article and discussed disagreements to reach consensus. In the following sections, we review and discuss the findings from data extraction and discussion based on these findings.

Results and Discussion

Research Question 1: What Conceptual Frameworks Have Been Adopted in Investigations of Moderators in AODs?

Nearly half of the papers reviewed ($n = 25$, 48.1%) did not cite a conceptual framework that focused on moderation. For those that did, we observed variation in the citation patterns. Table 3 provides a count of the individual framework citations, along with counts for observed combinations. The initial four frameworks listed were located during the scoping process and were presented in the literature review. Six papers used the Community of Inquiry (CoI) framework (Garrison et al., 2000) as a basis for their research involving moderated AODs; CoI is broader in scope than the initial four frameworks. CoI covers the design and management of classes using computer-mediated communications both synchronous and asynchronous, centered around ideas of cognitive presence, social presence, and teaching presence. For example, Evans et al. (2017) used CoI to analyze facilitator contributions in interprofessional education AODs to search for indications of teaching presence.

Three papers in our review cited research that did not meet our definition of a framework specifically for moderation: Kaye (1987), Mason (1991), and Chan et al. (2009). Mason (1989) used a set of assumptions from Kaye (1987) as a basis of analysis and subsequent discussion. Two papers cited Mason's (1991) guidelines for moderators (Murphy et al., 1996; Vlachopoulos & Mcaleese, 2004); this was unsurprising as these guidelines were later adapted into a full framework by Berge (1995). Chan et al. (2009) produced a typology of discussion thread patterns, used by Ghadirian et al. (2016) to analyze the effect of specific supports scripted for peer moderators in AODs.

Nandi et al. (2012) proposed the most similar example of a framework for moderation of AODs to our taxonomy, citing Baran et al.'s (2011) analysis of roles for an online teacher. They did not present their framework as developed specifically for moderators, but rather as "a new framework to provide implementation guidelines for online instructors" (Nandi et al., 2012, p. 26). The five categories of the proposed framework have some similarities to the taxonomy of moderator roles presented in our literature review, with managerial and instructional design, pedagogical, facilitator, technical, and social roles. This may be due to their following Baran et al.'s (2011) use of terminology from Berge (1995), and then filling in the gap between managerial and pedagogical roles by adding their concept of the facilitator role.

The two frameworks most commonly cited together ($n = 7$, 13.5%) were those of Berge (1995) and Salmon (2003). A subset of papers citing these two ($n = 3$, 5.8%) also cited the CoI framework. One paper (Vlachopoulos & Mcaleese, 2004) cited Mason (1991) as well. The majority of these papers ($n = 5$) were works by first author Vlachopoulos. We did not observe any patterns of framework adoption by year. The latest citation found for Feenberg's (1989) framework was 2014, and the latest citations for Berge (1995) and Salmon (2003) were 2018.

Table 3
Frameworks by Citation Count and Combinations of Citations

Framework	Count	Combination	Count
Feenberg (1989)	5	Feenberg + Berge	1
Berge (1995)	11	Feenberg + Other	1
Salmon (2003)	13	Berge + Salmon	7
Vlachopoulos & Cowan (2010b)	1	Berge + Vlachopoulos & Cowan	1
		Berge + Other	4
Other		Salmon + Vlachopoulos & Cowan	1
Community of Inquiry	6	Salmon + Other	3
(Garrison et al., 2000)		Feenberg + Berge + Other	1
Mason (1991)	2	Berge + Salmon + Other	3
Chan et al. (2009)	1	Berge + Salmon + Vlachopoulos	1
Kaye (1987)	1		
Baran et al. (2011)	1		

Research Question 2: What Are the Publication Trends, Instructional Context, Research Design, Research Outcomes, and Research Foci of the Studies Reviewed?
Publication Trends

We found 82 authors for the 52 papers included in this review representing 58 institutions, with 34 unique first authors representing 37 institutions. Since authors were not static in residency or position over time, we observed 130 different author roles. The majority were faculty ($n = 100$, 76.9%); the rest were students ($n = 15$, 11.5%), academic staff ($n = 8$, 6.2%), or fell into other categories such as staff of outside companies or institutions ($n = 7$, 5.4%).

Table 4
Most Prolific Authors and First Authors

Authors		First Authors	
Name	**Paper Count**	**Name**	**Paper Count**
Martin Valcke	11	Bram De Wever	5
Hilde Van Keer	11	Panos Vlachopoulos	5
Bram De Wever	8	Marijke De Smet	4
Tammy Schellens	7	Kui Xie	4
Panos Vlachopoulos	5	Hajar Ghadirian	3

A prolific group of authors ($n = 5$) from Ghent University in Belgium accounted for a plurality ($n = 11$, 21.2%) of papers included in this review. The published research we located spanned from 2005 through 2010 and tended to focus on topics involving the use of peer moderators or cross-age peers (such as graduate or higher-level students) serving as moderators (De Smet et al., 2010a; De Wever et al., 2010b; Schellens et al., 2007). Vlachopoulos was unique in representing multiple countries ($n = 4$), institutions ($n = 5$), and roles ($n = 5$) in publications from 2004 through 2014.

Table 5

Institutional Author Credit Counts, by All Authors and First Author Only

All Authors		First Author Only	
Institution	**Paper Count**	**Institution**	**Paper Count**
Ghent University	41	Ghent University	11
Ohio State University	8	National Institute of Education, Nanyang Technical University	3
University Putra	7	Ohio State University	3
Texas A&M	6	University of Tehran	3
National Institute of Education, Nanyang Technical University	5	(All others)	1 each

Table 6
Paper Counts Per Country and Year (by First Author)

Country																				Year												Total
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
USA											1		2		1			1			2				1	1		2	2		13
Belgium								1									1	2	2	2	3										11
United Kingdom	1				1	1	1							1					1	1											7
Iran																				1			1					1			3
Singapore															1			2													3
Canada															1								1	1							3
Australia																							1		1				1		3
China																					1							1			2
New Zealand																						1									1
Germany																					1										1
Taiwan																					1										1
Italy																													1		1
India																						1									1
Spain																						1									1
Malaysia																											1				1
Total Per Year	1	0	0	0	1	1	1	1	0	0	1	0	2	1	3	0	1	5	3	4	8	3	3	1	2	1	1	4	4	0	52

Note. The search period for the protocol covered the years 1978–2018. The years before the first paper meeting inclusion criteria (1989) have been truncated for readability.   The majority of publications ($n = 47$, 90.4%) came from 31 peer-reviewed journals; the remainder were book chapters ($n = 5$, 9.6%). Table 7 displays the breakdown of journals involved.

Publications included in this review spanned the globe, with authors representing 16 countries. The number of publications varied by year and country; Table 6 presents the publication information in graphical form, as publications by first author per country each year (years with no represented publications are omitted). The earliest paper included in this review was from a first author in the United Kingdom (Mason, 1989). Research from first authors in the United Kingdom ($n = 7, 13.5\%$) spanned the timeframe from 1989 through 2008; the most prolific country, the United States ($n = 13, 25\%$), had research spanning 1996 through 2018. Neither of these countries' publication records seem to represent a pattern of focused research by a coordinated team similar to what we observed from Ghent University ($n = 11, 21.2\%$).

Table 7
Journals Represented by Included Papers

Journal Name	Paper Count
Computers & Education	4
Distance Education	4
The Internet and Higher Education	3
American Journal of Distance Education	2
British Journal of Educational Technology	2
Innovations in Education & Teaching International	2
Instructional Science	2
International Journal of E-Learning & Distance Education	2
Journal of Research on Technology in Education	2
Learning and Instruction	2
Small Group Research	2
Journals with only 1 published article represented	20

Instructional Context

Almost all of the studies included performed research in a higher education environment, with some papers including overlaps between categories. The most prevalent was a higher education undergraduate setting ($n = 33, 63.5\%$), and the second most prevalent was the graduate level ($n = 25, 48.1\%$). A few studies included examinations of other settings ($n = 7, 13.5\%$) such as informal learning communities for test preparation ($n = 1$), professional development ($n = 2$), or working groups ($n = 2$), or were not clear about the setting ($n = 2$).

Subject areas for the included studies broke down similarly. The majority were in education ($n = 34, 65.4\%$). Other studies worked across a mixture of disciplines ($n = 4, 7.7\%$), in information technology ($n = 4, 7.7\%$), in psychology ($n = 3, 5.8\%$), in the medical field ($n = 2, 3.8\%$), in social work ($n = 1, 1.9\%$), English as a foreign language ($n = 1, 1.9\%$), or did not indicate their subject areas clearly ($n = 3, 5.8\%$).

Subjects of data collection carried only minor variations. The vast majority of papers collected data on students ($n = 44, 84.6\%$), with the second most common group being instructors ($n = 19, 36.5\%$). Graduate students or higher-year students operating as tutors or facilitators were third ($n = 6, 11.5\%$) followed by other educational support staff ($n = 2, 3.8\%$). Four papers collected data on individuals outside of these groups, looking at adult learning council coordinators ($n = 1, 1.9\%$), moderators of a community of practice ($n = 1, 1.9\%$), interprofessional education facilitators ($n = 1, 1.9\%$), and members of a test preparation forum (n

= 1, 1.9%). We observed slightly more variety in the combinations between the indicated groups, presented below in Table 8.

Table 8
Combinations of Subject Groups for Data Collection

Subject Groups	Number of Papers
Students	22
Students and Instructors	16
Students and Graduate Assistants	4
Instructors	2
Graduate Assistants	2
Students and Other Staff	1
Students, Instructors, and Other Staff	1

The authors of papers included in this review did not consistently provide demographic information regarding the subjects of the research. Less than half of the papers ($n = 22$, 42.3%) provided gender breakdowns in a male-female format; the rest either did not report genders ($n = 18$, 34.6%), defined numbers for only one gender ($n = 4$, 7.6%), or did not provide usable participant counts ($n = 8$, 15.4%). We observed a similar pattern for age categories; the majority of papers ($n = 33$, 63.5%) did not provide age data, and the rest provided data in a variety of formats that were beyond synthesizable use. Some only provided age ranges or average ages; some added in other information, such as median ages or a split of categories; and some provided vague or broad age ranges, such as "were of the baby boom generation, with two thirds between the ages of 40 and 60" (Gray, 2004, p. 22) or "[f]orty-eight percent indicated that they were younger than 40 years old" (Russell et al., 2009, p. 454). We found a similar lack reporting regarding ethnicity, as nearly 79% ($n = 41$) of papers included no demographic ethnicity data.

We observed some variation in the course environments being studied. The most common were fully online courses ($n = 23$, 44.2%), followed by hybrid ($n = 20$, 38.5%), and then face-to-face with supplemental asynchronous discussions ($n = 5$, 9.6%). The remaining four did not fit these categories, either by not providing enough information for certainty ($n = 2$, 3.8%), not being an instructed course ($n = 1$, 1.9%), or studying multiple cases with one fully online and the second hybrid ($n = 1$, 1.9%).

Structures for asynchronous discussions studied varied as well. The majority of studies described a weekly participation requirement ($n = 39$, 75.0%); a few others required participation on an irregular schedule ($n = 2$, 3.8%), daily ($n = 1$, 1.9%), or did not specify requirements clearly ($n = 10$, 19.2%). Lengths of discussion topics could be one week ($n = 23$, 44.2%), two weeks ($n = 9$, 17.3%), three weeks ($n = 5$, 9.6%), or one month ($n = 2$, 3.8%). A few papers described variable lengths of discussion topics ($n = 5$, 9.6%) or did not specify lengths ($n = 8$, 15.4%). For example, Hew and Cheung (2011a) described the length of discussions in their research as "ranged from 6 to 41 days" (p. 309), while Baran and Correia (2009) described a more common pattern of students volunteering to serve as a peer moderator for selected topics on a weekly basis.

Total time spent in discussions was similarly varied. For papers that quantified discussion amount in weeks ($n = 35$, 67.3%), we observed a minimum of two weeks, maximum of 34, with a median of 12 ($M = 10.9$, $SD = 5.5$). Other descriptions of total time spent included one month ($n = 1$, 1.9%), two months ($n = 1$, 1.9%), three months ($n = 2$, 3.8%), one semester ($n = 3$, 5.8%), an academic year ($n = 1$, 1.9%), as a cohort over multiple semesters ($n = 2$, 3.8%). Again,

a subset did not provide enough specificity to quantify ($n = 7$, 13.5%). Figure 3 provides a histogram of the spread of total weeks of discussion, for papers providing the total duration in weeks. Timeframes in this group were generally indicative of a college-level semester, such as those between six and 15 weeks ($n = 29$, 82.9%); outliers tended to be papers such as Mason's (1989) focused around events with no such limitation.

Figure 3
Histogram of Number of Weeks Spent in Discussion
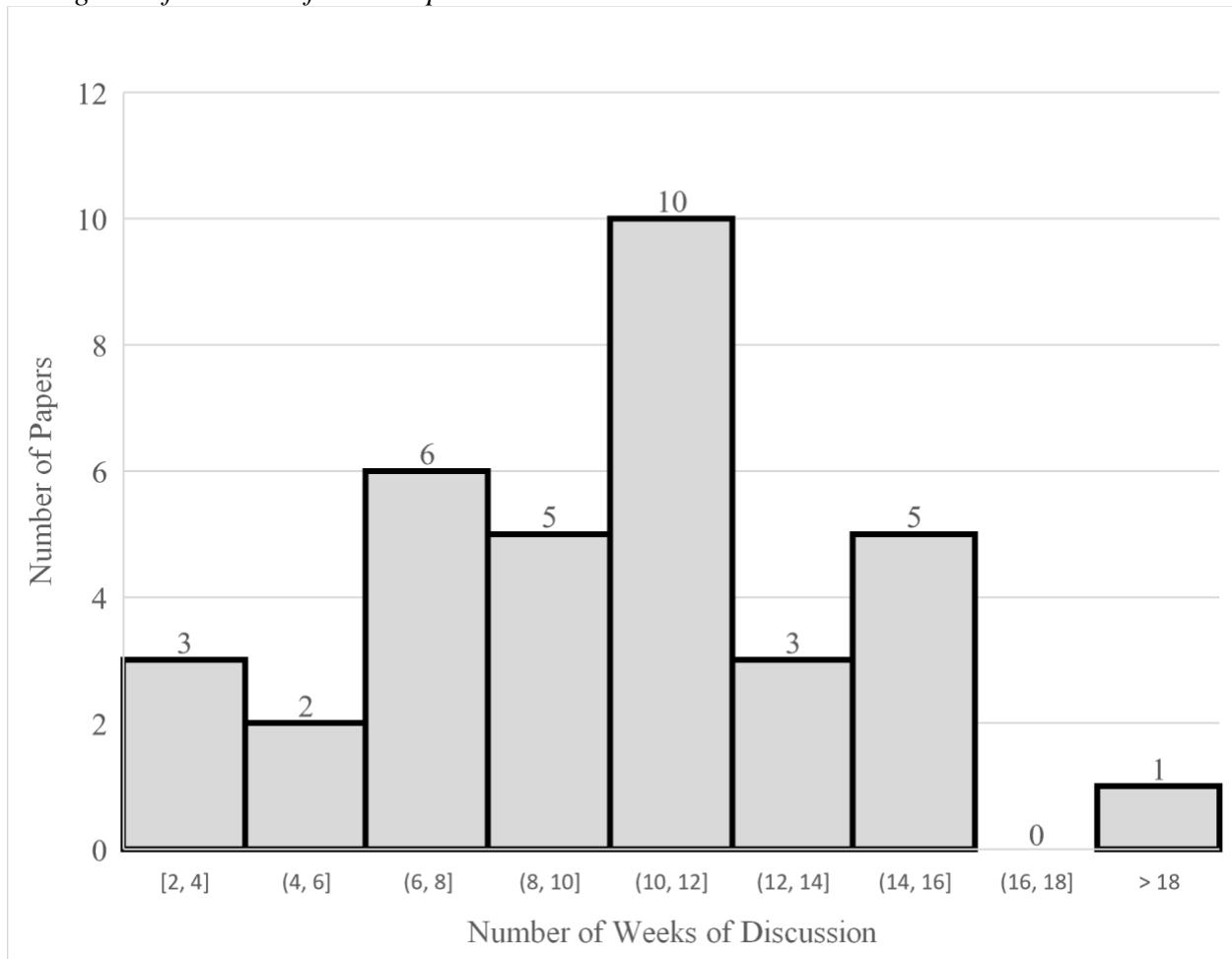
Research Design Characteristics

Examination of the types of research revealed several categories. Where authors self-described their type of research, the entry was coded to match. Where authors did not explicitly delineate the type of research, we examined the text to determine the appropriate category. Half of the papers ($n = 26$, 50.0%) involved case studies or research limited to a specific course or event, suggesting questions of generalizability for these small-scale studies. Table 9 provides the types of research identified and a breakdown of the case study or small study category as well.

Table 9
Types of Research Conducted on Moderation in AODs

Research Type	All Included Studies		Case or Small Studies	
	Count	Percentage	Count	Percentage
Single case nonexperimental	21	40.4	13	50.0
Group experimental	10	19.2	0	0.0
Qualitative	8	15.4	6	23.1
Group nonexperimental	6	11.5	3	11.5
Mixed methods (qualitative & quantitative)	3	5.8	1	3.8
Other[*]	2	3.8	1	3.8
Action research	1	1.9	1	3.8
Single-case experimental	1	1.9	1	3.8

[*]Studies in the Other category self-described as "semi-qualitative" (Vlachopoulos & Mcaleese, 2004, p. 401) and as an empirical inquiry studying multiple cases (Gairín-Sallán et al., 2010).

Research Outcomes and Results

We found research outcomes and results reported in a wide variety of formats; no common theme was represented across a majority of papers. The most common themes in results involved peer moderation in some form ($n = 18$, 34.6%) and student outcomes ($n = 18$, 34.6%), with a small overlap ($n = 7$, 13.5%) of papers discussing both. For example, Szabo (2015) compared peer facilitation to instructor facilitation and observed differences in participation rates, participation quality, and characteristics of individual postings. She concluded that peer facilitation increased overall participation rates but at a risk of discussions becoming superficial; instructor facilitation increased the quality of student responses, and instructor coordination with peer facilitators to produce initial discussion prompts increased the quality of discussion further (Szabo, 2015). Eight papers discussed the benefits of peer moderation, such as encouraging active participation (Baran & Correia, 2009) and empowering students (Poole, 2000). Another few ($n = 3$) discussed the benefits of both peer moderation and instructor moderation, and a remainder ($n = 6$) focused on other themes while overlapping the discussion of peer moderation. One outlier paper discussed results indicating instructor moderation to be superior to peer moderation (Hylton, 2007).

We found similar separations in discussions of student outcomes. The most prevalent group ($n = 10$, 19.2%) discussed student outcomes in the form of knowledge construction measurements. Other papers discussed student outcomes in terms of benefits to student or group communication ($n = 6$), with an outlier ($n = 1$) contradicting and finding no evidence that tutors were able to move their groups past introductory stages of conversation (De Smet et al., 2008). Two papers addressed learning outcomes, but one indicated a benefit to student achievement under instructor-facilitated discussions (Hylton, 2007) while the other concluded that moderated discussion supports were no more effective than a well-designed self-paced course (Russell et al., 2009). A final paper indicated that participants learned to express themselves effectively in text and developed communication styles that led to positive attitudes toward moderated AODs (Murphy et al., 1996).

We also looked into papers addressing role assignment ($n = 8$, 15.4%), a model in which moderator duties (such as posing an initial question, summarizing the discussion, or seeking

outside material to add to the conversation) are dispersed among multiple students in a discussion. The majority of the papers ($n = 5$) were mixed on the question of benefits related to role assignment, while the remainder ($n = 3$) were more strongly in favor. Papers indicating mixed results tended to focus on differing impacts to students depending on the roles they were assigned in a discussion (De Wever et al., 2007; Schellens et al., 2007).

Remaining themes involved in outcomes and results included impacts of moderation on participation levels ($n = 13$, 25%), analysis of styles of moderation ($n = 9$, 17.3%), and results involved in exploring or defining the role of a moderator ($n = 8$, 15.4%). A few papers ($n = 7$, 13.5%) provided results on moderation performance topics such as whether moderators could successfully follow protocols or adopt specific styles, such as Vlachopoulos and Cowan's (2010b) observation that moderators were unable to successfully implement a learner-centered style as intended. Even fewer addressed student perceptions of moderated AODs ($n = 3$, 5.8%), or leadership topics such as the usefulness or growth of leadership in peer moderation ($n = 2$, 3.8%). Single outlier topics included results from the training of students as moderators ($n = 1$, 1.9%) (De Smet et al., 2010a) and an examination of the mental habits of peer moderators ($n = 1$, 1.9%) (Hew & Cheung, 2011b). A small minority of papers ($n = 3$, 5.8%) did not report outcomes as such in their text.

Table 10 provides a list of the themes uncovered in research outcomes and results, in total and by research type. We did not notice dominant overlaps in themes; the noticeable overlaps came in connections between peer moderation and student outcomes ($n = 7$), participation levels ($n = 6$), and styles of moderation ($n = 5$), and between role assignment and student outcomes ($n = 6$), with a further 14 overlaps only covering 1-3 sources. For a visual representation of the overlap counts between themes, see Table A1 in Appendix A.

Table 10

Themes Identified in Research Outcomes and Results, by Research Design

Theme	Research Design								Total Papers
	Single case nonexperimental	Group experimental	Qualitative	Group nonexperimental	Mixed methods (qualitative & quantitative)	Other	Action research	Single-case experimental	
Peer Moderation	8	3	3	3			1		18
Student Outcomes	7	6	1	3			1		18
Participation Level	5	2	1	2	1	1	1		13
Moderator Style	5	1	1	1		1			9
Role Assignment	1	6						1	8
Moderator Role	7				1				8
Moderator Performance	2		4		1				7
No Outcomes	1		1			1			3
Student Perceptions	1			1				1	3
Leadership	1	1							2
Moderator Training		1							1
Peer Moderators				1					1

Research Foci and Research Questions

We examined research foci and research questions in a few ways. First, we examined the research to see if it focused on individuals with instructional roles (instructors, tutors, or other professional staff) acting as moderators, on students or other participants with assigned duties in a peer-moderator role, or students or participants as members of the discussion without assigned moderator duties. Table 11 provides a count of papers for the individual categories and a count of papers with overlapping foci.

Table 11

Research Focus and Participant Category

Participant Category	Paper Count
Peer Moderator	34
Instructional Role	22
Participant/Student	7
Not Clearly Indicated	1
Combinations	
Instructional Role + Peer Moderator	5
Instructional Role + Participant/Student	3
Peer Moderator + Participant/Student	4

We coded twelve overall themes from the research foci and questions. Table 12 provides a list of these themes, along with a short description of each theme and an example citation. Table 13 provides a count of papers addressing each theme, and separate counts by type of participant focus.

The strongest connection between themes was in examinations of strategies employed by moderators ($n = 24$, 46.2%), overlapping with student performance and discussion quality ($n = 16$) and role assignment ($n = 7$). Examinations of the performance of moderators ($n = 10$, 19.2%) did not overlap with explorations of moderator strategies, but 30% of these papers ($n = 3$) connected to student performance and discussion quality. Much like the category of research outcomes and results, no theme held a majority of the field, suggesting that there is not agreement on how to study moderation in AODs. One paper combined investigations of moderation-related themes with non-moderation-related items (Ghadirian, Salehi, et al., 2018). For counts of the papers that overlap for a given theme, see Table A2 in Appendix A.

Table 12

Descriptions of Themes Identified in Research Foci and Questions

Theme	Description	Example Citation
Strategies Employed by Moderators	Focus involved specific techniques or styles, such as variations in the frequency of posting by moderators.	(Ghadirian, Fauzi Mohd Ayub et al., 2018)
Student Performance and Discussion Quality	Examination of effects on student performance, such as posting frequency or types of comments.	(Ghadirian, Fauzi Mohd Ayub et al., 2018)
Performance of Moderators	Examinations of performance of moderators, or students when assigned the moderator role.	(Sansone et al., 2018)
Role Assignment	Examinations of different strategies for assigning moderation roles to discussion participants.	(Wise et al., 2012)
Qualities, Skills, or Experiences of Moderators	Examinations of qualities of moderators, such as comparison of AOD moderation skills to face-to-face moderation skills, or how peer moderators perceived the experience.	(Wise et al., 2012)
Defining the Role of Moderator	Examinations of the role of a moderator, to define the ideal role played or the situation of the role in different settings.	(Nandi et al., 2012)
Training of Moderators or Learning to Moderate	Examinations of different methods or supports used to train moderators or assist participants in learning to moderate AODs.	(Vlachopoulos & Cowan, 2010b)
Comparing Instructor Moderation to Peer Moderation	Comparisons of instructor moderation to peer moderation structures, either by the performance of moderators or performance of discussion participants.	(Szabo, 2015)
Learning Outcomes or Knowledge Construction	Examinations of the effects of AOD moderation on learning outcomes or knowledge construction.	(Ouyang & Scharber, 2017)
Leadership or Teaching Presence	Examining or detecting leadership or teaching presence within moderated AODs.	(Sun et al., 2017)
Identities in Discussions	Examining the concept of identities and how identities were negotiated between moderators and other participants in moderated AODs.	(Xie et al., 2017)
Not Directly Related to Moderation	Research focus items that were not directly related to moderation in AODs, such as examining student cognitive processes without framing against moderator activity. (The paper also included other themes related to moderation.)	(Ghadirian, Salehi et al., 2018)

Table 13

Research Focus and Question Themes, by Participant Focus

Theme		Participant Focus						
	Instructors	Peer Moderators	Untyped Moderators	Discussion Participants	Instructors + Peer Moderators	Instructors + Participants	Peer Moderators + Participants	Total Papers
Strategies Employed by Moderators	9	13			1		1	24
Student Performance and Discussion Quality	1	12			4	1	2	20
Performance of Moderators		9					1	10
Role Assignment		8						8
Qualities, Skills, or Experiences of Moderators	1	6						7
Defining the Role of Moderator	2		1			2		5
Training of Moderators or Learning to Moderate	1	4						5
Comparing Instructor Moderation to Peer Moderation		1			3			4
Learning Outcomes or Knowledge Construction	2	2						4
Leadership or Teaching Presence							2	2
Identities in Discussions							1	1
Not Related to Moderation		1						1

Research Question 3: How Has the Role of Moderator Been Described, How Has It Evolved, and What Are Implications for Practice in AODs?

In this section, we review results regarding the definition and expectations of a moderator. We also include results regarding implications for practice, and recommendations for training, as these are intrinsically linked to the definition of a moderator and the expectations of someone performing the role. The definitions and expectations of a moderator demonstrate support for the managerial, monitoring, pedagogical, technical, and social roles of our taxonomy, though the concept of technical support did not emerge in implications for practice or moderator identity. We hypothesize that this category may have mostly been passed to institutional support staff with the growth of intuitive interfaces and standardized LMS products for university-wide distance education programs.

Definitions and Expectations of the Moderator

In reviewing definitions and expectations of a moderator, we began with separate tables of extracted content, comparing statements related to definitions and then to expectations. We found a subset of papers that did not include a definition ($n = 15$, 28.8%) and another subset that did not include expectations ($n = 15$, 28.8%), with a minor overlap in papers including neither ($n = 3$, 5.8%). After coding each group of statements individually, we merged the sets of statements and compared them to determine a more unified set of themes for both definitions and expectations. Table 14 lists themes uncovered and delineates the number of papers supporting each theme in definitions and/or expectations. In addition, a breakdown of five subthemes for discussion management is shown. Table 15 provides a general description of each theme for definitions and expectations of the moderator, along with an example citation.

Table 14

Themes for Definitions and Expectations of the Moderator

Theme	Supported Definitions	Supported Expectations	Supported as Either	Supported as Both
Discussion Management	24	32	42	25
General Discussion Management	18	12	24	7
Topic Setting	7	15	17	5
Guiding the Discussion	4	9	12	1
Setting the Discussion Structure	5	5	8	2
Expected Management Skills	2	6	7	1
Social Management	20	23	31	12
Learning, Information Exchange, and Knowledge Construction	15	6	18	3
Weaving	11	11	17	5
Questioning	13	10	15	8
Feedback	10	7	14	3
Meta-Commenting	9	8	13	4
Participation	4	11	13	2
Leadership	5	1	5	1
Technical Support	4	1	4	1
Influences on Moderators	3			
Expectations of Moderator Styles		4		

Table 15

Descriptions of Themes for Definitions or Expectations of the Moderator

Theme	Description	Example Citation
Discussion Management		
General Discussion Management	Monitoring, facilitating, stimulating, or maintaining the flow of a discussion.	(Sansone et al., 2018)
Topic Setting	Selecting, setting, or presenting the topic and/or agenda for a discussion.	(Xie et al., 2014)
Guiding the Discussion	Keeping the discussion focused or on topic; posing leading questions or providing new directions for the discussion when needed.	(Sansone et al., 2018)
Setting the Discussion Structure	Determining discussion strategy; setting norms, rules, and expectations for participant behavior.	(Xie et al., 2017)
Expected Management Skills	Determining when and how to intervene in a discussion, or gain the attention and focus of participants when needed.	(Vlachopoulos & Cowan, 2010b)
Social Management	Managing social aspects such as welcoming participants, mediating disputes, preventing some participants from dominating the discussion, or prompting and inviting participation from others.	(Sansone et al., 2018)
Learning, Information Exchange and Knowledge Construction	Promoting learning or educational goals; fostering exchanges of information and knowledge construction behaviors.	(De Smet et al., 2010a)
Weaving	Summarizing discussions, identifying areas of agreement or disagreement, drawing or proposing conclusions indicated by a discussion.	(Hew & Cheung, 2011a)
Questioning	Posing questions designed to assist the discussion by probing points, requesting clarification, eliciting opinions, or contradicting points to encourage critical thinking.	(Nandi et al., 2012)
Feedback	Providing feedback to participants on their contributions, responding to questions by participants; insisting that participants support points with data or rational argument.	(Nandi et al., 2012)
Meta-Commenting	Moderators intervene to clarify the discussion purpose, encourage multiple views of issues, or steer the discussion toward new concepts or ways of thinking.	(Nandi et al., 2012)
Participation	Moderators participate in the discussion, point out questions or concerns left unanswered, or provide their own comments and opinions.	(Szabo, 2015)
Leadership	Moderators provide leadership to a discussion.	(Xie et al., 2018)
Technical Support	Moderators provide technology support to participants or humanize the technology involved.	(Tagg, 1994)
Influences on Moderators	Moderators learn while performing their duties or shape the role by their individual traits and personality.	(Ghadirian, Fauzi Mohd Ayub et al., 2018)
Expectations of Moderator Styles	Specific expectations of moderator styles, such as minimizing intervention to an as-necessary level, at a higher rate to address internal discussion content, or to fade out intervention rates as participants grow more experienced in the discussion process.	(De Smet et al., 2010a)

Statements of Implications for Practice

As with definitions and expectations, we began this analysis with separate tables of extracted content for explicitly phrased benefits resulting from moderated AODs, explicitly phrased challenges, and other statements phrased more neutrally as implications. Statements for a given category did not need to connect just to students; for instance, there were indicated impacts such as a potential reduction of workload for instructors in the event of successful implementation (Ghadirian, Salehi et al., 2018). Most commonly, papers included implications for practice without explicitly naming benefits or challenges ($n = 28$, 53.8%). Others included statements of both benefits and challenges ($n = 10$, 19.2%), benefits but not challenges ($n = 5$, 9.6%), or challenges but not benefits ($n = 5$, 9.6%). A few papers included no statements of practice implications ($n = 4$, 7.7%). After coding each group of statements individually, we merged the sets of statements and compared them to determine a common set of themes. Table 16 provides a list of the themes, along with an indicator for whether they appeared as benefits, challenges, or implications for practice. Table 17 provides a general description of each theme, along with an example citation.

Table 16
Themes Uncovered Analyzing Statements of Benefits, Challenges, or Implications for Practice

Theme	Number of Papers	Category of Statements		
		Benefits	Challenges	Implications for Practice
Social Implications	21	X	X	X
Learning or Knowledge Construction	18	X	X	X
Role Assignment	11		X	X
Student Behavior	11	X	X	X
Instructional Efficiency	9	X	X	X
Leadership	8			X
Student Agency or Empowerment	6	X		X
Modeling	5	X	X	X
Preventing or Treating Confusion	1	X		
Related to Course Design				
Course Design	20			X
Course Interfaces	8		X	X
Participation				
Participation Improvement	12	X		X
Participation Issues	2		X	X
Comparisons of Moderator Structures				
Instructors vs. Peer Moderators	8			X
Single Moderators vs. Team Moderation	4	X		X
On Moderators				
Moderator Role and Expectations	22			X
Moderator Styles or Strategies	21		X	X
Moderator Training	19	X	X	X
Being Assigned Moderator Status	4	X		X

Choosing a Moderator	2		X
Graduate Students as Moderators	1	X	
Moderator Concerns	1	X	

Table 17

Descriptions of Themes for Statements of Benefits, Challenges, or Implications for Practice

Theme	Description	Example Citation
Social Implications	Perceived benefits, challenges, or implications for social management of AODs. Benefit example: a perceived approachability of peer moderators to students. Challenge example: the potential for text messages to be misinterpreted.	(Murphy et al., 1996)
Learning or Knowledge Construction	Statements relating moderator activities to learning outcomes.	(Ghadirian, Salehi et al., 2018)
Role Assignment	Statements relating to assigning roles to students in discussion.	(Szabo, 2015)
Student Behavior	Statements regarding the behavior of students in performing moderator duties or reacting to actions by moderators.	(Sansone et al., 2018)
Instructional Efficiency	Impacts of moderation on the workload of instructors.	(Ghadirian, Salehi et al., 2018)
Leadership	Statements regarding a need for instructors to retain some facets of leadership, or the importance of leadership to guide a discussion.	(Szabo, 2015)
Student Agency or Empowerment	Benefits or impacts of allowing students to take leadership roles and actions, such as setting discussion topics or being assigned a peer moderator status.	(Ghadirian, Fauzi Mohd Ayub et al., 2018)
Modeling	Statements on instructors or moderators setting discussion parameters or providing examples of expected conduct by their moderator behavior.	(Evans et al., 2017)
Preventing or Treating Confusion	Statements on the importance of moderators acting to prevent confusion on the part of discussion participants.	(Tagg, 1994)
Related to Course Design		
Course Design	Statements on how course design aspects such as the specificity of role assignments, discussion group sizes, or assessment of learner needs affect moderated AODs.	(Ghadirian, Salehi et al., 2018)
Course Interfaces	Statements on how aspects of technological interfaces can impact moderated AODs.	(Nandi et al., 2012)
Participation		
Participation Improvement	Statements on how moderated AODs can improve student participation.	(Sansone et al., 2018)
Participation Issues	Statements on factors that can negatively impact moderated AODs, such as allowing an overabundance of purely social commentary.	(Anshu et al., 2010)

Table 17 (continued)

Theme	Description	Example Citation
Comparisons of Moderator Structures		
Instructors vs Peer Moderators	Comparisons of function or effectiveness of instructor actions as moderators to actions of peer moderators.	(Szabo, 2015)
Single Moderators vs Team Moderation	Comparisons of effectiveness or efficiency of using teams of moderators as opposed to a single moderator.	(Szabo, 2015)
On Moderators		
Moderator Role and Expectations	Statements on expected moderator behavior or functions within an AOD.	(Ouyang & Scharber, 2017)
Moderator Styles or Strategies	Statements regarding styles of moderation adopted, or strategies used by moderators in AODs.	(Ouyang & Scharber, 2017)
Moderator Training	Statements regarding the necessity of training moderators, or specific recommended behaviors or techniques to train moderators in.	(Ghadirian, Salehi et al., 2018)
Being Assigned Moderator Status	Effects of assigning moderator status to a participant, such as changes in participation rate or style.	(Sansone et al., 2018)
Choosing a Moderator	Statements on qualities relevant to choosing a moderator.	(Gairín-Sallán et al., 2010)
Graduate Students as Moderators	Statements regarding benefits of using graduate students to act as moderators in undergraduate AODs.	(Murphy et al., 1996)
Moderator Concerns	Peer moderators' concerns regarding their ability to moderate AODs successfully, such as knowing when or how to intervene, or an appropriate amount and frequency of postings.	(De Smet et al., 2010b)

Identity of Moderators

The majority of papers involved moderators who were peers in discussions, such as student moderators or members of a community of learning ($n = 32$, 61.5%). For example, Xie et al. (2014) found an increase in participation quantity, diversity, and interaction attractiveness during the times when students were assigned the moderator role in a discussion. The second most common were moderators as instructors or instructional staff ($n = 16$, 30.8%), followed by structures where the moderators could come from either category ($n = 5$, 9.6%). For example, Gray's (2004) research studied the moderating duties and roles of paid coordinators in online communities of practice, finding these staff moderators "critical in sustaining the online community over an extended period and enhancing the learning function" (p. 20).

A few papers involving peer moderators also involved role assignment, a structure in which moderator duties are split among multiple peer individuals ($n = 6$, 11.5%). These papers split student duties among specifically scripted tasks such as starting the discussion, summarizing points made, ensuring that relevant concepts are addressed, or looking for outside source materials to contribute (De Wever et al., 2007, 2010b).

Training Types, Recommendations for Training, and Non-Training Supports

We separated statements regarding training into three categories: types of training, recommendations for training, and non-training supports. Types of training included ideas such as modeling, in-class training, and the provision of reading materials. Modeling may be accomplished by using trial periods with assigned roles (De Wever et al., 2007; Schellens et al., 2007). It might also be accomplished by having instructors perform the role before, and/or alongside, peer moderators (Rourke & Anderson, 2002; Schellens et al., 2005; Xie et al., 2011). For in-class training and reading materials, De Smet et al. (2008) described a training program starting two weeks before classes in which peer moderators received face-to-face instruction as well as written reference materials including guidelines, practical examples, and reminders.

Recommendations for training included role assignment, targeted training on specific moderation techniques, and encouraging or requiring moderators to engage in reflective activities. Specific targeted training recommendations included finding a balance between individual and group support (De Smet et al., 2009), constructing effective questions for promoting engagement (Hylton, 2007), and understanding different moderating styles (Baran & Correia, 2009; Liu & Yang, 2012).

Non-training supports included having moderators operate in supportive teams or recruiting moderators with previous experience in the role. The use of teams to moderate was a common and long-running theme in papers ($n = 16$, 30.8%), as early as Mason (1989) and as late as Szabo (2015). Rourke and Anderson (2002), focusing on the concept of teaching presence, found students preferred teams of peer moderators to an instructor's moderation. They observed an advantage for the peer moderator teams in that "they worked in teams of four; therefore, they possessed sufficient resources to fulfill all of the teaching presence responsibilities," such as keeping the discussion "responsive, interesting, and structured" (p. 17).

Table 18 outlines the number of papers supporting a theme for each category, along with the overall number of papers supporting the theme. Brief descriptions of these themes follow below in Table 19, with one example citation provided for each theme. The majority of papers ($n = 30$, 57.7%) described performing some sort of training for moderators; the remainder ($n = 22$, 42.3%) provided no descriptions of training. A single paper (Nandi et al., 2012) represented

training moderators as part of the research but did not provide any specific information on the nature or duration of the training.

Table 18
Themes Involved in Training-Related Statements

Theme	Category			Total Paper Count
	Types of Training	**Recommendations for Training**	**Non-Training Supports**	
Modeling	16	6		18
Moderation Teams			16	16
In-Class Training	15			15
Reading Materials	15			15
Specific Training		12		12
Previous Training			10	10
Role Assignment	7	7		8
Balance		5		5
Reflection		3	2	5
Encouragement	2	1		3
Cross-Age			2	2
Workload		2		2
Administrative Support			1	1
Follow-Up		1		1
Instructional Design		1		1
Instructor Duties		1		1
Moderator Interventions		1		1
Role Taking	1			1
Who to Train		1		1

Table 19
Descriptions of Training-Related Themes

Theme	Description	Example Citation
Modeling	Trial periods to practice moderation, or periods where a more experienced individual (such as a teacher) demonstrated moderating activities.	(Xie et al., 2018)
Moderation Teams	Moderators operate in multiple-member teams. Support structures are provided such as focus group review sessions, or private discussion areas for moderators to consult team members.	(Szabo, 2015)
In-Class Training	One or more direct training sessions using class time.	(Ghadirian, Salehi et al., 2018)
Reading Materials	Reference materials such as handbooks, guidelines, materials or discussion records from prior courses, or helpful websites.	(Ghadirian, Salehi et al., 2018)
Specific Training	Statements referring to training moderators in specific methods or styles of moderation.	(Ghadirian, Salehi et al., 2018)
Previous Training	Previous experience with online discussion moderation, face-to-face discussion moderation, or as professional educators.	(Ouyang & Scharber, 2017)
Role Assignment	Specific moderator duties are distributed among multiple members of a discussion, usually related to a peer-moderation structure.	(Wise et al., 2012)
Balance	Training moderators to find a balance in moderation aspects, such as between clear role descriptions and overly rigid scripting, or balancing the amount of social interaction allowed compared to task-focused interaction in a discussion.	(Anshu et al., 2010)
Reflection	Engaging in reflective practices, such as keeping a logbook or reviewing moderation activities against guidelines or a framework.	(Vlachopoulos & Cowan, 2010b)
Encouragement	Encouraging moderators in the development, application, or expansion of their communication styles. Providing extrinsic motivation, such as offering extra grading points to peer moderators.	(Murphy et al., 1996)
Cross-Age	Drawing moderators from more advanced cohorts in a school environment.	(De Smet et al., 2009)
Workload	Recommendations designed to reduce the amount of time or effort necessary for moderation.	(Nandi et al., 2012)
Administrative Support	Planning moderator interventions in cooperation with a more experienced individual, such as a researcher.	(Kienle & Ritterskamp, 2007)
Follow-Up	Augmenting initial moderator training with continued professional development and social supports.	(Gairín-Sallán et al., 2010)
Instructional Design	Conducting a learner and needs analysis to prepare for implementing peer moderation.	(Baran & Correia, 2009)
Instructor Duties	Recommended instructors be cautious not to use "student centered" design as a pretext to shift facilitation duties onto peer moderators solely to reduce teaching workload.	(Baran & Correia, 2009)
Moderator Interventions	Training on when and how to intervene in discussions, and how to signal to students when a moderator is acting in the moderator capacity.	(Vlachopoulos & Cowan, 2010b)
Role Taking	Instructing moderators on a framework and asking them to attempt a particular moderation style.	(Vlachopoulos & Mcaleese, 2004)
Who To Train	Described identifying candidates with attitudes and qualities compatible with moderation tasks as equally important to moderator training.	(Gairín-Sallán et al., 2010)

Conclusions and Future Research

As we examined these articles in the context of our research questions, we found a discordant field in terms of frameworks, research foci and questions, and research outcomes. We looked for possible patterns of adoption for frameworks, but we found inconsistency. Almost half ($n = 25$, 48.1%) of the papers reviewed did not cite a conceptual framework focused on moderation. We did not encounter a commonly cited framework (Berge, 1995; Feenberg, 1989; Garrison et al., 2000; Salmon, 2003) originally proposed after 2000. This is surprising given the growth of distance education and rapid change in technology that supports moderated AODs. Citations of previous knowledge and frameworks are important since they illustrate connections of the research to a wider field and to concepts that influence a study's design (Antonenko, 2015). The inconsistency in citations and number of papers not citing a framework suggest that writers may not be aware of prior research or communicating with others involved in the topic.

In looking for consistency and dominant themes, we crafted tables to provide a visual representation of overlapping paper counts for research foci and questions, and outcomes and results (see Appendix A, Tables A1 and A2). In both cases we were surprised by the lack of consistency, with scattered themes overlapping in one to three papers and some themes providing no overlap at all. This provided further evidence of discord within the field.

We noticed patterns in the research focusing on higher education settings and might anticipate this changing in the next few years as distance education technology penetrates the K–12 world, especially following the COVID-19 pandemic. The lack of consistency in reporting demographic information on subjects also makes it difficult to speak to the generalizability of results across included papers. Half of the sources qualifying for inclusion were conducted as case studies or similarly small-scale studies. These points suggest a need for wider and larger-scale investigations on the implementation and techniques for moderated AODs, expanding the populations studied as well as the learning environments, to increase the generalizability of results and recommendations. It also supports a need for more coordination and cooperation between researchers to consistently decide what is beneficial to measure and how to measure it. We found no large-scale studies in which, for instance, 10+ instructors were asked to implement and test a specific mode or framework of discussion moderation. We did identify a group of prolific authors from Ghent University, representing a large number of articles ($n = 11$, 21.2%) in six years. The advantages to collaboration were evident in this regard since the team of authors were able to produce several papers on moderated AOD topics in a relatively short period; formation of such working groups might be a method to generate larger-scale research with more generalizable results in the future.

Almost half of the papers included focused on strategies employed by moderators, matching the definitions and expectations of a moderator for discussion ($n = 42$, 80.8%) and social ($n = 31$, 59.6%) management. This aligns with the managerial and social roles shown in our taxonomy of moderator roles. Categories connected to the monitoring and pedagogical roles (knowledge construction support, weaving, questioning, feedback, meta-commenting, and participation) also saw support. We found few papers to support an expectation for moderators to engage in the technical role ($n = 4$, 7.7%); with the development of an intuitive user interface, LMSs, and adoption of distance education at university-wide levels, it may be that this role has widely passed to institutional support staff. No new roles were identified in the literature included in this study.

In evaluating the definitions, expectations, and statements related to practice, we noticed some separations between roles, most notably those things that were tightly connected to an

instructor's role (such as course design or the retention of some leadership facets) and some connected to peer moderation such as benefits through student agency or empowerment. We also noticed a majority focus on peer moderators ($n = 34$, 65.4%) and a strong minority focus on instructors ($n = 22$, 42.3%), demonstrating that both structures are valid for investigation. The most common themes were investigations of moderator strategies ($n = 24$, 46.2%) and student performance or discussion quality ($n = 20$, 38.5%), with a solid overlap of papers connecting these themes ($n = 16$, 30.8%).

In analyzing existing frameworks for our taxonomy, we encountered some similar sentiments with Berge's (1995) framework targeted at instructors, Salmon's (2003) framework addressing instructors and offering guidance on selecting students to assist in moderating duties, and Vlachopoulos and Cowan's (2010b) framework separating other instructional facets from moments when an instructor wears the moderator hat. We suggest that future frameworks and research should take this distinction into account, working to separate the instructor's role more clearly from those duties that can safely be appointed to students or assistants within an AOD. We also note that many papers did not describe training their moderators. Natural questions to ask here are, how would someone become an effective moderator without training? Is it possible that some papers involving instructors as moderators deemed prior training unimportant to mention? The lack of reporting on training creates issues for usability of results in the field. For instance, papers that report the effects of peer moderation on student learning outcomes without describing the structure, training and/or moderator strategies involved, do not offer clear and generalizable guidance to instructors looking to replicate the design in their courses. Future research could explore these questions further, or survey instructors who moderate on how they learned their craft.

Limitations

As noted by Martin et al. (2020), there are limitations inherent in systematic reviews. These include limitations related to the search engines used, the search terms used, the possibility of selection and publication biases due to preferences on the part of journals for topics or research methodologies, and the limitations of coding and reliance on author descriptions. In addition, our inclusion criteria focused on academic and educational environments with structured, moderated discussions and did not deliberately target informal settings such as social media which could have produced different results or perspectives on moderators.

Final Thoughts

Before the COVID-19 pandemic, online educational models were growing and becoming more recognized as effective (Blumenstyk, 2022; Johnson et al., 2020; Seaman & Johnson, 2021). We see this trend continuing and, given that poor implementations of moderation can have negative impacts on both faculty and students, a growing need for instruction and frameworks to assist practitioners in conducting effective moderated AODs as part of their courses. We provide our comments in this spirit, intending our research suggestions to provide entry points into topics that will be critical to the future refinement of discussion moderation techniques and implementation.

Declarations
The author(s) declare no potential competing interests with respect to the research, authorship, and/or publication of this article.

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Appendix A
Tables Displaying Overlap Counts of Themes for Research Outcomes and Results, and Research Focus and Questions

Table A1

Overlap of Themes in Research Outcomes and Results, by Source Count

Theme	Peer Moderation	Student Outcomes	Participation Level	Moderator Style	Role Assignment	Moderator Role	Moderator Performance	Student Perceptions	Leadership	Moderator Training
Peer Moderation										
Student Outcomes	7									
Participation Level	6	2								
Moderator Style	5	2	3							
Role Assignment		6	1							
Moderator Role	1	2								
Moderator Performance	1	1	1							
Student Perceptions	1		1	1	1					
Leadership	2									
Moderator Training	1			1						

Note. Themes with no overlap (*n* = 1) and the category of no reported outcomes are not included in this table.

Table A2

Overlap of Themes in Research Focus and Questions, by Source Count

Theme	Strategies Employed by Moderators	Student Performance and Discussion Quality	Performance of Moderators	Role Assignment	Qualities, Skills, or Experiences of Moderators	Training of Moderators or Learning to Moderate	Comparing Instructor Moderation to Peer Moderation	Learning Outcomes or Knowledge Construction	Leadership or Teaching Presence
Strategies Employed by Moderators		16		7				1	
Student Performance and Discussion Quality	16		3	7	1		3	1	1
Performance of Moderators		3		2		1	1		
Role Assignment	7	7	2					1	
Qualities, Skills, or Experiences of Moderators		1							
Training of Moderators or Learning to Moderate			1				1		
Comparing Instructor Moderation to Peer Moderation		3	1			1			
Learning Outcomes or Knowledge Construction	1	1		1					
Leadership or Teaching Presence		1							

Note. Themes with no overlap ($n = 3$) are not included in this table.

Appendix B
Table of Included Paper Citations, Arranged by Decade

1970s	1980s	1990s	2000s	2010s
	1. (Mason, 1989)	2. (Tagg, 1994) 3. (Tagg & Dickinson, 1995) 4. (Murphy et al., 1996)	5. (Poole, 2000) 6. (Creanor, 2002) 7. (Rourke & Anderson, 2002) 8. (Lim & Cheah, 2003) 9. (Durrington & Yu, 2004) 10. (Vlachopoulos & Mcaleese, 2004) 11. (Gray, 2004) 12. (Schellens et al., 2005) 13. (Lu & Jeng, 2006) 14. (De Wever et al., 2007) 15. (Guldberg & Pilkington, 2007) 16. (Hylton, 2007) 17. (Kienle & Ritterskamp, 2007) 18. (Schellens et al., 2007) 19. (De Smet et al., 2008) 20. (De Wever et al., 2008) 21. (Vlachopoulos, 2008) 22. (De Smet et al., 2009) 23. (Russell et al., 2009) 24. (Baran & Correia, 2009) 25. (De Wever et al., 2009)	26. (Anshu et al., 2010) 27. (De Smet et al., 2010b) 28. (De Smet et al., 2010a) 29. (De Wever et al., 2010a) 30. (De Wever et al., 2010b) 31. (Vlachopoulos & Cowan, 2010b) 32. (Vlachopoulos & Cowan, 2010a) 33. (Gairín-Sallán et al., 2010) 34. (Hew & Cheung, 2011a) 35. (Hew & Cheung, 2011b) 36. (Xie & Ke, 2011) 37. (Liu & Yang, 2012) 38. (Nandi et al., 2012) 39. (Wise et al., 2012) 40. (Vlachopoulos & Cowan, 2014) 41. (Xie et al., 2014) 42. (Szabo, 2015) 43. (Ghadirian et al., 2016) 44. (Evans et al., 2017) 45. (Ghadirian & Ayub, 2017) 46. (Ouyang & Scharber, 2017) 47. (Sun et al., 2017) 48. (Xie et al., 2017) 49. (Ghadirian, Fauzi Mohd Ayub, et al., 2018) 50. (Ghadirian, Salehi, et al., 2018) 51. (Sansone et al., 2018) 52. (Xie et al., 2018)

Online Learning for First-Generation and Underrepresented Minoritized Students: A Literature Review Using a Model of Student Engagement

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Abstract
First-generation and underrepresented minoritized (URM) students may have greater challenges in online learning than other students. Communities of support can help these highly motivated students be more engaged and successful in the remote learning environment. In this scoping literature review, we identified fifteen categories of first-generation and URM student challenges in online learning as found in peer-reviewed research of the last ten years. We placed these challenges within the Student Engagement model and found them to be barriers of student engagement. The results of our analysis may help guide practitioners and educators in the continuance or creation of theoretically grounded interventions for student support.

Keywords: first-generation students, underrepresented minoritized (URM) students, minorities, online learning, undergraduate students, student engagement

Online learning functions as a viable option for many students in higher education. One benefit of online learning is that it allows for the convenient and needed flexibility in students' schedules, which can accommodate students who are employed, caring for dependents, and commuting (Joosten & Cusatis, 2020). Along with opportunity, online learning can bring unique challenges for undergraduate students. For example, students in online learning have "less access to classmates as a social resource" and may need to rely more on their families for support (Brubacher & Silinda, 2021, p. 142), an option that some students may not have. Additionally, online courses require other student attributes for success, such as skills of time management, organization, and knowledge of online technologies (Joosten & Cusatis, 2020), which some students may not possess.

While the rapid shift to emergency remote teaching (ERT) due to the COVID-19 pandemic may not have represented true online learning (Hodges et al., 2020), it did underscore some of these difficulties. Barber et al. (2021) noted that the increased student workload and struggles to stay focused on school proved challenging for all students and limited their ability to succeed. DeRossett et al. (2021) stated that university students experienced higher levels of strain, such as depression, anxiety, and stress, compared to individuals who were not students. Additionally, the shift to ERT contributed to feelings of detachment or isolation and impacted student learning. Surveys conducted at multiple universities (Kimble-Hill et al., 2020) revealed many ways that students were impacted by the quick shift to remote learning, including tech challenges, maintaining the school pace, distractions from the home environment, student housing concerns, and decreased motivation. Students also struggled with issues of internet connection, computer cameras, video-conferencing software, and lack of access to computers and printers.

ERT during the COVID-19 pandemic also highlighted the disparities that disproportionately affected URM and first-generation students. While research reported most students experienced various barriers, including distractions, anxiety, and decreased motivation, non-white, female, and first-generation college students were more affected (Gillis & Krull, 2020). Similarly, URM students were more at risk of experiencing academic obstacles (Means & Neisler, 2021; Soria et al., 2020) or increased home responsibilities and decreased economic security (Barber et al., 2021) in the unexpected shift to remote learning. COVID-19 also underscored the digital divide (unequal knowledge of and access to internet and devices) that exists among students of underserved backgrounds and can impact online learning (Moore et al., 2018).

Beyond ERT, first-generation and underrepresented minoritized (URM) students may have greater challenges in online learning than their counterparts. Research reports they are more likely to suffer mental health problems, food and housing insecurity, and financial and other difficulties that can impact online learning (Moore et al., 2018; Soria et al., 2020). Even early researchers sought to identify challenges or barriers to attrition for online learners, such as Rovai (2003), who found that many external factors, including demographics, skills, outside employment, family responsibilities, along with other internal factors, like integration, programs, and self-esteem, influenced student retention.

Purpose

While many challenges facing these students in online learning have already been identified, this scoping literature review uniquely analyzes and categorizes the challenges of first-generation and URM students in online learning, with the goal of providing informed support for these student populations. Evidence shows that programs that combine academic and socioemotional support can improve success rates for college students that are low-income and first-generation (Holcombe & Kezar, 2021). Thus, theoretical support is needed to ensure programs are designed to support the populations they seek to help.

The largely accepted affective, behavioral, and cognitive (ABC) classification of student engagement (Ben-Eliyahu et al., 2018; Borup et. al., 2020)**,** identifies three ways in which a student engages in an online or blended course. Further, the Student Engagement model provided by Borup et al. (2020), provides deeper insights into understanding the *facilitators*, *indicators,* and *outcomes* of student engagement. These factors help to potentially identify the influences that affect the performance and success of online student populations. By placing the identified challenges of first-generation and URM online students into the Student Engagement model, practitioners and educators may be guided in the continuance or creation of theoretically grounded interventions to better promote success for first-generation and URM students in online learning. This research answers the following questions:

1. What are the challenges of first-generation and URM students in online learning?
2. How do these challenges align within the model of Student Engagement of Borup et al. (2020)?
3. What specific support would be most beneficial for first-generation and URM students in online learning?

Definitions

We use the term "underrepresented minoritized" (URM) students throughout this paper, slightly adjusted from the term underrepresented minority, which is defined in the U.S. context as Black, Hispanic, Native American, Alaska Native, or Pacific Islander (Institutional Research, 2019). Milner and Jumbe (2020) of the United Kingdom offered that using the term "minoritized"—coined in 2003 by Yasmin Gunaratnum— "provides a social constructionist approach to understanding that people are actively minoritized by others rather than naturally existing as a minority, as the terms racial minorities or ethnic minorities imply" (p. 1). Using the term "underrepresented minoritized" rather than "underrepresented minorities" allows researchers to address the challenges that these students may experience even if their race or ethnicity falls numerically in most of their specific region. Additionally, this minoritization of college students can exist in the United States as well as globally, as do the sources of research that are included in this paper.

We also use the term "first-generation students," who are typically described as those whose parents did not complete a postsecondary degree (Institutional Research, 2019) and will be considered as such for the purposes of this paper. The first-generation student population often overlaps with the URM student community given that they are demographically from "the most disadvantaged groups (and) are more likely to be female, older, black or Hispanic, have dependent children, and come from low-income communities" (Douglas, 2019, para. 11). Both populations can be considered at-risk for increased academic challenges and therefore not only merit being researched together but often appear in the literature simultaneously as well.

When citing specific research in the literature, we will use whichever term the authors use to reference the population of students studied by them.

Literature Review

First-generation students, who are also frequently underrepresented minoritized (URM) and low-income students (Calma, 2020; Douglas, 2019; PNPI, 2021), are highly motivated and often among those most committed to improving the world (Haney, 2020). However, they may experience unique or exacerbated challenges in post-secondary education. And while many of these students experience great anticipation upon beginning their education, they may encounter feelings of self-doubt as the stress and uncertainty set in (USC Dornsife, n.d.).

Statistical data reports first-generation students have lower grades in college compared to continuing generation students (DeRossett et al., 2021). The Postsecondary National Policy Institute (2021) stated that only 21% of low-income, first-generation college students will complete a degree within six years of initial enrollment, compared to 57% of their counterparts. In 2015, bachelor's degree completion rates for African American males were 17% and for Hispanic males 13% (Salvo et al., 2019). Even with increased effort to support URM students, such as financial aid, tutoring, advisement, and appropriate course offerings, many students still receive lower grades, have higher dropout rates, and are less likely to graduate than their non-URM peers (Moreno, 2021).

The challenge lies in understanding the reasons behind the disparities seen in the performance trends of these student populations. Often the long work hours (Killham et al., 2021), greater family obligations and responsibilities (Cochrane & Maposa, 2018), or lack of family support to succeed at the university (Brubacher & Silinda, 2021; Moreno, 2021) can affect the engagement and retention of these students. Additionally, students can experience guilt about potentially achieving a "better life" than their family members and may even feel the need to be "two different people," as they balance student demands with being an active community and family member (Moreno, 2021, p. 214). This guilt can manifest as cultural differences between family and student life (Covarrubias et al., 2020).

Given that these students experience challenges in their in-person studies, they may experience heightened challenges in the online environment. Research on the impact of online learning for first-generation and URM students has mixed results. Some researchers found that the online modality can positively impact these students. For example, the convenience of online education is widely accepted as an advantage over more traditional, in-person modalities of education (Howard et al., 2020; Joosten and Cusatis, 2020). Yeboah and Smith (2016) found that the flexibility of online courses positively influenced the academic success of URM students (Yeboah & Smith, 2016). Johnson et al. (2021) and Joosten and Cusatis (2020) reported that the reach of online education has been particularly useful for geographically remote students. And Fischer et al. (2020) found that low-income, first-generation, and low-performing students were not disadvantaged in online courses. Kawalilak et al. (2012) reported that Aboriginal adult learners were found to have strong motivation and high success rates in online learning. And Wladis et al. (2015) found that while Black and Hispanic students may perform more poorly in STEM courses, the online environment was not the culprit. Salvo et al. (2017) even proposed that online learning may even be a "color free" environment where students were more likely to be treated equally and therefore had a decreased chance of dealing with racial issues.

However, other researchers suggest that strong performance disparities do exist for first-generation and URM students in online learning. For example, Xu and Jaggars (2014) claimed

that academic performance differences between white and URM students were exacerbated in online courses. Shea and Bidjerano (2019) researched online course load related to successful completion rates and found that minority students were more likely to drop out if they had higher online loads, including those who had been previously strong academically. And Howard et al. (2020) claimed that perceptions of the advantages of online learning are offset by decreased outcomes for URM students. Survey research conducted at a predominantly Hispanic university revealed a preference for in-person instruction (Shapiro et al., 2020), and African American male students were found to be less likely to enroll in online classes (Salvo et al., 2017).

The rush to emergency remote learning induced by COVID-19 emphasized online learning disparities that were not solely confined to the pandemic. URM students experienced more challenges overall than non-Hispanic, white students (Means & Neisler, 2021) and had more concerns with childcare, housing, technological access, and internet bandwidth (Kimble-Hill et al., 2020; Williams, 2020). URM students also struggled with motivation and access to instructor feedback and peer collaboration (Means & Neisler, 2021) or negatively impacted programs of peer tutoring and learning communities (Kimble-Hill et al., 2020). As online learning expands, exerted efforts are required to ensure the needs and challenges of first-generation and URM students are addressed.

As online learning expands, exerted efforts are required to ensure that the needs and challenges of first-generation and URM students are addressed. By identifying the challenges of these students and viewing them through appropriate theoretical lenses, institutions can help provide the needed, informed support to ensure that programs are properly designed to support the students they seek to help.

Engagement

The challenges frequently seen in the first-generation and URM students, including attrition and decreased academic outcomes, support the need for student engagement, along with challenges to it, as a theory of choice from which to view the challenges of these students. Borup et al. (2020) defined academic engagement as the "energy exerted towards productive involvement with course learning activities" (p. 811). Student engagement is correlated with educational outcomes like performance and persistence (Halverson & Graham, 2019) and should therefore be an element of focus for the success of first-generation and URM students in online education. We note here that the focus of our paper is not to provide an extensive review of engagement theories but rather to show how principles of this theory can provide insight into the success of online for first-generation and URM students. Accordingly, our discussion here will focus only on select research on engagement, rather than addressing the broader field of engagement.

Although some have referred to engagement as the "educational bottom line" or "holy grail of learning," many students still do not engage in their education and therefore experience high rates of attrition and decreased academic outcomes (Halverson & Graham, 2019, p. 146). To help understand student outcomes, engagement is commonly categorized in the three areas of affective, behavioral, and cognitive (ABC) engagement (Ben-Eliyahu et al., 2018; Fredricks et al., 2004; Reschly & Christenson, 2012). The Academic Communities of Engagement (ACE) framework (Borup et al., 2020) identifies specific examples and indicators of these three ABC dimensions in which students engage in an online course (see Table 1).

Table 1

Dimensions of Engagement with Definitions and Examples of Indicators

Dimension	Definition	Example Indicators
Affective	*The emotional energy associated with involvement in course learning activities.*	• Boredom vs. Enjoyment • Anxiety/Frustration vs Confidence • Sadness vs. Happiness • Situational and Personal Interest
Behavioral	*The physical behaviors (energy) associated with the completing course learning activity requirements.*	• Attendance/Participation • Completing/Submitting Work • Following course procedures • Time on Task
Cognitive	*The mental energy exerted towards productive involvement with course learning activities.*	• Attention • Absorption/Concentration • Learning Presence • Cognitive/Metacognitive Strategy Use

Note. This table was created in development of the ACE framework to provide definitions and examples of each of the three dimensions of engagement. From Borup et al., 2020, p.11.

Facilitators of Engagement

     Facilitators of engagement are conditions that influence a student's ability to engage with course content, and therefore achieve academic performance (Borup et al., 2020). These facilitators are organized into the categories of (a) learner characteristics, (b) personal environment, and (c) course environment. *Learner characteristics* may include a student's interest in a subject or intrinsic motivation to master a concept that influences that student's engagement. A student's *personal environment* may include a student's family or access to technology and the resulting influences on the student's engagement. And lastly, a learner's course environment comprises that which is largely influenced by the educators, including the design of the course and instructor-student interaction.
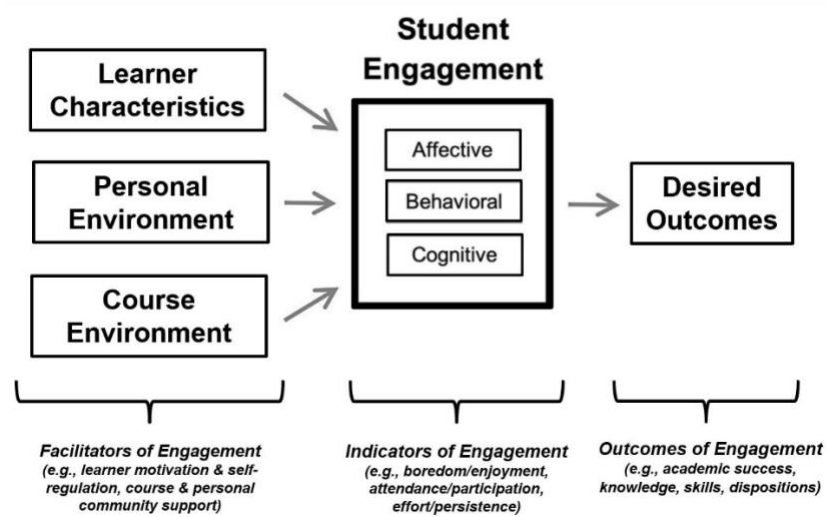
Indicators of Engagement

     The affective, behavioral, and cognitive domains of engagement can be referred to as *indicators* of engagement (Borup et al., 2020) or ways of understanding how students demonstrate their engagement. Halverson and Graham (2019) presented crucial components for success that accompany each area of engagement. For example, cognitive engagement includes elements of persistence, effort, and focused time; positive emotional engagement is required to learn relatedness and interconnectedness, while negative emotional engagement, like frustration and boredom, impact learning with technology; and behavioral engagement includes the behaviors that are essential to complete learning activities.

Outcomes of Engagement

     Ultimately, the *outcomes* of student engagement, such as academic achievement, are the purpose of focusing on engagement. These outcomes generally include academic performance such as grades, course completion, and student satisfaction (Borup et al., 2020). Borup et al. (2020) designed the model of Student Engagement, which portrays the *facilitators*, *indicators*, and *desired outcomes* of student engagement (see Figure 1).

Figure 1
Model of Student Engagement

Note. General model of student engagement distinguishing facilitators, indicators, and outcomes. Adapted from Halverson and Graham 2019, p. 147 (Borup et al., 2020, p. 811).

Engagement in Online Learning

Given the prolific employment of online learning for undergraduate students, the environment merits deep consideration with respect to engagement. If the online learning modality is to be an accessible and convenient option to support the needs of first-generation and URM students, we need to understand the challenges or barriers to academic engagement experienced by these students. This is especially true given that the online learning environment can be perceived as less engaging or be viewed as requiring a trade-off between engagement and flexibility (Garrison, 2009; Gill et al., 2015). Understanding the student facilitators of engagement may help the efforts of educators and practitioners to better support and improve the outcomes of engagement. Specifically, by applying the Student Engagement model (Borup et al., 2020) to the identified first-generation and URM student challenges, the impacted areas of facilitators and outcomes of engagement can be revealed and therefore addressed.

Methodology

Our research purpose was to identify the challenges of first-generation and URM students in online learning and then assess the impact of these challenges on student engagement, as viewed through the Student Engagement model of Borup et al. (2020). As authors who do not identify as first-generation or URM, we turned to peer-reviewed research to identify these challenges and used the theoretical framework of student engagement to analyze the data.

To begin this scoping review, we crafted searches of the literature using keywords to find research articles. We did not include elements of the Student Engagement model in the search, such as "engagement," "cognitive," "behavioral," or "affective influences," to not skew the results of the literature search, or data, toward the selected framework to be used for analysis. Engagement search terms, along with others like "challenge" or "problem," biased the search by

improperly eliminating the number of articles found. Therefore, these additional search terms were not used and were instead reserved for the designated analysis of the literature.

ERIC is the premier database for Education and was therefore the database of choice for the search. The Center for First-Generation Student Success was used as an additional database. This database is a collection of research and scholarship that "informs understanding of the student experience, institutional approaches to programming, and identification of supports and barriers for first-generation students" (Center for First-Generation Student Success, n.d.).

For the search in ERIC, we used key terms to represent the three different categories of the research question: (1) first-generation and URM students, (2) online learning, and (3) undergraduate learning. To conduct the actual search, we used the thesaurus feature in ERIC to identify all terms that may be associated with those categories. They were strategically grouped and included the following:

Table 2
Search Terms for First-generation and URM Students in Online Learning Literature Review

Subject	Keywords
First-generation and URM Students	"First Generation College Students" OR "African Americans" OR "African American Students" OR OR "African American Education" OR "Black Studies" OR "Blacks" OR "Ethnic Groups" OR "Minority Groups" OR "Race" OR "Minority Group Students" OR "Ethnicity" OR "Multiracial Persons" OR "Racial Attitudes" OR "Racial Bias" OR "Racial Differences" OR "Racial Discrimination" OR "Racial Distribution" OR "Racial Factors" OR "Racial Identification" OR "Racial Integration" OR "Racial Relations" OR "Latin Americans" OR "Cubans" OR "Haitians" OR "Maya (People)" OR "Mexicans" OR "Puerto Ricans" OR "Hispanic Americans" OR "Latin American Culture" OR "Latin American Literature" OR "Asian Americans" OR "Asians" OR "Asian American Students" OR "Chinese Americans" OR "Filipino Americans" OR "Japanese Americans" OR "Korean Americans" OR "Hmong People" OR "Indochinese" OR "Laotians" OR "Pacific Americans" OR "Vietnamese People" OR "Indigenous Populations" OR "Alaska Natives" OR "American Indians" OR "Eskimos" OR "Pacific Islanders" OR "Indigenous Knowledge"
AND Undergraduate	"Undergraduate Students" OR "College Students" OR "College Freshmen" OR "Higher Education" OR "Undergraduate Study"
AND Online Learning	"Electronic Learning" OR "Blended Learning" OR "Computer Assisted Instruction" OR "Computer Mediated Communication" OR "Distance Education" OR "Electronic Classrooms" OR "Flipped Classroom" OR "Multimedia Instruction" OR "Online Courses" OR "Telecourses" OR "Virtual Classrooms" OR "Virtual Schools" OR "Virtual Universities" OR "Web Based Instruction"

For the search in the Center for First-Generation Student Success, we made strategic selections from the site's three search categories. Our choices included the following:

1. *Content type*: "scholarly articles" (options included: "all, books, reports, scholarly articles")
2. *Category*: selected "all" (options included: "all; academic & Co-curricular Experiences; Access and Persistence; COVID-19; Data; Assessment; & Evaluation; Extracurricular & Social Integration; Identify & Intersectionality; Non-cognitive Factors; Professional Development; Student Outcomes & Completion; Student Support Programs & Services; Newsletter")
3. *Topic*: selected "all" (options included: "all; Affordability & Aid; Belonging & Motivation; Career & Post-completion; Classroom & Faculty Experiences; Defining First-gen; In-person Events; Institution-specific approaches; Institutional Type & Selectivity; Matriculation & Transition; Mentoring; Online or On Demand Events; Preparedness; Student Characteristics)

Literature sorting strategies

The following inclusion criteria were used:

1. Must be in English.
2. Must be peer-reviewed (to screen for higher quality studies).
3. Must be published in the last 10 years, 2011–2021 (to focus the review on recent, relevant research).
4. Must be focused on first-generation or URM or otherwise identified as potentially at-risk students (to support the focus of the research.
5. Must be situated in higher education (to support the focus of the research purpose).
6. Must include some discussion or measurement of challenges, specifically articles needed to report some empirical data (to support the focus of the research).

This literature review followed a modified PRISMA protocol (see Figure 2) for a total of 42 articles included in the literature review (see Appendix A). As noted in this protocol, articles were identified using the above inclusion criteria based on titles and abstracts, with duplicates, books, and conference reports excluded. A second review of the full-text articles using the above inclusion criteria resulted in 42 manuscripts to include in the analysis. The research articles were reviewed and coded by one author with consistent feedback from multiple peer researchers throughout the process.

Figure 2
Modified PRISMA Protocol
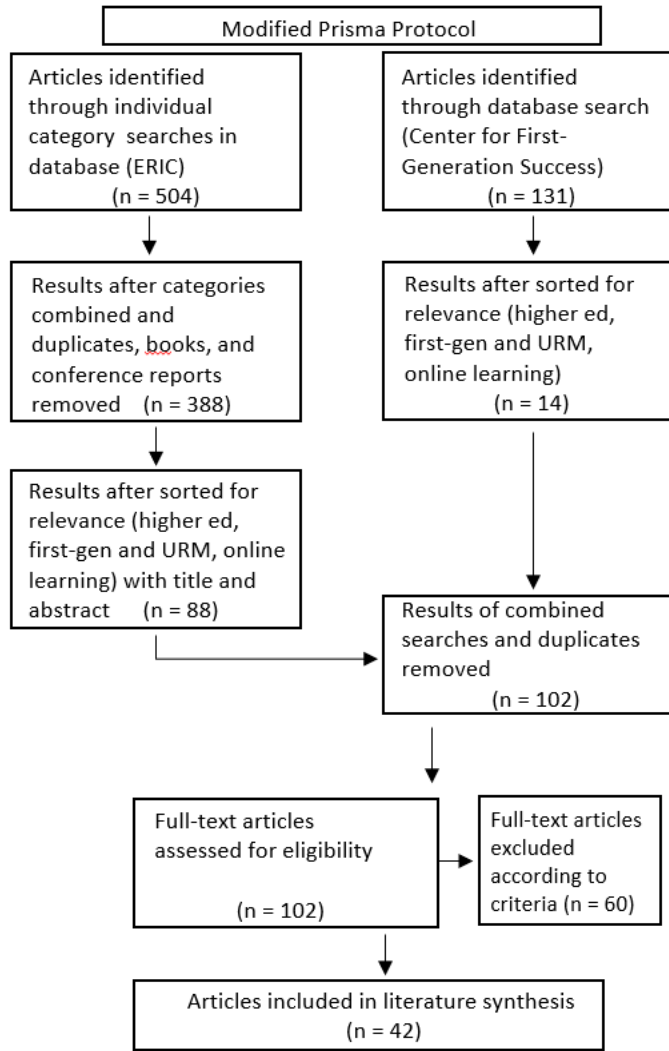
The authors used emergent coding to identify the themes of student challenges found in the literature search. Specifically, one author copied findings and summaries of each research article into a document. The author then identified and coded themes that emerged from the findings and summaries, such as student grades, access to technology, or motivation. These themes were then further condensed into the 15 categories used for analysis. An associate professor from an outside department served as an independent reviewer. This professor repeated the coding process and achieved the same results. Additionally, the co-author of this article checked 20% of the coding by reviewing the complete original articles for themes and achieved the same results as the original coder. The analysis and placement of the 15 categories into the Student Engagement model (Borup et al., 2020) were reviewed and confirmed by Dr. Charles Graham, coauthor of the Borup et al. (2020) paper. The list of categories of student challenges, along with the authors and frequency of citation, is in Appendix A.

Analysis of the Literature

Within the Academic Communities of Engagement framework, Borup et. al. (2020) identified three ways in which a student engages in an online or blended course: affectively,

behaviorally, and cognitively. They proposed that the student's ability to engage with the course increases with the communities created by both the course itself, or those associated with the program, and with the personal community of the student, made up of the relationships typically formed before the student interacts with the course.

We first reviewed the manuscripts and identified the challenges reported in online learning. We then analyzed the literature using the model of Student Engagement from Borup et al. (2020). Specifically, we categorized the identified challenges or barriers of first-generation and URM students in online learning as either challenges to *facilitators* or challenges to *outcomes* of engagement. We further categorized the challenges to *facilitators* of engagement into the three subcategories of *Learner Characteristics, Personal Environment,* and *Course Environment.* Additionally, from these categorizations, we provided preliminary recommendations for student support. To limit any factors associated with emergency remote learning, we first analyzed manuscripts published prior to the Covid-19 shutdowns to gain insight from true online learning and then reviewed any manuscripts that mention emergency remote online learning (where we noted above that ERL underscored difficulties that already existed).

Limitations

This literature review has some limitations. Searching only two databases could be a limiting factor in retrieving manuscripts on this topic.

Results

The identified challenges or barriers to success in online learning of first-generation and underrepresented minoritized (URM) students fall into fifteen themes or categories: (a) course design, (b) digital divide, (c) family obligations, (d) economic barriers, (e) language/linguistics, (f) instructor/peer interaction, (g), family support, (h) motivation, (i) sense of belonging, (j) racism, (k) learner readiness, (l) mental health, (m) culture, (n) attitude, and (o) course load. Some categories included varied results about whether a given topic is a challenge. We included these mixed results for consideration. And while some research, including Wladis et al. (2015) found no significant difference for first-generation or URM students in outcomes in the online setting, multiple studies in this literature review consistently found significant performance gaps for URM students as measured by student grades (Gregory, 2016; McCarty, 2013; Xu & Jaggars, 2014) and course completion (Howard et al., 2020; Nguyen, et al., 2020).

Course Design

The potential impact on the success of URM students by course design, or specific instructional characteristics, emerged from the literature in various forms, including positive (Joosten & Cusatis, 2019) and low-impact results (Gillis & Krull, 2020). However, findings also included learning preferences of design that negatively impacted retention for Black/African American students (Armstrong et al., 2021; Salvo et al., 2019), limited flexibility that proved to be a barrier to indigenous student needs (Cochrane & Maposa, 2018), and online math courses that did not equally serve Native American/Alaskan Native/Pacific Islander, Hispanic, and Black/African American students and who in turn did not perform as well in the course. (Guerrero et al., 2020). Even high achieving African American, male STEM students found that the nature of their online math course was pedagogically ineffective (Jett, 2021). Palacios and Wood (2016) found that the asynchronous, multi-media modality was effective for Black men but warned that in general, careful consideration be used when promoting online learning to

Asian, Black, Latino, and white men at community colleges because of their overall preference for face-to-face modalities.

Chávez et al. (2012) shared perspectives that emerged from interviews with diverse online students. A Hispan(ic) student reported that while their goal of education was to prepare to serve their people, that concept seemed foreign to their professors whose subjects discussed in class were "completely disconnected from the world" (p. 13). A Taos Pueblo student, noting that professors lectured on theory and never gave examples, asked, "How am I supposed to serve my people with only this abstract, rote memorization instead of learning?" (p. 28).

Digital Divide

As previously stated, the "digital divide" traditionally refers to the unequal knowledge and access of students to sufficient internet and devices. Ellison (2019) recommended the term "digital inequities" to avoid the more binary, deficit thinking of the digital divide associated with students of color. The literature identified multiple challenges in this area, including disparities highlighted by the COVID-19 pandemic.

Rural, indigenous students identified barriers of insufficient access to online educational programs, quality internet, and personal computers (Kawalilak et al., 2012; Willems, 2012). Similarly, Banerjee (2020) reported that first-generation, low-income, and non-white students faced overall decreased technological access. Moore et al. (2018) shared that limited access to devices and the internet for students from underserved backgrounds proved to be a barrier to homework completion.

During the COVID-19 pandemic, surveys of students at a Hispanic university (Shapiro et al., 2020), low-income and first-generation students (Williams, 2020), Latino/a/x/Hispanic students (Fariña et al., 2021), and marginalized students of color, lower socioeconomic, and rural backgrounds (Kimble-Hill et al., 2020), showed exacerbated digital challenges of limited access to devices and sufficient internet, which impeded digital learning success. Fariña et al. (2021) noted that students had been coping with "pre-pandemic resourceful adaptations" (p. 245), such as using university computers, but shelter-in-place orders impacted their access to these devices and subsequent ability to complete remote learning requirements. Barber et al. (2021) reported that the pandemic also caused a disproportionate decrease in access to undergraduate research experiences for URM students.

Family Obligations

Through student surveys, multiple researchers confirmed that URM and first-generation students experience greater family obligations and responsibilities (Cochrane & Maposa, 2018; Vielma & Brey, 2021), especially during the COVID-19 pandemic (Barber et al., 2021; Fariña et al., 2021; Killham et al., 2022; Kimble-Hill et al., 2020; Shapiro et al., 2020; Zalaznick, 2020). These family obligations manifested in various ways, including expectations to help siblings with their own online coursework (Barber et al., 2021) and serving as caregivers for young or elderly family members (Fariña et al., 2021; Zalaznick, 2020).

Chávez et al. (2012) captured the loyalty and duty that some students feel toward their families while conducting interviews with 50 Native, Hispano, and Mestizo American students. One Hispan(ic) student said, "I was taught that I have a responsibility to my family and to my people. Even now while I am in college, I must send whatever money I can home to help support my family" (p. 13).

Economic Barriers

Many authors addressed topics within the theme of economic barriers, which encompasses concerns about housing, food, finance, and jobs. While some conditions, such as homelessness (Fariña et al., 2021), had existed before the pandemic, multiple student surveys conducted during the pandemic highlighted the disproportionate impact and increased awareness of the situation.

Through student surveys, Barber et al. (2021) identified greater insecurities in finance and food for URM and first-generation students. Williams (2020) found that low-income and first-generation students experienced greater challenges in housing, food, and jobs. Other researchers identified that URM (Kimble-Hill et al., 2020) and Latino/a/x/Hispanic (Fariña et al., 2021) students struggled to find adequate and safe places to study because of housing situations. And first-generation Latina students (Killham et al., 2021), URM students (Vielma and Brey, 2021), and students at a Hispanic university (Shapiro et al., 2020) all had disproportionate employment obligations or challenges. From a different perspective, Walton et al. (2020) identified that financial support and affordable housing were strong factors related to the persistence of indigenous students in remote learning.

Language/Linguistics

Researchers found that at times differences in language and linguistics can pose a challenge for minority students in online courses (Yeboah & Smith, 2016). Kimble-Hill et al. (2020) identified possible language barriers for Hispanic and Native Hawaiian students in their preference for verbal explanations over online lab courses. And Williams (2020) similarly found student challenges in online learning due to language barriers, summarized with a student offering perspective: "Spanish is my first language, and sometimes the rapid nature of digital learning keeps me from fully understanding" (Williams, 2020, p. 26).

Kawalilak et al. (2012) asserted that providing the technological access of online learning is insufficient and that the linguistic traditions of Aboriginal students needed to be addressed to accommodate their unique learning needs, including linguistic strengths and obstacles. This may be true of many URM online learners.

Instructor/Peer Interaction

Joosten and Cusatis (2020) identified that compared to their counterparts, minority students have a higher preference for socialization. However, this could place URM students at a disadvantage in online learning (Joosten & Cusatis, 2020). Using input from collegiate students of African descent, Eugene and Clark (2012) identified various concerns over lack of social context in the online environment, lack of collaboration, and feeling isolated from other students in online learning and identified social aspects of online learning as a moderate barrier to success.

Chávez et al. (2012) shared the feelings of a Mestizo college student who found that they could "be alone and in touch at the same time" (p. 2). However, lack of instructor and peer interaction proved to be barriers to success for many, including online indigenous students researched by Cochrane and Maposa (2018). African American male students (Salvo et al., 2019) noted the lack of professor interaction and timely feedback challenging, as did marginalized students (Williams, 2020). Similarly, students at a Hispanic university found that the online setting created difficulties in obtaining professor help with academic concerns (Shapiro, et al., 2020).

Interviews conducted by Kawalilak et al. (2012) revealed varying Aboriginal student opinions regarding interaction in the online environment. One student shared, "I liked the convenience…I felt safe…no one laughed if I didn't understand" (p. 13). However, different student perspectives revealed challenges instead. A student offered, "I didn't complete a module once, nobody noticed. If the teacher was here, she would notice." Another student shared, "I think I know the instructor, but they don't know me. They can't see me" (p. 13).

Family Support

Family support has been determined to be a contributing element for first-generation and URM student success (Gloria & Castellanos, 2012; Walton et al., 2020). Lack of this support appeared multiple times in the literature as a barrier for many students (Stone et al., 2016; Yeboah & Smith, 2016). With this, students in online learning may need even more family support but first-generation and URM students are at greater risk of not having it (Brubacher & Silinda, 2021). This decreased support can be manifest as an actual lack of parental knowledge of how to navigate the university environment (Killham et al., 2021; Stone et al., 2016), or it can appear as negative distraction (Stone et al., 2016).

Stone et al. (2016) looked at the experience of 87 first-generation students in an open-entry, online undergraduate course. They found a range of student experiences with respect to family support. Some students shared challenging comments from family members that accused them of striving for a "higher class than others" (p. 156) or that school was a "waste of time" and resources and not needed for success (p. 158). However, approximately half received unconditionally positive comments, including extremely proud parents who are "impressed with (their student's) determination" and tell "everyone" what their student is doing (p. 159).

Motivation

First-generation students are highly motivated and often among those most committed to improving the world (Haney, 2020; Stone et al., 2016). In a study of indigenous leaners, Kawalilak et al. (2012) found that motivation, specifically a strong desire to obtain post-secondary education, was a key factor for student success. However, in effort to identify barriers to e-learning for students of African descent in STEM disciplines, Eugene and Clark (2012) identified motivation as a weak to moderate barrier. Similarly, Armstrong et al. (2021) noted that motivation was associated with student retention to a degree and that Black and other students had lower rates of completion than white students.

Challenges with motivation were especially highlighted during the COVID-19 pandemic. Through student surveys at a largely Hispanic university, Shapiro et al. (2020) identified motivation to be among the primary nonacademic challenges, and DeRossett et al. (2021) identified that academic motivation was impacted by demographic variables. Gillis and Krull (2020) found that non-white, female, and first-generation students particularly struggled with feelings of decreased motivation. Through a different student survey, Cox et al. (2021) reported that Black/African students reported lower motivation for online learning as compared to Asian/Pacific Islander and white/Caucasian students.

Sense of Belonging

Student sense of belonging emerged in the literature, as related to impact on the shift to remote pandemic learning. Cox et al. (2021) used a survey of items with Likert ratings to report a

statistically lower sense of belonging for both Black/African and white/Caucasian students as compared to Asian/Pacific islander students, and similarly, DeRossett et al. (2021) identified a correlation between demographic variables and academic belonging. While sense of belonging was not found as a challenge for first-generation and URM students in regular online learning in this literature search, it may still impact these students.

Racism

While Salvo et al. (2017) proposed the idea that remote learning could be a *color free* environment where students were treated equally and had a decreased chance of dealing with racial issues, Fariña et al. (2021) found evidence of challenges for African American, Asian and Asian American, and Latino/Hispanic students in online learning, especially during the COVID-19 pandemic. Through a lens of critical race theory, they argued these students faced a "double pandemic" (p. 241) of racist attacks, decreased access, and stress, all of which impacted their efforts to maintain satisfactory academic progress in remote courses.

Learner Readiness

Researchers have identified various learner attributes and characteristics, such as time management, self-directedness and regulation, self-efficacy, and digital efficacy as factors that impact student performance in online learning (Kawalilak et al., 2012; Martin et al., 2020; Walton et al., 2020). However, some research indicates that URM students may give lower ratings to their own competencies in these areas (Kuo & Belland, 2019; Martin et al., 2020; Joosten & Cusatis, 2020; Yeboah & Smith, 2016), thus identifying a potential area of concern for their performance.

Digital efficacy is distinct from digital access (Cotton et al., 2014) and as a form of learner readiness can potentially further divide URM students from their counterparts. Kuo and Belland (2019) summarized that even with increased access to technology for underrepresented minorities, disparities in skill have not proportionately decreased. However, Salvo et al. (2019) found that previous information technology training contributed to successful online course completion for African American male students in online courses.

Mental Health

Through student surveys in online introductory courses, Gillis and Krull (2020) studied student perceptions of the transition to remote learning required by the COVID-19 pandemic. They found that most students experienced many challenges, including increased anxiety, but non-white, female, first-generation students were disproportionately affected. De La Cruz et al. (2021) also reported that first-generation college students reported considerable hurdles of mental health issues during the pandemic. Greater anxiety and other mental health conditions may be an issue for these students during non-pandemic conditions.

Culture

While the online learning environment provides increased access to education, elements of culture can cause challenges for students of various backgrounds. Chen and Bennett (2012) found that students from China had problems "acculturating to their online courses" due in part to "a clash between their heritage and host educational cultures" (p. 690). This was attributed to the constructivist approach of the online courses (Chen & Bennett, 2012; Warring, 2013) where Chinese students had cultural concerns in sharing differing opinions from faculty and fellow

students (Warring, 2013). Chen and Bennett (2012) suggested that these findings may not be unique to Chinese students and that care should be taken with the increased globalization of education.

From an additional perspective, Kawalilak et al. (2012) studied barriers of Indigenous students in online learning and found that Aboriginal cultural sensitivity was paramount to success. Walton et al. (2020) specified the need for more Indigenous faculty and culture on campus for student success. Chávez et al. (2012) found that culturally, Native, Hispan(ic), and Mestizo American students preferred that faculty provide connections between course content and their everyday lives and communities.

Attitude

Multiple authors researched the importance of underrepresented minoritized (URM) student attitude. Willems (2020) offered those factors, such as access to education and student attitude, had an impact on the success of indigenous online learners. Johnson et al. (2021) found that the positive attitude of students at the University of the South Pacific contributed to the largely successful transition to remote learning during the COVID-19 pandemic.

Other researchers found that imposter syndrome was an unfortunate challenge frequently experienced by first-generation and URM students (Calma, 2020; Kimble-Hill et al., 2020). A student shared, "It's the notion that you are not a part of a community, that you are an outsider, and it often manifests in the college environment" (Calma, 2020, para. 10). Another student expressed uncertainty about their own abilities saying, "I have thought on occasions that I wasn't smart enough for study at a university level" (Stone et al., 2016, p. 162).

Course Load

Using data of more than 45,000 students from 30 community colleges, Shea and Bidjerano (2019) conducted a research study focused on completion rates of minority students compared with nonminority students. They found that with each unit of completed online study, the likelihood of degree completion increased, except for minority students. Even academically stronger minority students were found to be more likely to drop out than nonminority students when they had higher online loads.
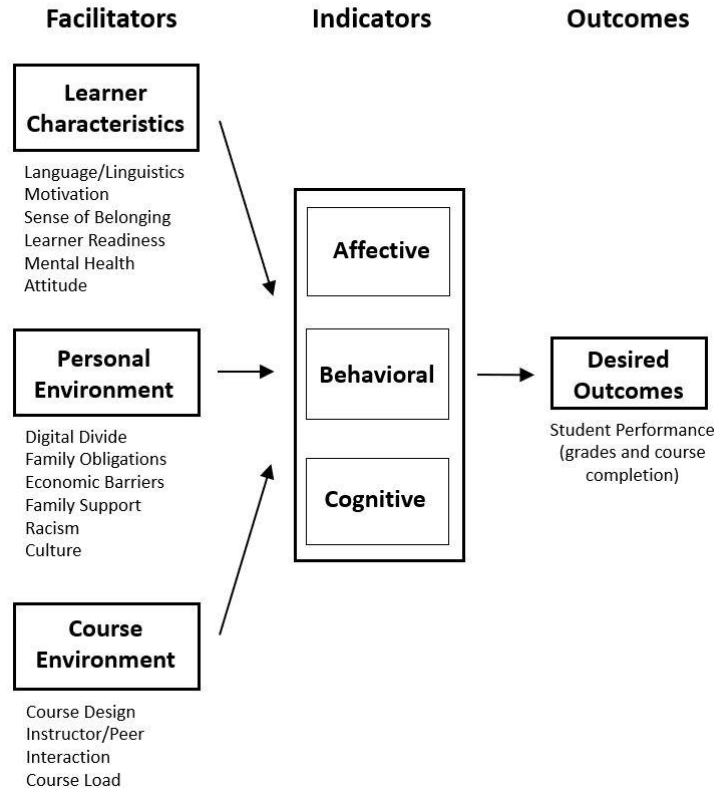
Discussion

This literature review identified the challenges of first-generation and underrepresented minoritized (URM) undergraduate students in online learning as they appear in published, peer-reviewed research. The intent of this effort was to categorize these findings into the model of Student Engagement, created by Borup et al. (2020) in effort to determine which areas of student engagement receive impact by these challenges, acknowledging that students likely face several challenges simultaneously and experience a compounding effect.

The literature search identified reports of challenged *Desired Outcomes* of engagement, as measured by student performance in grades and course completion, along with challenged *Facilitators* of engagement, which include all fifteen of the identified areas of student challenges. These fifteen themes of first-generation and URM student challenges fall into the three subcategories of *Facilitators* identified as *Learner Characteristics, Personal Environment,* and *Course Environment*. Figure 3 reports the identified challenges within the Student Engagement framework (Borup et al., 2020).

Figure 3
First-generation and URM Student Challenges in Online Learning

Potential Challenges to Online First-Generation and URM Student Engagement

Facilitators **Indicators** **Outcomes**

Learner Characteristics

Language/Linguistics
Motivation
Sense of Belonging
Learner Readiness
Mental Health
Attitude

Affective

Personal Environment

Digital Divide
Family Obligations
Economic Barriers
Family Support
Racism
Culture

Behavioral

Cognitive

Desired Outcomes

Student Performance
(grades and course completion)

Course Environment

Course Design
Instructor/Peer Interaction
Course Load

The findings of this literature review fall under the category of *Facilitators* of engagement, aside from reported research on challenged student performance categorized under *Desired Outcomes*. However, for these students, these categories are more often barriers rather than facilitators of engagement. Academic Communities of Engagement (Borup et al., 2020) asserts that like the Zone of Proximal Development (Vygotsky, 1978), students can engage more fully in their online environment, potentially impacting *Desired Outcomes*, when activities are scaffolded by the supportive communities around them. By recognizing where students need support, institutions can appropriately focus their efforts. The placement of student challenges within the Student Engagement framework are important because they reveal or confirm what areas of support are needed.

Interventions or support can be offered within the areas of Learner Characteristics, Personal Environment, and Course Environment. Specific to the findings of this literature review, we developed and offer multiple recommendations for interventions that address the student challenges and student requests found in each category. Institutions can generate ideas for their own needs by reviewing the challenges and recommendations in Table 3.

Table 3
Facilitators of Engagement with Student Challenges and Recommendations

Facilitators of Engagement	Challenges	Recommendations
Proposed Learner Characteristics Interventions	Language/Linguistics	• Offer language proficiency support • Provide definitions of common terms of the educational environment • Avoid undefined jargon
	Motivation	• Provide mentorship programs • Provide vision and purpose to education and course content • Provide acknowledgement of milestones
	Sense of Belonging	• Provide mentorship programs • Provide information for student clubs • Enhance learner-learner and learner-teacher course design
	Learner Readiness	• Advocate for first-year preparation courses • Provide digital literacy support, such as tutorials or mini courses, to support digital navigation
	Mental Health	• Provide links to campus mental health resources • Provide necessity and consistent distribution of assignments and assessments throughout the course
	Attitude	• Offer frequent, sincere encouragement to students • Teach the concept of imposter syndrome and how to overcome it
Proposed Personal Environment Interventions	Digital Divide	• Inform students of campus resources • Be flexible and understanding of student needs • Provide videos to explain digital navigation
	Family obligations	• Inform students of campus resources • Be flexible and understanding of student needs
	Economic barriers	• Inform students of campus resources • Be flexible and understanding of student needs
	Family support	• Encourage student communication with family about accomplishments or needs as appropriate • Provide information about institution events and contribution
	Racism	• Inform students of campus resources • Adjust course content for sensitivity and inclusivity • Highlight institutional policies of intolerance for racist comments, posts, gestures, and references • Report and encourage student reporting of racism
	Culture	• Review and adjust course content for sensitivity and inclusion • Provide real-world examples and application of course content • Invite discussion of culture and tradition
Proposed Course Environment Interventions	Course Design	• Be flexible • Provide quick feedback • Use relevant examples • Chunk content appropriately

Instructor/Peer Interaction	• Enhance learner-learner and learner-teacher elements of the course
	• Increase instructor involvement in responses
Course Load	• Provide advisement for appropriate student online course loads

We recommend that each institution use the identified categories of first-generation and URM student challenges within the Student Engagement framework (Borup et al., 2020) and simple recommendations provided to assess the needs of the students they are serving. This can serve to bring awareness of the student needs and increase institution ability to create or continue needed support and interventions to provide the greatest impact for student success.

Suggestions for Future Research

We also identify the need to further research first-generation and URM student needs within these now categorized findings. These research efforts can be channeled towards analyzing the efficacy of existing interventions or identifying gaps. Researchers may consider whether institutional efforts are harnessing the strengths of these students and/or supporting these students in the needed areas of the Student Engagement model (Borup et al., 2020), including *learner characteristics*, *personal environment*, and *course environment*. Research may include the student perspective and the institutional perspective of these efforts.

Conclusion

Online learning has increased in availability and popularity and now functions as a viable option for many students in higher education, especially given the needed convenience and flexibility it provides for student schedules. Along with opportunity, however, online learning can bring unique problems for first-generation and underrepresented minority undergraduate students who may experience greater challenges in online learning than their counterparts.

Research shows that though highly motivated (Haney, 2020; Stone et al., 2016), first-generation and URM students are more likely to suffer mental health problems, food and housing insecurity, financial and other difficulties that can impact online learning (Moore et al., 2018; Soria et al., 2020) The COVID-19 pandemic also highlighted the disparities that disproportionately affected URM and first-generation students in remote learning. And while many challenges of these students in online learning have already been known, we uniquely sought to identify and categorize the challenges of these students within the model of Student Engagement by Borup et al. (2020) to offer better student support.

We identified student challenges to *Desired Outcomes* of engagement, as measured by student performance in grades and course completion, along with fifteen themes of barriers to *Facilitators* of engagement. We identified and categorized the following fifteen themes with the intent to develop proposed interventions for improved success in learning among first-generation and URM students:

- *Learner Characteristics*—language/linguistics, motivation, sense of belonging, learner readiness, mental health, and attitude
- *Personal Environment*—digital divide, family obligations, economic barriers, family support, racism, and culture

- *Course Environment*—course design, instructor/peer interaction, course load

The placement of student challenges within the Student Engagement framework reveals or confirms needed areas of student support. We recommend that each institution use the identified categories of first-generation and URM student challenges and the pertinent recommendations such as those we provided to generate awareness and ideas to support student success for those they are serving.

Declarations

The authors have no conflicts of interest to declare.

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Appendix A
Summary of Research by Category, Positive Effect, Challenging Effect, and Manuscripts Included in the Literature Review

Category	Positive Effect	Challenging effect
Course Design	• Joosten & Cusatis, 2019	• Armstrong et al., 2021 • Chávez et al. 2012 • Cochrane & Maposa, 2018 • Gillis & Krull, 2020 • Guerrero et al., 2020; Jett, 2021 • Palacios &Wood, 2016 • Salvo et al., 2019
Digital Divide		• Banerjee, 2020 • Barber et al., 2021 • Fariña et al., 2021 • Kawalilak et al., 2012 • Kimble-Hill et al., 2020 • Moore et al., 2018 • Shapiro et al., 2020 • Willems, 2012
Family Obligations		• Barber et al., 2021 • Chávez et al., 2012 • Cochrane & Maposa, 2018 • Fariña et al., 2021 • Killham et al., 2021 • Kimble-Hill et al., 2020 • Shapiro et al., 2020 • Vilma & Brey, 2021 • Zalaznick, 2020
Economic Barriers		• Barber et al., 2021 • Fariña et al., 2021 • Killham et al., 2021 • Shapiro et al., 2020 • Vilma & Brey, 2021 • Walton et al., 2020 • Williams, 2020
Language/Linguistics		• Kawalilak et al., 2012 • Kimble-Hill et al., 2020 • Williams, 2020 • Yeboah & Smith, 2016

Instructor/Peer Interaction	• Chávez et al., 2012 • Kawalilak et al., 2012	• Chávez et al., 2012 • Cochran & Maposa, 2018 • Eugene & Clark, 2012 • Joosten & Cusatis, 2020 • Kawalilak et al., 2012 • Salvo et al., 2019 • Shapiro, et al., 2020 • Williams, 2020
Family Support	• Gloria & Castellanos, 2012 • Killham et al., 2021 • Walton et al., 2020	• Brubacher & Silinda, 2021 • Killham et al., 2021 • Stone et al., 2016 • Yeboah & Smith, 2016
Motivation	• Kawalilak et al., 2012	• Armstrong et al., 2021 • Cox et al., 2021 • De Rossett et al., 2021 • Eugene & Clark, 2012 • Gillis & Krull, 2020 • Shapiro et al., 2020
Sense of Belonging		• Cox et al., 2021 • De Rossett et al., 2021
Racism	• Salvo et al. (2017)	• Fariña et al., 2021
Learner Readiness	• Kawalilak et al., 2012; Martin et al., 2020; Salvo et al., 2019; Walton et al., 2020	• Kuo & Belland, 2019 • Martin et al., 2020 • Johnson et al., 2021 • Joosten & Cusatis, 2020 • Yeboah & Smith, 2016
Mental Health		• Gillis & Krull, 2020 • De La Cruz et al., 2021
Culture	• Chávez et al., 2012	• Chen & Bennett, 2012 • Kawalilak et al., 2012 • Walton et al., 2020 • Warring, 2013
Attitude	• Johnson et al., 2021 • Willems, 2020	• Calma, 2020 • Kimble-Hill, 2020 • Stone et al., 2016
Course Load		• Shea & Bidjerano, 2019 • Yeboah & Smith, 2016
Student Performance	• Wladis et al., 2015	• Gregory, 2016 • Howard et al., 2020 • McCarty, 2013 • Nguyen, et al., 2020 • Xu & Jaggars, 2014

Introduction to OLJ Volume 27, Issue 1

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In addition to the special issue papers, this first issue of 2023 also includes ten articles from our regular submission process. Topics include access, inclusion, synchronous online learning, student satisfaction, student evaluation of online faculty, student perspectives on engagement, faculty adoption of online teaching, and more.

In "Universal Design for Learning (UDL) Infusion in Online Higher Education" author Noha Fahad Altowairiki of University of Jeddah, Saudi Arabia, investigates whether UDL, a framework for creating inclusive learning experiences that decreases barriers in education, offers appropriate accommodations and preserves high achievement expectations for all students. Providing education that is more inclusive requires that we understand barriers to adoption of frameworks such as UDL. The author specifically used a case study design to investigate the role of academic leaders and faculty in adoption of UDL in an online graduate program. The analysis reveals four themes providing insight about effect adoption: the need for leadership, professional development, a community approach, and specific challenges. The author concludes that UDL adoption is more than an individual initiative and that it requires sufficient support and collaboration across multiple levels within the academic institution.

The pandemic increased the number of online students and especially those who participated in synchronous online learning either through Zoom or through other video conferencing platforms. With the sheer increase in new populations studying online, there is a need to better understand how students, many of whom would otherwise not have opted into online education, responded to this new mode of instruction. The authors of "Students' Satisfaction with Quality of Synchronous Online Learning Under COVID-19 Pandemic: Perceptions from Liberal Arts and Science Undergraduates Students," Izabela Majewska of the University of North Florida and Varaidzo Zvobgo of Texas A&M International University use the Community of Inquiry model to frame their investigation of student satisfaction with synchronous online courses. Somewhat surprisingly, results indicate that neither interaction with the course platform, nor interaction with peers was associated with perceptions of the quality of the overall synchronous online instruction. The authors provide interpretations of these result and recommendations for future research.

The topic of student satisfaction is also central to the next study in this issue, "Student Satisfaction and the Future of Online Learning in Higher Education: Lessons from a Natural Experiment" by Graham Wright, Shahar Hecht, and Leonard Saxe of Brandeis University and Sasha Volodarsky of Northeastern University. As with the previous article, these authors note that the pandemic forced new students into the online modality and may have therefore eliminated the selection bias that adheres to online learning in normal times. By the second year of the pandemic, some of the initial challenges experienced by faculty, staff, and students had abated, thus setting the conditions for a natural experiment in which we might see the impacts of online learning across the board, rather than with students who traditionally opt in to online education as with pre-pandemic online programs. Accepting this premise might require some suspension of disbelief. For example, a key benefit of online learning is its flexibility and voluntary nature. Moreover, the spring 2021 term was still not "normal" online learning, so it might not be a fair representation of mature, planned online education environments tailored to support the needs of voluntary online learners. However, these conditions did allow us to see how a significantly broader segment of the student population responds to online learning, especially in emergency conditions (which may come around again). The authors present results indicating that students who experienced at least weekly face-to-face coursework were more satisfied with their overall college experiences and with the interaction with faculty than were students who did not experience in-person instruction. Regarding the value of the interactions with faculty, the relationship between in-person instruction and the perceived higher quality of the interactions with faculty were significant only for white students compared to

Hispanic, African American, and Asian students, who did not perceive these benefits—a very interesting finding itself that warrants further research. The other key implication of the study may be to reinforce our current understanding that online learners benefit from the flexibility afforded by online education when they choose it, not when online learning is forced on them (a condition—"voluntariness"—discussed in another article in this section of the journal; see below). Going forward it may be helpful to remember that what some see as selection biases that hinder online learning research can also be seen as an inherent condition of online learning. In other words, the freedom to opt into online education is not a "bug"—it is a "feature." Given that, institutions do indeed need to plan more carefully for online instruction (especially in times of crisis), including more professional development for faculty and support for students who are not the typical audience for distance learning when crises that require a pivot to online learning occur.

Student evaluation of online teaching effectiveness is also the focus of the fourth article is this section, "Establishing a Student Evaluation of Online Teaching and Learning Framework Through Analysis of Existing Instruments" by Ting Sun of the University of Utah, Florence Martin of North Carolina State University, and Stella Kim and Carl Westine of the University of North Carolina at Charlotte. As online education continues to grow, student evaluation of faculty online teaching is taking on greater importance. Whether used as a consideration for tenure and promotion decisions; for renewal of contracts for contingent faculty; or as formative assessment to improve online instructional quality, student evaluation of online instruction is an important element in the lives of online instructors. Previous work in this area indicates that many institutions do not customize the forms used for student evaluations of faculty to reflect the online educational context. The authors of this article have a goal to develop a more representative framework for the evaluation of online teaching through an analysis of 278 evaluation elements found in 27 different instruments. Through this work, the authors developed the SEOTL framework, a multidimensional approach that includes consideration of learner, instructor, course, technology, and organization, thus providing a holistic and comprehensive model for evaluation.

The next paper in this section also seeks to understand student perceptions of important variables in online learning, in this case online engagement. In "Student Perceptions of Online Engagement" authors Petrea Redmond, Megan Alexsen, Suzanne Maloney, Joanna Turner, Alice Brown, and Marita Basson of the University of Southern Queensland, Australia, argue that the large and expanding area of research on learner engagement rarely includes student views of what engagement is. In this paper, they aim to highlight student voices regarding the nature of learner engagement in online contexts. Building on previous literature, they sought to understand student perspectives on various aspects of engagement, including its social, cognitive, behavioral, collaborative and emotional dimensions. Using a mixed methods approach, the investigators gathered quantitative and qualitative data on the relative importance of the various dimensions of engagement among a broad representation of online students. Results suggest that cognitive and behavioral dimensions of engagement are highly ranked and that hands-on learning activities are associated with engagement.

There are several theories that aim to describe, explain, or predict adoption of innovation including the increased usage of online teaching. The unified theory of acceptance and use of technology (UTAUT) incorporates several of these and is the framework for explaining adoption, continued use, and increased use of online instruction in the next paper, "Rising to the Occasion: The Importance of the Pandemic for Faculty Adoption Patterns" by Jing Zhang, Becky Sumbera, Pamela Medina, Melika Kordrostami, and Anna Ya Ni of California State University San Bernardino and Georgette Dumont of the University of North Florida. The UTAUT model predicts the adoption of innovations through its depiction of various constructs that enable or constrain such adoption. These constructs include the degree to which potential adopters are influenced by peers (social influence); the degree to which adoption of the innovation is required or voluntary (voluntariness); whether potential adopters believe the adoption will improve their ability to complete tasks associated with the innovation (performance expectancy); how difficult or time-consuming it will be to learn to employ the innovation (effort expectancy); and whether there will be support for adoption (facilitating conditions). The authors of this paper surveyed 180 faculty with an instrument reflecting the UTAUT model and found that the model does predict adoption of online

teaching as well as continued and increasing use. This paper clarifies the conditions under which faculty will engage in large-scale efforts to respond to crises as well as their likelihood to participate in ongoing attempts to meet the flexibility needs of online learners in the 21st century.

The next paper in this section considers how classroom space influences approaches to active learning and how that understanding informs the transition of active learning designs for classrooms to active learning designs for online settings. In "Faculty Transition Strategies from In-Person to Online Teaching: Qualitative Investigation for Active Learning" authors Tracey Birdwell and Merve Basdogan of Indiana University, Bloomington employed a phenomenological research method to elicit personal descriptions of lived experience regarding online active learning design. The researchers conducted interviews with faculty who had undergone training in the consideration of physical spaces for online learning as a foundation for designing active online spaces. They elicited narratives that documented the journey from replicating classroom instruction, to augmenting it, and, finally, to transforming instruction for active online collaborative learning. Through this research, the authors propose different metaphors for virtual learning spaces including core, supplemental, and augmented spaces that describe the designs that instructors enacted.

One of the less researched areas in online education is virtual field placements and supervised experiences. How do learners develop skills and professional identity when the field placement or supervision is conducted remotely? That is the topic of the next paper, "Online Group Supervision in Graduate Psychology Training During the COVID-19 Pandemic" by Shulamit Geller, Keren Hanetz-Gamliel, and Sigal Levy of The Academic College of Tel Aviv-Yaffo, Israel. The authors review literature indicating that successful group supervision experiences are characterized by factors associated with group climate, group cohesion, supervisor-supervisee working alliances, and professional identity development. Using four existing instruments to measure student perceptions of these important dimensions of successful supervisory experiences, the authors aimed to compare rankings of students who completed their placement with in-person supervisors as compared to those who worked in virtual supervisory settings. They also sought to test the association between COVID-19 related worries and social support and aspects of online group processes. Results indicate that there were no differences between online and in-person group supervision in group cohesion, group climate, and working alliance with their supervisor. However, the researchers concluded that students' worries about COVID-19 related social interactions and their perceived social support were linked to productive involvement with the group and the supervisor. More specifically, students' reports of more pandemic-related worries and less social support were associated with reports of less productive group processes. The paper includes more details and recommendations for online group supervision in psychotherapeutic educational settings.

The Community of Inquiry model should be familiar to many readers of the *Online Learning Journal*. We have been publishing papers on this influential theory since 2001 when Terry Anderson, Liam Rourke, Randy Garrison, and Walter Archer wrote a seminal paper on the teaching presence construct when our journal was named the *Journal of Asynchronous Learning Networks*. The theory has been a framework for hundreds if not thousands of studies in many different journals since those early days. As the model has become the focus of international research, it has become necessary to translate the instruments used to assess forms of presence that are hypothesized to make up an effective collaborative online learning experience. The next paper is "Development and Validation of the German Version of the Community of Inquiry Survey" by Lisa-Maria Norz, Werner O. Hackl, and Elske Ammenwerth of Private University for Health Sciences and Health Technology, Austria, and Petra Knaup-Gregori and Nils Benning of Heidelberg University, Germany. The authors conducted item analysis, reliability analysis, exploratory factor analysis, and confirmatory factor analysis to confirm the reliability and validity of the German CoI Survey. This work will enable other researchers to employ the CoI survey with German speakers and extend research beyond its current boundaries.

The pandemic led to a huge surge in research on the topic of emergency remote instruction. Unlike planned online education with its focus on faculty training, instructional design, and student support, emergency remote instruction was conducted in haste, with great urgency, and with varying degrees of success. Early results indicated that faculty and students struggled with this somewhat chaotic

form of distance education, despite the often-heroic efforts of faculty, staff, and students. As time goes on opportunities for mapping the literature that has emerged become available with the potential to get a sense of where the research was published, which topics were covered, which journals published the work and other variables related to bibliometric analysis. The final paper in this issue is "Research Trends in the Field of Emergency Remote Teaching: A Bibliometric Analysis" by Betül Tonbuloğlu of Yildiz Technical University and Burcu Avcı Akbel of Ankara Yildirim Beyazit University. Studies such as this do not provide a review of the content of the literature (for example, disclosing results of the research) but instead focus on the shape of the literature in terms of publication frequency, countries producing the literature, citation analyses, and other parameters that describe the emerging field of research. In this paper the authors also limited their research to open access journals, which may color the results given many studies on this topic appear in closed journals. Nonetheless, studies such as this one begins to sketch the outlines of emerging fields and can provide valuable information to other researchers.

In closing, I would like to thank the special issue editors, Florence Martin, Curt Bonk, and Vanessa Dennen for their many labors on this edition of the *Online Learning Journal*. Their service to the field is significant and very much appreciated.

Universal Design for Learning Infusion in Online Higher Education

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Abstract

This qualitative case study explored the development of online teaching capacity to incorporate the universal design for learning (UDL) framework in an online graduate program. The participants in the study were purposefully selected from multiple levels at a Canadian university: (1) the program level, (2) the faculty level, and (3) the institution level. Using a series of semi-structured interviews and document analysis, four themes were identified: (1) leadership, (2) community of practice, (3) educational development, and (4) challenges. In addition to highlighting the roles of academic leaders in fostering UDL adoption in online learning, the findings also revealed forms of support that need to be in place to increase online teaching capacity. The findings from the study provide valuable input toward setting the stage for UDL to be meaningfully adopted in an online learning setting.

Keywords: community of practice, online learning, universal design for learning, higher education, online teaching capacity

The rapid and widespread growth of online learning in higher education necessitates thoughtful and pedagogical considerations to create an inclusive learning experience. "Online learning has grown to meet the need for increased continuing and professional education, increased retention and degree completion, and accessibility for new students outside their catchment areas," according to Rudestam and Schoenholtz-Read (2010, p. 7). Contemporary online learning requires more than simply accessing learning materials; rather, it involves multiple types of interactions between and among instructors and students to acquire knowledge and grow personally and professionally from the learning experience. Online learning design should endeavor to "motivate learners, facilitate deep processing, build the whole person, cater to individual differences, promote meaningful learning, encourage interaction, provide relevant feedback, facilitate contextual learning, and provide support during the learning process" (Ally, 2008, p. 18).

Online learners vary in their abilities, experiences, expertise, languages, cultures, learning styles, and non-academic commitments. To attract varied learners and meet their needs, an inclusive and accessible learning experience needs to be designed. The Alberta Ministry of Education (2016) has defined inclusion as "a way of thinking and acting that demonstrates universal acceptance and promotes a sense of belonging for all learners" (para. 1). One of the educational frameworks that fosters inclusion is Universal Design for Learning (UDL) (Meyer et al., 2014). UDL provides a blueprint for educators to guide them in designing a flexible learning experience that meets diverse learners' needs without reducing academic rigor.

UDL has been implemented successfully in higher education contexts, whether the courses are offered face-to-face, online, or through blended approaches; this has been clearly documented (e.g., He, 2014; Kumar & Wideman, 2014; Morra & Reynold, 2012; Ostrowski et al., 2017; Rao & Tanners, 2011; Rose et al., 2006). However, limited empirical research has investigated developing teaching capacity to incorporate UDL principles into teaching and learning practices (Hromalik et al., 2020; Westine et al., 2019). According to Westine et al. (2019), to broadly expand UDL adoption in the online learning context, investigating the faculty adoption process is warranted: "Exploratory research that identifies concrete examples of best practices . . . would be beneficial" (p. 37). Thus, this article highlights a qualitative case study exploring the development of online teaching capacity to incorporate UDL with the involvement of multiple stakeholders' perspectives (e.g., academic leaders, educational development providers, instructors, and instructional designers).

Review of Related Literature

In the following sections, UDL is described followed by its implementation in higher education. Then, educational development for UDL incorporation in higher education is discussed.

Universal Design for Learning

UDL is a scientifically valid framework for creating a learning experience that (1) provides flexibility in the ways students are engaged, information is presented, and knowledge and skills are demonstrated, and (2) "reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students" (Scott et al., 2015, p. 101). The framework includes three main principles based on neuroscience and educational research. Neuroscience research has demonstrated how people learn based on the three brain networks: affective, recognition, and strategic domains. The UDL

framework principles are aligned with the three networks and supported with effective teaching and learning strategies to optimize learning for all (Meyer et al., 2014).

The first UDL principle, providing multiple means of engagement, is associated with the affective networks of the brain, which spark learner engagement in the learning process by prioritizing and motivating what to learn and do (Meyer et al., 2014). To support the affective networks, four teaching methods can be used: offering options in content and tools, providing adjustable levels of challenge, offering a choice of rewards, and offering choices of learning context (Rose & Meyer, 2002). The second UDL principle, providing multiple means of representation, is associated with the recognition brain networks, which are responsible for perceiving information and "transforming it into usable knowledge" (Meyer et al., 2014, p. 54). To support the recognition networks, Rose and Meyer (2002) recommended providing multiple examples, highlighting critical features, providing multiple media and formats, and supporting background knowledge. The third UDL principle, providing multiple means of action and expression, is associated with strategic networks, which support performing tasks, organizing ideas, and demonstrating knowledge (Meyer et al., 2014). To support the strategic networks, some effective teaching methods can be implemented, including providing flexible models of skilled performance, having opportunities to practice with supports, offering multiple ongoing feedback, and allowing flexible opportunities for demonstration and expression (Rose & Meyer, 2002). Although it that seems each of these brain networks works alone and has its own contribution, they work together throughout the learning process, beginning by sparking the interest to engage in the process and ending with expressing what has been learned (Meyer et al., 2014). Hence, UDL is not specified for creating accommodations for learners with disabilities; rather, it provides a blueprint for instructors to create an accessible learning experience that attempts to meet all learners' needs through providing room for flexibility without reducing the quality of learning. For example, using an audio format of reading material can address a range of students, including those with visual impairments, those with learning disabilities, and those whose preference is auditory (Rao & Tanners, 2011).

Universal Design for Learning in Higher Education

Recently, UDL has become more common in higher education contexts. Davies et al. (2013) argued that UDL holds the potential to ameliorate some of higher education's most pressing issues, including the intractably low rates of persistence, retention, and degree completion evident at most colleges and universities today" (p. 195). The literature on the current research shows that both students and instructors have positive attitudes with respect to UDL incorporation. It has been found the use of UDL principles affects students' level of interest and engagement (Smith, 2012). Providing the multiple options of learning content, adjustable levels of challenges, and rewards were the main strategies that influenced students' level of engagement. Using multiple formats of representation (i.e., recorded lectures, PowerPoint slides, hands-on presentations made by students, small group discussions, and videos) helped students to deepen their understanding of complex concepts (Kumar & Wideman, 2014). He (2014) conducted a case study to examine the design of an online course based on UDL. The findings showed that 57% of the participants reported that the use of synchronous sessions was their favorite part of the course and that being able to review the recorded sessions was appreciated. The majority (60%) of the participants identified that ongoing feedback and responses to their questions through multiple formats (e.g., emails, synchronous discussion, and individual and group Skype meetings) facilitated their online learning process.

Schelly et al. (2011) and Davies et al. (2013) found that instructors who received training sessions on UDL generally adopted its principles into their teaching practices. Specifically, instructors used seven strategies in their teaching practices that resulted from training: (1) using multiple means of representation, (2) relating key concepts to the larger objectives of the course, (3) providing an outline at the beginning of each class, (4) summarizing material throughout each class session, (5) using instructional videos, (6) highlighting key points of an instructional video, and (7) using well-organized and accessible materials (Davies et al., 2013). Westine et al. (2019) examined online instructors' familiarity, course design use, and educational development interest regarding UDL at a large university in the southeastern United States. They found that 71.6% of online instructors were familiar with at least one UDL principle. Also, instructors reported high to moderate interest in learning more about UDL, which included "even those with familiarity and high implementation" of UDL (p. 37).

UDL implementation in higher education "has faced significant hurdles" due to the complexity of change management (Fovet, 2020, p. 164). Thoughtful consideration needs to be given to facilitate the process of change in a "multilayered, complex, anchored in tradition and historical hierarchy" environment (Fovet, 2020, p. 164). Lack of faculty incentives (i.e., promotion, tenure) for quality teaching may inhibit instructors to develop their teaching capacity and invest their time for UDL implementation (Singleton et al., 2019). Top-down mandates along with recognizing and rewarding teaching excellence would foster UDL infusion across faculties (Singleton et al., 2019). In addition, adequately training, sufficient resources and ongoing support need to be in place to maximize teaching capacity for UDL incorporation (Hromalik et al., 2020).

Educational Development for Universal Design for Learning

UDL incorporation requires instructors to follow a heuristic procedure for the design and facilitation of learning experiences, which may create a challenge to make an instructional design decision that involves selecting an approach with an array of options (Hromalik et al., 2020). In other words, instructors are content experts, not expert instructional designers; consequently, appropriate support needs to be offered (Hromalik et al., 2020). From UDL point of view, multiple types of educational development opportunities (e.g., boot camps, seminar series, webinars, online recourses) would be offered to meet the individual learning needs of instructors (Borup & Evmenova, 2019). These multiple methods should address UDL principles, curriculum development, and technological tools (Fovet, 2020; Schmidt et al., 2016). Also, they should be "an ongoing activity, as 'shotgun' approaches often do little" (Slavit et al., 2003, p. 35). As noted by Hromalik et al. (2020) "given the complexity of the UDL framework, it is uncertain whether faculty or pre-service teachers are truly able to effectively use UDL as a heuristic tool after a brief training" (p. 93).

Effective educational development fosters collaboration between and among instructors to share their experiences, identify problems, propose solutions, apply their ideas, and reflect on their teaching practices (Hromalik et al., 2020). Moreover, coaching is an effective strategy to foster UDL integration (Lock et al., 2019).

Coaching can build will, skill, knowledge, and capacity because it can go where no other professional development has gone before: into the intellect, behaviors, practices, beliefs, values, and feelings of an educator. Coaching creates a relationship in which a client feels cared for and is therefore able to access and implement new knowledge. (Aguilar, 2013, p. 8)

To reach desired outcomes, instructors need more than acquiring a knowledge of UDL; they need to be guided throughought UDL implementation (Hromalik et al., 2019; Lock et al., 2019).

UDL incorporation in online learning environment requires a deep understanding of the relationship between UDL, technology, and online pedagogy to promote student learning (Benson & Ward, 2013; Koehler et al., 2004). UDL incorporation is more than designing an accessible material, it involves facilitating and assessing online learning process. Success in supporting online instructors is "dependent upon the availability of opportunities for learning how to teach online" (Schmidt et al., 2016, p. 8).

Reviewing the literature on UDL development practices in higher education revealed that limited studies have been documented. Westine et al. (2019) highlighted the importance of examining instructors' teaching practices in terms of the UDL implementation process and their decision-making to ensure widespread adoption.

Research Design

This study aimed to explore a group of online instructors developing their teaching capacity to adopt UDL in their practices. The study was guided by the following two research questions:

1. What are the roles of academic leaders in supporting UDL incorporation into online learning?
2. How do instructors develop their teaching practices to implement UDL in the design and facilitation of online learning?

Methodology

A case study design was purposefully selected to deeply examine the development of online teaching capacity for UDL adoption in the higher education context. Case study research is "an in-depth description and analysis of a bounded system" (Merriam, 2009, p. 43). Creswell (2007) explained that, in a qualitative case study, "the investigator explores a bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information . . . and reports a case description and case-based themes" (p. 73). A case study design allows the researcher to investigate the phenomenon from a holistic perspective through the involvement of multiple sources of data in order to gain a deep understanding and thus provide a rich description (Merriam, 2009). A case study research design is used when "the interest is in the process, rather than outcomes, in context rather than a specific variable, in discovery rather than confirmation. Insights gleaned from case study can directly influence policy, practice, and future research" (Merriam, 1998, p. 19).

Case Description

A case study is "a bounded system" (Stake, 1995); thus, this case study was bounded to a specific group of instructors and academic leaders who designed, facilitated, and directly led an

online graduate program based on UDL for more than two iterations within a Canadian university. The online program consisted of four half-courses that were offered in a prescribed sequence within one year. The instructional design team of the program was formed by three sessional instructors and the program coordinator.

The participants in this case study were selected from three different levels within the university:

1. Online program level: three online instructors and the program coordinator.
2. Faculty level: three academic leaders (i.e., the Graduate Programs Associate Dean, the Distance Programs Coordinator, and the Professional Development Director).
3. Institution level: The Teaching and Learning Center Director and an instructional designer.

Involving participants from multiple levels was a means to gain a holistic picture of the types of support offered to the development of online teaching capacity. Pseudonyms were assigned to each participant, as shown in Table 1.

Table 1
Participants' Pseudonyms

Pseudonyms	Role
Nancy	Sessional instructor
Heather	Sessional instructor
Susan	Sessional instructor
Lisa	Program Coordinator
Karen	Graduate Programs Associate Dean
David	Professional Development Director
Julia	Distance Programs Coordinator
Sarah	Teaching and Learning Center Director
Jodi	Instructional Designer

Methods of Data Collection

The case study approach accommodates multiple data sources to enable researchers to gain a deeper understanding of the phenomenon under investigation. Thus, in this study, data were collected from multiple sources for two reasons: (1) to obtain a complete picture of how online instructors develop their teaching capacity to implement UDL effectively and (2) to cross-check information (Gay et al., 2009).

First, semi-structured interviews were conducted with each participant in the study. The interview focused on: (1) exploring each instructor's development practices in the use of UDL, (2) the understanding of academic leaders and educational development providers' roles in supporting online instructors' development practice, and (3) providing an opportunity for participants to offer suggestions and recommendations to foster UDL implementation in online higher education contexts (see Appendix). All the interviews ranged from 40 to 60 minutes, were audio-recorded, and then transcribed verbatim.

Second, documents were collected based upon the participants' consent as a source of data, including the program curriculum review (i.e., a critical examination of the program led by instructors and the program director to optimize the learning outcomes of the program, and improve the student learning experience); course outlines designed by instructors, and educational development resources offered by the participants. Such document evidence

provided background information on the types of support—and subsequent outcomes—that occurred throughout the participants' experience in this program.

Methods of Data Analysis

The data were analyzed using thematic analysis (Braun & Clarke, 2013). The thematic analysis process includes three steps: identifying emerging themes, analyzing the themes, and reporting patterns (themes) within the data (Braun & Clarke, 2013). It is important to highlight that data analysis stages are not linear but iterative (Creswell, 2007).

To start, data from different resources were prepared and organized in readiness for analysis. Interviews were transcribed verbatim and sent to all participants to give them an opportunity to review them for accuracy and clarity purposes. Collected documents were clarified and summarized using document summary forms (Miles & Huberman, 1994) to explore their significance. The summary form included a description of the document, the significance of the document, and a summary of the content.

Then, each dataset was coded, and codes were grouped to build initial themes that would be related to the research questions. Coding data and building initial themes, in this stage, were highly inductive. After that, each set of initial themes from different resources was reviewed and examined at two levels: (1) the level of coded data, to ensure all data under each theme formed "a coherent pattern" (Braun & Clarke, 2006, p. 20); and (2) the level of the themes, to identify the relationships between themes to ascertain if they reflected the meaning of the data and answered the research questions (Braun & Clarke, 2006). Microsoft Excel spreadsheets were used to display and analyze the data, which helped in building and examining the themes. Thematic maps were also used to identify relationships between the codes and themes, and between the different levels of themes (i.e., main themes and sub-themes). In the fourth stage, each theme was "defined and refined" by identifying it's "essence" and to determine which aspect of data each captured (Braun & Clarke, 2006, p. 22), and to link each theme with the related research questions for the purpose of writing the case report. Once written, the case report was shared with the participants in the study to provide feedback and/or to add additional information to increase accuracy.

Ensuring Validity

Three strategies were employed to ensure the worthiness of the data. First, triangulation, which involves using "multiple sources of data" (Merriam, 2009, p. 215), was achieved through data collection from interviews and documents with the involvement of participants from multiple levels within the institution. Second, member checking reassured the accuracy of transcripts and interpretations of the collected data. In this study, each participant received a copy of their interview transcript to give them a chance to add or change any part of the transcript and provide feedback. Six out of nine participants did provide feedback on their interview transcriptions. In addition, the case report was sent to each participant with an invitation to read and provide feedback within ten days to increase the accuracy of the study. Seven out of nine participants did provide feedback. Most of given feedback was focused on copyediting; none affected the accuracy nor interpretation of data collection and analysis.

Results

Based on the analysis of the collected data from interviews and documentation, four themes were identified: (1) leadership, (2) community of practice, (3) educational development, and (4) challenges (see Table 2). Each of these themes is detailed discussed in the following sections.

Table 2
Emerging Themes from Data Analysis

Themes	Sub-themes	Coding	Sample Quotes
Leadership	(1) Macro level: institution	Clear vision Strategic plans Resources Rewarding scholars	"It's kind of that advocacy across multiple levels" "Reconceptualizing, and creating a vision for people to work toward, and then strategizing to support that"
	(2) Meso level: faculty	Customized support Hosting open dialogue Building networks Technical and pedagogical supports	"Have a go-to person to go to, to be able to say: How did you set your course up?" "We can't assume that even though instructors are passionate about UDL…they can figure out how to leverage all of the affordances within the LMS"
	(3) Micro level: department/program	Sufficient time Iterative process	"Each time I have taught the course, I have expanded pieces to make sure that it gets designed further to the edges"
Educational development		Formal sessions Informal sessions Short sessions Long program, Group support One-on-one coaching.	"Creating opportunities for instructors to come together to learn" "There were lots of opportunities for me . . . to take part in workshops, or receive one-on-one support" "Working at the elbow with the instructors"
CoP		Sense of belonging Regular meeting Shared goals Feedback	"We do have a sense of community" "We had this deep trust in what we were doing" "I did not feel isolated" "We really supported each other in designing our courses"
Challenges		Lack of knowledge Mindset and tradition Time Empirical research	"I think the biggest [challenge] is knowledge" "Mindsets aren't changed if people are not required to change their mindset" "People are very busy."

Leadership

Fostering UDL adoption requires effective leadership at multiple levels within the academic institution, which was mentioned by seven participants in the interviews. According to the participants' perspective, UDL implementation starts at the institutional level, the "macro level," through creating a clear vision and policy, offering resources, and rewarding scholars. David argued that the role of the institution is "reconceptualizing, and creating a vision for people to work toward, and then strategizing to support that." Sarah also explained that the institution level fosters UDL implementation through creating policies (e.g., vision, strategic plans, recognition, and reward system) and providing resources to enable UDL adoption. Instructors would adopt UDL if it is a part of the "strategic plans and part of what gets rewarded"; otherwise, "it's got a chance of success in little pockets here and there," as Karen reported.

Next, at the faculty level, the "meso level," sufficient and customized support needs to be offered, such as hosting open dialogue, building networks, and ensuring that technical and pedagogical supports are in place. First, hosting open educational conversations with instructors related to student variability and how UDL helps in designing an inclusive learning environment that addresses all learner needs is a necessary step, as explained by five participants (two instructors and three academic leaders). Lisa and Nancy reported that misconceptions regarding UDL exist in the field, such as that UDL is specified for disabled students. Offering professional dialogue opportunities aims to (1) increase awareness of UDL and (2) enable leaders to gauge instructors' receptiveness and attitudes toward UDL (Susan, Nancy, Lisa, and Sarah). These conversations need to be supported with evidence. As Sarah explained "we need to be able to communicate appropriate research-informed evidence that [UDL] actually makes a difference . . . in order to get appropriate buy-in." Having buy-in from instructors facilitates UDL implementation "much more smoothly," and that happens through conversations instead of telling instructors, "You need to do this by this deadline" Susan noted.

Second, building networks of colleagues for the UDL preparation phase was recommended by Lisa, Sarah, and Heather. The aim of networks is to provide an opportunity for instructors to support each other's practice and learn from and with each other. Lisa mentioned that networks allow instructors to "have a go-to person to go to, to be able to say: How did you set your course up? How did you wrestle with the issue when somebody asked a question about fairness, or equity? How did you assess these?" Sarah also explained that building a small network of instructors helps in transferring knowledge through significant conversations, so that change is likely to occur.

Third, ensuring technical and pedagogical customized support are in place was one of the local leadership roles at the faculty level, as mentioned by three participants. For instance, Mary, who is an academic leader, explained that one of her roles is to ensure sufficient resources are in place to support instructors. Sarah also concluded that faculty leadership plays an important role if and when action and change occur.

Last, at the program level, the "micro level," instructors are responsible for investing their time in developing their teaching practice and redesigning their course. UDL implementation is an iterative process; thus, the provision of sufficient time needs to be thoughtfully considered. Nancy explained that, although she has a deep understanding of UDL, she has adopted its principles gradually: "Each time I have taught the course, I have expanded pieces to make sure that it gets designed further to the edges." In addition, Sarah recommended that instructors should teach the same course more than once in order to better design and

redesign the course based on UDL over time. Also, providing ongoing feedback throughout the implementation process from designing a learning environment, facilitating the learning process, to assessing learning outcomes, was recommended by Susan, Heather, and Nancy. Instructors should not feel isolated; rather, they should be able to ask their leaders for advice and get feedback on their practice as mentioned by Nancy. Formative feedback would also be provided by colleagues as well as mentioned by the participants.

Educational Development

A varity of educational development opportunities need to be offered to develop online teaching capacity for UDL adoption, according to seven of the participants. These opportunities need to be flexible and customized to meet the needs of individual instructors. Lisa and Julia argued that a variety of educational development opportunities were offered, but the challenge for people became how to decide which opportunity they needed and whether they were willing to invest their time to develop their teaching practice. In this case, multiple learning opportunities were offered, ranging from informal sessions to formal programs, from short one-hour sessions to a long four-week program, or from group support to one-on-one coaching. Specifically, at the institutional level represented by the Teaching and Learning Center, multiple opportunities were provided, such as the Online Teaching Preparation Program (for novice online instructors, it offers to support them in navigating online teaching successfully), Instructional Design Program (it helps instructors to design or redesign their courses through developing measurable learning outcomes, planning learning activities, and creating assessments), Online Teaching Award (it recognizes teaching excellence of full-time academic staff that developed and taught two or more online or blended courses), and Teaching and Learning Grant (it supports evidence-based projects that integrate research evidence into teaching and learning practice, generates new knowledge about teaching and learning in the institution, and disseminates the findings of the projects to benefit others in the institution). These opportunities were not only specified for UDL adoption; rather, they were offered generally to increase online teaching capacity at the university. The participants, Nancy, Heather, and Susan had used some of the above opportunities throughout their online teaching experiences over the years.

In addition, at the faculty level, several opportunities for faculty members and sessional instructors were offered (e.g., workshops, coaching, and café conversation). For example, there were regular formal workshops, an hour in length, to discuss various topics related to teaching and learning in postsecondary education. Technology coaching was a customized support to assist instructors in navigating the learning management system (LMS) and designing their course shells. According to Lisa, "Our coaches meet one-on-one. One of the things I really like about our coaches is when people make appointments, they must identify what they want to work on." Susan was one of the people who used the provided technology coaching to explore the affordances of the learning management system and design her course shells. Heather said, "We can't assume that even though instructors are passionate about UDL, and they want to try and use that in their course . . . they can figure out how to leverage all of the affordances within the LMS." Café conversation was a less formal session, in which instructors met several times throughout the academic year to discuss and share their practices. As reported by Lisa, the aim of these conversations was to research and reflect on their practices. Online instructors Nancy, Heather, and Susan did mention that they attended several educational development opportunities at the faculty or institutional level.

Community of Practice (CoP)

For this online graduate program, a CoP approach was used to support UDL adoption. The importance of creating and maintaining a CoP to develop teaching capacity was evident during the interviews. Regular meetings, commitments, collaboration, trust, and common interests were the main features of the community. To express their feelings toward having such a community, the instructors made such statements as "We do have a sense of community," "I did not feel isolated," "It was a really incredible experience," and "We really supported each other in designing our courses."

The academic coordinator and the instructors, who formed the instructional design team, agreed to collaborate and support each other in the development of the program design and facilitation at the early stages of the program, as reported in the Program Curriculum Review. The team met prior to teaching the program to discuss program goals and design, and how to model UDL in online learning, as explained by Nancy and Heather. During the design phase, the team shared their course designs, exchanged resources, and provided formative feedback. Heather stated, "We were bringing forward our draft syllabus, and sharing them with each other for feedback, or looking at resources—the conversation was always around: Are we really modelling? Are we leveraging the UDL framework in our work?" Nancy offered a similar description: "We had this deep trust in what we were doing … we developed some of the things we were doing, and passed them back and forth, and we received feedback, and it was feedback in a very collaborative sense. … I think that when you're open to critical friends, it grows you as an educator." Then, after each course ended, the instructors and academic coordinator met to reflect on what worked, what did not, and what changes could be made in the future. As a result, the instructor had an opportunity to learn with and from each other's experience "in terms of content, technological and pedagogical issues that emerged as part of teaching in this program," as stated in The Program Curriculum Review.

Using the CoP approach influenced sessional instructors' sense of belonging and satisfaction, as reported by Heather and Nancy. Heather expressed her feelings as follows:

> I felt more a member of the faculty, even though I wasn't. … I did a lot of meetings before I actually signed my sessional contract, supporting the other teachers who were designing. … I was willing to invest my time and do that because I felt like I was a valued member of the team, even though I wasn't getting any financial benefit from doing it.

Such an approach requires effective leadership to create enabling conditions that build and maintain a sense of community of practice, as explained by the instructors. The three participating instructors spoke of Lisa's strong leadership, as she supported them to enhance their online teaching practice, encouraged them to collaborate with each other, and provided feedback.

Challenges

The participants identified four challenges that may affect UDL integration in higher education. First, the lack of knowledge regarding UDL was reported as the main challenge by three participants (i.e., Julia, Nancy, and Lisa). For instance, Julia argued, "I think the biggest [challenge] is knowledge, and people having a clear definition of what it means and how they can support their learners."

Second, Karen and David noted that changing the mindset and tradition around teaching and learning approaches is challenging in higher education, as UDL requires a flexible and

inclusive design. Karen spoke of the tradition of teaching and learning in the higher education system, such as "one size fits all." According to her, a lot of academics "who are teaching in other disciplines have had no training on how to be a good teacher or have had no training on how people learn best." Changing the mindsets about learner variability and learning styles is needed; however, "mindsets aren't changed if people are not required to change their mindset."

Third, the lack of time to increase teaching capacity and redesign courses was another reported challenge by David, Nancy, Julia, and Sarah. David noted that instructors are very busy with their teaching, research and publications, and administrative work, which may create a challenge for them to find time to learn and practice new teaching approaches such as UDL. Therefore, Nancy and Julia highlighted that sufficient time needs to be given for people to first acquire knowledge and then gradually implement UDL.

Fourth, Sarah claimed that insufficient empirical research on the effectiveness of UDL incorporation in the higher education context is often overlooked. Having access to empirical research findings on UDL implementation and outcomes on student learning, engagement, and satisfaction would help motivate instructors to adopt it and redesign their courses; otherwise, it may be challenging, as most higher education institutions are research intense.

Discussion

Our findings demonstrate that leadership plays a key role in developing online teaching capacity for UDL adoption. Effective leadership is reflected in a clear vision and strategic plans, and appropriate customized supports, thus enabling conditions and opportunities for learning, recognition, and rewards. Through meaningful communication and collaboration between and among multiple levels of leadership within a university, efficient infrastructure and sufficient support are offered that meet the needs of individuals. UDL implementation in higher education needs to be a "faculty-driven" process along with institutional support for wide-campus adoption (Bowman, 2016). Having buy-in from instructors through open conversation is a critical component in UDL incorporation because they need to see the values of UDL and understand the method of practice to change from their traditional ways (Bowman, 2016; Goforth-Melroy, 2014). Thus, pedagogical support and technical coaching are required throughout the UDL incorporation process.

The findings demonstrated that having a CoP scaffolds the process of UDL incorporation. Similar to what was found in previous research (Schaler & Fusco, 2003), developing online teaching capacity is more than a series of workshops: it requires a continuance of support to put knowledge into practice with ongoing feedback, and that occurs within a supportive community. Having a community influenced sessional instructors' sense of belonging, motivation to continually develop their teaching practice, and satisfaction. It is important to assign a facilitator for each CoP to provide support and guide discussion and activities to reach desired outcomes (Cheng & Lee, 2014). In this study, the academic coordinator, Lisa, was the facilitator of the CoP.

Affording a variety of educational development opportunities is required to build teaching capacity to redesign learning experiences based on UDL (Lock et al., 2019). Pedagogical knowledge regarding online learning pedagogy and the UDL framework, guidelines, and technological skills are necessary for UDL integration. UDL incorporation occurs through an iterative process, in which instructors make small changes and observe their effectiveness, as then they are more likely to invest their time and change their entire teaching practices (Bowman, 2016).

Future Research Directions

Drawing on the experience of this research, two recommendations for future research are offered. First, a larger similar study with a more varied sample of courses or programs (online, blended, face-to-face) from different disciplines is recommended. Second, another area for future research in UDL is institutional support. Such questions need to be investigated: What types of infrastructures and supports are required to foster UDL infusion across faculties and programs? What are the barriers and how are they addressed about the implementation of UDL? A mixed methods study could be carried out using a survey along with interviews to gather such information.

Conclusion

UDL adoption in the design and delivery of online learning aims to reach all individual needs and interests. The challenge for higher education institutions is fostering UDL adoption across faculties and programs. UDL adoption is more than an individual initiative; it requires adequate support and sufficient collaboration among and through multiple levels within the academic institution. The results of this study make a significant contribution to the literature on UDL and the development of online teaching capacity. This study explored the phenomenon from a holistic perspective that involved instructors, academic leaders, and educational development providers. Thus, the findings' respond to Westine et al.'s (2019) recommendation to investigate the faculty adoption and provide "concrete examples of best practices" (p. 37).

UDL infusion requires thoughtful considerations of what to do before, during, and after the process. The preparation phase is critical in setting the stage for UDL incorporation. A clear vision and strategic plans regarding UDL integration are needed and effectively communicated across programs. Then, a recognition and award system can be established to encourage instructors to redesign their courses and modify their teaching approach.
Ongoing technological and pedagogical support is recommended for individuals throughout the incorporation process. Instructors need to understand UDL theory and then apply its principles gradually within a supportive learning community. Using reflective practice aims to identify areas of strength to be amplified and areas of weaknesses to be eliminated. Creating and sustaining a CoP as an educational development approach is suggested to facilitate the process of UDL implementation. Academic leaders play a significant role starting from the creation of the strategic plan and vision down to the implementation in practice, through ensuring adequate resources with an array of supports are in place to not only facilitate its incorporation but also its sustainability.

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Appendix A
Sample of the Interview Questions

Online UDL-Based Program
- Tell me about the preparation, implementation, and outcomes of the UDL-based program regarding the UDL incorporation.
- What support and resources were used to increase the online teaching capacity to use UDL?
- What structures and scaffolds are needed to support UDL implementation in online learning?
- How do you assess the program from the UDL perspective?
- Did you collaborate with other instructors and leaders in the program to increase your teaching capacity in UDL implementation? Explain.
- What are the roles of academic leaders, development providers, and instructors in UDL implementation within online learning environment?
- What issues or challenges did you face in designing or implementing the program?

Recommendation
- Based on your experience, what did work well in the online program, what did not work?
- What kind of support did you receive/offer, and what kind of support you wished you received/ offered (e.g., institution level, program level, individual level)?
- What recommendations do you have for the university and academic leaders to foster UDL implementation?

Wrap Up
Do you have anything else to add regarding the design and implementation of UDL for the online program?

Students' Satisfaction with Quality of Synchronous Online Learning Under the COVID 19 Pandemic: Perceptions from Liberal Arts and Science Undergraduates

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Abstract
COVID-19 imposed dramatic changes on educational practices worldwide with American institutions of higher learning moving a significant number of their courses and educational programs to electronic online modes. In the post-pandemic world, the same institutions and educational programs recognize the need to incorporate technological components into their courses. Yet, some disciplines and areas of study may be better equipped for this change than others. The liberal arts are believed to be more reliant on face-to-face interaction and thus can be argued to have been more negatively affected by the required move to synchronous online learning during the pandemic Instructors have the option of teaching online courses either synchronously or asynchronously. As synchronous online learning requires course delivery in real-time via online video conferencing, the hope is that some of the drawbacks associated with teaching liberal arts online can be mitigated with technology-based, face-to-face interaction. In the spirit of exploring the relationship between liberal arts education and synchronous online learning, this research aimed at gauging Jacksonville liberal arts students' levels of satisfaction with the quality of instruction in synchronously delivered courses during the spring semester of 2021. Informed by the Community of Inquiry theory, of special interest were aspects of synchronous online learning like interaction with the virtual platform (video conferencing), interaction with content, interaction with instructor, and interaction with peers. Three local institutions participated in this study, yielding a sample of 141 students who participated in an anonymous Qualtrics survey pertaining to their learning experiences in the synchronous mode. Using a mixed-methods approach, results show positive perceptions, challenges, and recommendations for synchronous online learning.

Keywords: Synchronous online learning, student satisfaction, quality of instruction, Covid-19 instruction

The COVID-19 pandemic has had profound consequences on all aspects of life. These have been seen nowhere as clearly as in education, as the traditional face-to-face learning environment was replaced by a virtual one. With different strands of the virus continuing to circle the globe and state restrictions varying by location, instructors have become increasingly aware of the need to rely on technology to supplement their teaching. Consequently, online education at colleges and universities has become the new norm, giving students the choice of enrolling in either asynchronous or synchronous courses. Asynchronous learning, a student-centered learning mode, occurs in different times and spaces particular to each learner (Gómez-Rey, et al., 2017). Instructors usually set up a learning path which students engage with at their own pace (2017). On the other hand, synchronous online learning allows simultaneous group interaction despite physical distance (Wang, et al., 2018). Put simply, this is a model where the people teaching and the people learning have some form of live interaction, usually through videoconferencing software, meaning they engage in education-related activities at the exact same time, despite physical separation (2018). Synchronous online learning usually takes place if there is a specific need for live discussion or interaction, or as a strategy to build community among learners and faculty (2018). This community building and shared learning experience through the exchange of ideas is an especially important concept in the teaching and learning of liberal arts (Tang & Dang, 2019). While necessity dictates that liberal arts education embrace technology, the exact impacts of synchronous online learning involving videoconferencing in the discipline during the pandemic have not been adequately explored.

The world is an unpredictable place, and global emergencies like the recent COVID-19 pandemic are inevitable. During such times, higher education, and especially those disciplines more reliant on face-to-face interaction like liberal arts, should not become completely paralyzed due to lack of access to traditional brick-and-mortar learning environments. Creating an optimal online learning environment, whether synchronous or asynchronous, takes time, work, and planning under the best of circumstances. But providing pupils with the highest quality of instruction is still paramount for institutions of higher learning even in times of worldwide emergencies, and researchers should at least learn from this global disaster.

According to Sogunro (2017), quality of instruction refers to "the degree to which an instruction is adequately delivered, meets students' learning needs, learning styles, interests, expectations, and is well aligned to standards (2017, p.174). Without quality instruction, student motivation to learn recedes (2017). Assessing the relationship between student satisfaction and quality of instruction during the COVID-19 pandemic can provide higher education professionals with both theoretical and practical lessons for the future when the world is faced with similar situations that would call for synchronous online learning. In our research, quality of instruction is the composite of the integration of course materials into the synchronous online learning platform, supplemental material, thought-provoking videoconference sessions, and various teaching methods used to enhance student learning. We further test the relationship between student perceptions of interaction with peers, instructors, and the virtual platform with satisfaction of quality of instruction to determine the association and suggest implications for synchronous online education.

As educators, our main role is to disseminate knowledge to our pupils in a fashion that is both appealing to them and has been proved to be effective in the learning process. While the overwhelming determinant of learning effectiveness is instructional design, the extent to which students enjoy the course is not inconsequential. Enjoyment and attitude speak to student engagement and willingness to stick to the course which, in turn, relates to persistence in

learning. Consequently, the exploratory data collected in this research are intended to gauge student satisfaction with online synchronous learning in order to provide educators with a clearer understanding of what the students desire from such courses and what most effectively aids their learning experience. Such knowledge of present-day emergency instruction is invaluable to creating a more enjoyable, and thus more effective, educational experience now and when other crises arise.

Research Gap

A review of existing literature reveals limited research that has empirically investigated the interaction between students and synchronous learning environments, (e.g., Allen et al., 2004; Bernard et al.,2009). Similarly, little literature exists to date about the perceived quality of liberal arts instruction from students who have taken synchronous online classes (Bernard, 2019; Einfeld, 2016; McGinn, 2019). Furthermore, most available research data on synchronous online learning as evidenced by the studies mentioned above, was collected before COVID-19 pandemic, and thus do not address the present realities of synchronous online learning and student satisfaction with its quality under the present worldwide pandemic conditions. Only two previous studies with similar parameters were found, but with important differences. Li (2021) investigated factors that affect learning engagement in home-based synchronous online courses from the perspective of educational environments Wichanpricha (2021) analyzed student perceptions and difficulties of synchronous learning in Academic English courses through Microsoft Teams. However, both studies took place outside of the United States, the former in China and latter in Thailand.

As there is a significant lack of data on this exact topic of research, this study is exploratory in nature and intends to fill a gap in the literature by providing empirical evidence on the relationship between American liberal arts students' interaction with the virtual platform, peers, and instructor, and their satisfaction with quality of instruction during COVID-19.

Theoretical Framework

This research is guided by the Community of Inquiry (CoI) theory, which was developed by Garrison, Anderson, and Archer (2000). The Community of Inquiry (CoI) theoretical framework is a popular model for online and blended courses, tailored for high interaction among instructors and students by means of tools such as videoconferencing, discussion boards, and wikis. According to Garrison et al., 2000b, online learning involves the engagement of community in a course of inquiry, and the construction of knowledge based on cognitive, social, and teaching "presences." Although these three "presences" have specific characteristics, they are ultimately interdependent. "Presence" in online learning environments is displayed through student and instructor interactions.

Cognitive presence is the degree to which learners can construct and find meaning through course activities, thought, and communication in online learning environments (Garrison, Anderson, & Archer, 2001). In the CoI framework, cognitive presence considers the social interactions that influence cognition which best works when there is a sense of community (Rovai & Wighting, 2005). Cognitive presence includes identifying the important concepts that students should learn and instructors then design the course activities that are aligned with the assessment of those activities. Cognitive presence allows for constant testing and feedback through assignments and other interactive simulations that stimulate the development of skills and solutions to problems (Garrison, 2011). In addition, instructors encourage experimentation

and diverse views through engaging online discussions, open-ended questions, and debates. Student interaction creates an active learning environment and help students develop (Rovai, 2004). Another important factor of the CoI is that it produces a sense of mutual presence, where students can connect, intellectually and emotionally, with the teacher and peers, which ultimately fosters an inclusive learning environment (Hufford, 2014). For online learning to be successful, there needs to be interaction and teaching support that sustains social and cognitive presence (Miller et al., 2014).

The third component of the CoI is teaching presence, involving the design, facilitation, and direction of cognitive and social processes, which together make the learning process meaningful to students and help them to achieve the learning outcomes (Anderson, Rourke, Garrison, & Archer, 2001). When educators design online courses, they pay attention to instructional design and organization, curriculum development, course delivery method, netiquette, and learning activities. Teaching presence includes direct instruction, developing curriculum for the online course, content, learning activities, and assessment (Garrison, 2011). If done correctly, this supports student learning needs, engagement, and collaboration. It also provides students with the autonomy to work as individuals and groups (Falloon, 2011; Garrison et al., 2010). This dimension applies to our research because virtual learning involves designing the course and materials that facilitate interaction between learner and teacher (feedback), learner and learner (learning activities), and learner and content (learning activities and assessments).

Social presence relates to the ability of learners to communicate within a trusting environment and develop interpersonal relationships with peers (Garrison, 2009). With social presence, learners showcase their personal characteristics into the community of inquiry as "actual people" (Anderson, Rourke, Garrison & Archer, 2001). Learners demonstrate social presence through open communication and collaborative group work. Communication occurs when learners engage with other learners, ask questions, contribute to discussions, and share and express support to other learners (Garrison, 2011; Palloff & Pratt, 2007). Synchronous communication positively impacts on the level of social presence for students who use it. For example, synchronous audio and chats promote social presence and social interaction. The chats help to maintain regular contact, discussions, and immediate feedback. Synchronous online learning, which has become a norm since COVID-19 pandemic began, provides a platform where learners build relationships with their peers and acquire knowledge in the same way they would in a face-to-face environment. Considering how CoI concentrates on high interaction among instructors and students by means of various tools as mentioned, we believe this theoretical framework to be more than adequate for this research, the concentration of which is the synchronous aspects of online learning.

Literature Review

When the COVID-19 pandemic began, colleges and universities transitioned from regular face-to-face mode of instruction to synchronous online learning. This type of online learning was designed to emulate the traditional face-to-face instructional method to provide continuity of instruction. According to Stephens and Mottet (2008), the use of audio and videos in synchronous online learning such as WebEx and Zoom increases the quality of online learning experience (2006). Synchronous online learning plays an integral role in the teaching of liberal arts as based on the nature of the discipline. Considering that the scholarly literature on the topic of this research is limited to studies conducted abroad where the institutional culture is much different from the one in the United States, the literature review that follows provides a

discussion of the nature of American liberal arts and its connections to, and perceived level of instructional success in, online instruction, hindrances to high quality online instruction, and predictors of high-quality online instruction.

Liberal Arts and Online Education

The Association of American Colleges and Universities (2021) defines liberal education as a philosophy of education that empowers individuals with broad knowledge and transferable skills, and a strong sense of values, ethics, and civic engagement characterized by challenging encounters with important issues, and more a way of studying than a specific course or field of study. Renowned institutions of higher learning such as NYU (associate such education with academic and research activities that enable students to develop skills, think critically and creatively, communicate clearly, work collaboratively, solve complex problems, and contribute fully to society as engaged and informed global citizens and leaders. Similarly, Tang et al. (2021) believe that such education depends on the concept of a dynamic learning community, featuring liberal teacher-student interactions and a pedagogic environment, learner-centered formative assessment, effective student services for strategic university articulation, and dynamic student activities and engagement. While the term is used in multiple ways, it is clear from the above-mentioned definitions that liberal arts education strives to deliver an academic experience that fosters intellectual curiosity, a critical thought process, self-reflection, leadership and teamwork skills, a sense of commitment and professionalism and a heightened sensitivity to one's socio-cultural environment (2019). It puts emphasis on the creation of a learning environment where the student takes the responsibility of learning, and the teacher facilitates the learning process. In essence, liberal arts education inculcates the following: (1) lifelong learning, (2) academic freedom, (3) importance of practice and experience, (4) critical thinking and civic competence, (5) competency development instead of knowledge accumulation, (6) priority of general education over specialized education, (7) the concept of learning to learn, (8) self-directed learning effort, (9) political neutrality, and (10) interaction and Socratic dialogue (Kurennoy, 2020).

Shreaves, et al. (2020), conducted a mixed-methods study of faculty perceptions of online teaching at a midsized liberal arts university to better understand faculty acceptance and participation in online teaching. While study participants perceived online learning as attractive to students, they wanted online courses carefully regulated, in part because online learning was seen as contrary to their teaching values. Similarly, the study stakeholder groups, both faculty and students, in Einfeld's (2016) research expressed the belief that a traditional liberal arts education is not compatible with a fully online degree. Faculty members felt that moving liberal education to the online mode would undermine the essential nature and core purposes of a liberal arts education such as a) multi-disciplinary approach, b) liberal arts skills, c) embodied learning, d) faculty to student interaction, and e) student to student interaction (2016). Believing that liberal arts education ought to address the whole person—mind, body, heart, and spirit—human bodies must be physically present together or as close to that as possible (2016). The students claimed that since online learning was less personal, it would undermine the opportunity to develop close relationships and to pursue wholistic formation (2016).

Nonetheless, each stakeholder group in Einfeld's (2016) study identified means by which online and hybrid learning might be incorporated in ways that are compatible with the essential nature and core purposes of liberal arts education, thus, proving there is value to be found in online liberal arts education. Similarly, Pazich, Kurzweil, and Rossman (2021) posit that even

during a pandemic, technology can create more opportunities for discussion and application of concepts in liberal arts. In their study, faculty members teaching in the Teagle program, a hybrid model in which students learned foundational concepts primarily online and on their own, reported their students having more opportunity during class for in-depth discussion and application (2021). Some reported that student participation in online discussions allowed less-outgoing students greater opportunities to participate, and better-enabled faculty members to get to know them as individuals as compared to a traditional face-to-face setting. In addition to student engagement, most faculty members were satisfied with the level of student learning, reporting that the depth and breadth of student learning were either greater than, or about the same as, the depth and breadth of student learning in analogous, traditionally taught courses (2021). Notably, however, faculty members who worked on fully online courses felt that important aspects of the liberal arts learning experience were not replicable, noting that it was easier for students to become disengaged. Most indicated they would pursue a hybrid model that included more personal interaction if they were to attempt another course re-design (2021).

Hindrances to High Quality of Online Instruction

Dhawan (2020) explored the growth of EdTech Start-ups and online learning to offer some suggestions and recommendations for the success of online mode of learning during a crisis-like situation. The author posits that successful technology integration is dependent on administration and faculty members staying mindful of the difficulties and problems associated with modern technology (2020), including downloading errors, issues with installation, login problems, and problems with audio and video (Hussein et al., 2020). In Bernard et al. (2019) about a third of students indicated that the video conferencing was what they least liked about the course because if internet disconnects either at the beginning or throughout the entirety of the courses it leaves a lasting negative impression of the learning experience. Sometimes students find online teaching to be boring and unengaging as students want a two-way interaction which sometimes is difficult to implement (Darby, 2019). Maintaining personal attention is a big hindrance for students who already have short attention spans (Dhawan, 2020). For others, online learning has so much time flexibility that students never find time to do it (Sabri, 2021). Lack of attention may also be the result of mediocre course content (Ariani & Tawali, 2021). For those kinesthetic learners for whom the learning process cannot reach its full potential until they practice what they learn, online content is all theoretical and does not let students learn by doing (Song & Hill, 2007). Students also feel that lack of community, technical problems, and difficulties in understanding instructional goals are the major barriers for online learning (Song et al., 2004). Balancing their work, family, and social lives with their study lives in an online learning environment proved to be too challenging (Hung et al., 2010). Students were also found to be lacking in several e-learning competencies and academic-type competencies such as their knowledge of navigating various Learning Management Systems (Parkes et al., 2015).

Predictors of High-Quality Online Instruction

Good communication and information sharing for both instructors and students to cope with the change is believed to be critical for the success of online learning during COVID-19. Duplicating the face-to-face experience in a video-conference format is difficult and takes intentionality, course redesign, and proper use of the best available technology, including personal devices (Bernard, 2019). Through their research, Tsang et al. (2021) proved that student/student dialogue, instructor/student dialogue, and course design were significant factors

that predicted perceived learning. In the context of learning during the pandemic, student interaction was indicative of a successful outcome, as social support is a crucial coping mechanism for students. Student/student interaction is vital to building community in an online environment, which supports productive learning by enhancing the development of problem-solving and critical thinking skills (2021). Interactions among students allow the cohort to build a virtual community to compensate for the sudden loss of face-to-face communication (Rapanta et. al., 2020). Furthermore, interactions between instructors and students enhance students' understanding of course materials which stimulates learning interest (2020).

Outside of emergency remote instruction, Oztok, Zingaro, Brett and Hewitt (2013) address the importance of dialogue among the various actors in a classroom environment in the context of social presence. Constructive dialogue in any online learning environment has been linked to several desirable aspects of student perception and learning in online courses. For example, high levels of social presence can lead to student perceptions of increased learning, course satisfaction, and emotional satisfaction (Nippard & Murphy, 2008). Social presence fosters critical thinking and makes interaction intrinsically rewarding (Rourke et al.2001). More so, it is necessary for effective online instruction, the construction and negotiation of knowledge, and the establishment of a community of learners (Rockinson-Szapkiw, 2009). Oztok et al. (2013) agree that social presence is more easily fostered in a synchronous online learning environment, where teachers and students can be seen as more immediate, the media is rich in carrying social presence indicators, and some elements of face-to-face social presence are restored.

If higher education is to rely more on online learning because of the COVID-19 pandemic, then it is imperative for institutions of higher learning to make synchronous online courses more dynamic, interesting, and interactive. Considering the lack of physical face-to-face interaction in asynchronous online courses and the need to communicate among members of the classroom learning community, all efforts should be made to humanize the learning process to the best extent possible (Wang, 2017). Personal attention should be provided to students so that they can easily adapt to this learning environment (Divayana, 2021). Social media and various group forums can be used to communicate with students (Huang, 2018). Communication is the key when it gets difficult to reach students via texts, various messaging apps, video calls, and so on, so content should be such that it enables students to practice and hone their skills (2018). Teachers should also use these features to set time limits and reminders for students to make them alert and attentive (Wang, 2017). Students can easily interact with the instructor and classmates through the chat feature, voice communication using a microphone, polls, and whiteboard tools (Stephens & Mottet, 2008).

Research Hypotheses

Based on the above-mentioned literature connecting our three independent variables (*Interaction with the Virtual Platform, Interaction with Instructor,* and *Interaction with Peers*) and our dependent variable (*Quality of Instruction*), the following research hypotheses were proposed and tested:

H1: There is a positive relationship between students' perceptions of *Interaction on the Virtual Platform* (video conferencing) and satisfaction with *Quality of Instruction*.

H2: There is a positive relationship between students' perceptions of *Interaction with Instructor* and satisfaction with *Quality of Instruction*.

H3: There is a positive relationship between students' perceptions *of Interaction with Peer*s and satisfaction with *Quality of Instruction.*

Data and Methodology

This study involved human subjects from non-protected populations. IRB approval was obtained from all three participating institutions. The research survey link was emailed to each of the institutions' Schools of Liberal Arts and Sciences faculty members, who were asked to disseminate the survey among their students (Appendix A). The study sample consisted of students enrolled in one or more synchronous online learning courses in the 6 months prior to completion of the survey. They must have participated in one or more synchronous online classes that utilized Zoom, WebEx, Canvas Conference/Chat, or any other video conferencing computer software to learn the course material. By clicking on the email link, potential participants were taken to the informed consent document. After participants agreed on the informed consent document, they were directed to the anonymous Qualtrics survey designed by the researchers. The survey consisted of six elements. The first element gathered data on student perceptions of *Interaction with the virtual platform* (video conferencing), the second element requested data on satisfaction with *Quality of Instruction*, the third element of the survey requested data on perceptions of *Interaction with Instructors*, the fourth component asked questions about perceptions of *Interaction with Peers*. The survey also contained two open-ended questions and demographic data. Participants had 6 weeks to complete the online survey. Students chose their own date, time, space, and technology equipment to complete the survey. Upon data collection completion, a mixed-method approach using regression analysis and thematic analysis was used to determine student satisfaction with quality of instruction of synchronous online learning during the pandemic.

While Community of Inquiry theory does have an available 35-question survey, the data collection instrument was not used in this study. Based on research that examines student time constraints and length of surveys as reasons for low student response rates on student educational satisfaction surveys (Duncan, 2008; Anderson et al.,2005), this research utilized a shorter, self-designed survey instrument with 25 Likert-Scale type questions and 2 optional open-ended questions. The instrument used did, however, stay within the parameters of CoI theory as our survey categories incorporated the 3 "presences" of teaching, social, and cognitive in online education.

Research Measures
Dependent Variable

The dependent variable (satisfaction with *Quality of Instruction*) was measured by students' overall perceptions of the interactions with peers, students, and virtual platform. The term "quality of instruction" ought not to be confused with "effectiveness of learning." "Effectiveness of learning" implies students meeting measurable educational benchmarks in

synchronous online learning. Instead, our data strictly represent student opinions on their experiences in synchronous online learning.

The following items were used to measure this quality of instruction: a) The synchronous online communications are integrated well with other course materials (ex. e-textbooks, supplemental course materials; b) The content of supplemental material outside of video conferencing is well put together and easy to understand; c) The video conferencing sessions are thought provoking; d) The supplemental materials outside of video conferencing sessions are thought provoking; e) The instructor uses additional learning methods to enhance the learning experience during the video conferencing sessions (ex. videos, games, educational online simulations). Each item was measured on a Likert scale of 1-5, with 5 being "strongly agree" to 1 being "strongly disagree." The Cronbach alpha for the items used to measure quality of instruction was 0.9.

Independent Variables

Three independent variables were used in this research. The first was *Interaction with the Virtual Platform* (Videoconferencing). Seven items were used to measure this variable: a) It is easy to access the video conferencing software used in the course (Zoom, Canvas Conference, Microsoft Teams, Cisco WebEx, etc.,); b) It is easy to share my screen in the video conferencing; c) It is easy to enable the video and or audio in video conferencing; d) It is easy to use the chat feature in video conferencing; e) The video conferencing sessions are too long for my attention span; f) It is easy to use emoticons to indicate my engagement in the video conferencing sessions; g) It is easy to use emoticons to express my understanding of the material being covered in the video conferencing sessions. Each item was measured on a Likert scale of 1-5, with 5 being "strongly agree'" to 1 being "strongly disagree." The Cronbach alpha for the items was 0.8.

The second independent variable was *Interaction with Instructors.* Questions used to measure this item were as follows: a) The instructor provides adequate feedback to my questions/ comments in virtual conferencing; b) The instructor is available for virtual conferencing office hours; c) The instructor periodically asks for feedback from students on content comprehension; d) The instructor provides aid to students struggling with navigating the virtual conferencing software; e) The instructor maintains the easy flow of the video conferencing sessions (ex. no awkward silent moments); f) The instructor provides a conducive learning environment where students feel comfortable to express their views and opinions; g) The instructor provides a conducive learning environment where students feel comfortable to ask him/her questions. Each item was measured on a Likert scale of 1-5, with 5 being "strongly agree" to 1 being "strongly disagree." The Cronbach alpha for these items was 0.92.

The third independent variable was *Interaction with Peers.* The following items were used to measure this variable: a) The instructor encourages group discussions and debates in the video conferencing sessions in breakout rooms; b) The instructor allows for individual and/or group presentations in the video conferencing sessions; c) The instructors establish and maintains video conferencing netiquette by telling students to turn on their cameras; d) The instructors establish and maintains video conferencing netiquette by encouraging students to maintain eye contact with the camera when talking; e) The instructors establish and maintain video conferencing netiquette by telling students to mute their microphones when they are not contributing; f) The instructors establish and maintains video conferencing netiquette by telling students to use the chat feature for constructive comments and relevant questions. Each item was

measured on a Likert scale of 1-5, with 5 being "strongly agree" to 1 being "strongly disagree." The Cronbach alpha was 0.8.

Control Variables

Control variables such as age, gender, education, and tenure are paramount to properly understand the relationship between independent and dependent variables. The main control variable in this research was gender. Education and age were not used as control variables because the respondents were all undergraduate students within the age range of 18-25.

As this research controlled for gender, a dummy variable was created that would differentiate between male and female respondents. Male was coded as 1 and 0 if otherwise to see if there was a significant difference between males and females in satisfaction with quality of instruction. Previous research on the effects of gender on online learning outcomes has shown that females achieve higher learning outcomes than men because they exhibit more persistence, engagement, and commitment than males (Richardson & Woodley, 2003). In addition, Alghamdi et al., (2020) concluded that females had stronger self-regulation than males which contributed to better achievement of online learning outcomes. Gender was used as a control variable as similar international studies investigated it as a factor affecting academic success in online liberal courses during COVID-19 (Choi, 2021) and online distance learning (Mohamad, 2020).

Data Analysis

For the quantitative data, we used Ordinary Least Squares regression with robust standard errors to examine the relationship between our dependent and independent variables, and Pearson correlation was also used to assess the strength of the linear association among the variables. The survey was administered to 250 students and 141 completed the survey, thus providing a response rate of 56%. To analyze the open-ended data, we employed thematic analysis which is a flexible approach to analyzing qualitative data. This method allows researchers to identify descriptive themes from data and develop explanations useful for research. To familiarize ourselves with the data, we went through the open-ended responses to questions and noted potential themes.

Results

Table 1 provides the descriptive statistics. About 40% of the respondents were male.

Table 1
Descriptive Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
Quality of Instruction	141	3.42	0.9432	1	5
Video Conferencing	141	3.86	0.6892	1	5
Interaction with Instructors	141	3.93	0.8664	1	5
Interaction with Peers	141	3.12	0.8666	1	5
Gender (Male)	141	0.397	0.4911	0	1

On average, *Quality of Instruction* was 3.42 suggesting a tendency towards agreement. *Interaction with Virtual Platform (Video conferencing)* mean was 3.86. *Interaction with Instructors* had a mean of 3.93. Although, on average, there was agreement among the respondents concerning the relevance of *Interaction with Peers*, their responses were close to neutral as shown by the mean of 3.12.

Table 2
Correlation Table

Variables	1. (QoI)	2. (VC)	3. (II)	4. (IP)	5. Male
1. Index for Quality of Instruction (QoI)	1				
2. Index for Video Conferencing (VC)	0.4433*	1			
3. Index for Interaction with Instructors (II)	0.6956*	0.5428*	1		
4. Index for Interaction with Peers (IP)	-0.1511	-0.0920	-0.1681*	1	
5. Male	-0.1942*	0.0495	-0.0024	-0.1374	1

As shown on Table 2 above, there is a positive correlation between perceptions of *video conferencing* and satisfaction with *quality of instruction* (0.44). Perceptions of *Interaction with Instructors* and satisfaction with *Quality of Instruction* are also positively correlated (0.7). Similarly, there is a positive correlation between *Interaction with Instructors* and *Video Conferencing* (0.54). There is a negative correlation between *Interaction with Peers* and *Interaction with Instructors* (-0.17), and Male and satisfaction with *Quality of Instruction* (-0.19).

Table 3
Regression Results

Variables	Index Quality of Instruction
Index Video Conferencing	0.148
	(0.0910)
Index Interaction with Instructors	0.681***
	(0.0826)
Index Interaction with Peers	-0.0701
	(0.0686)
Male	-0.397***
	(0.116)
Constant	0.550
	(0.403)
Observations	141
R-squared	0.533
Degrees of freedom	4

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

From the regression results, student perceptions of *Interaction with Instructors* were associated with a significant increase of (0.68***) in satisfaction with *Quality of Instruction.* Therefore, an increase in satisfaction with quality of instruction was due to the influence of the perceptions of *Interaction with Instructors.* Thus, Hypothesis 2, which predicted a positive relationship between student perceptions of *Interaction with Instructors* and *Quality of Instruction*, was supported. Another significant result was the control variable (gender). The results showed that being Male was associated with a 40% (0.4) reduction in satisfaction with quality of instruction. In other words, compared to females, males were less satisfied with quality of instruction.

Perceptions of *Interaction with the Virtual Platform* (video conferencing*)* were not significantly associated with satisfaction of *Quality of Instruction*; therefore Hypothesis 1 was not supported, and lastly, students' perceptions of *Interaction with Peers* were not significantly associated with satisfaction of *Quality of Instruction*; therefore, Hypothesis 3 was not supported. A discussion of the results is presented in the next section.

Discussion on Empirical Results

This study examined satisfaction with quality of instruction for synchronous online learning among liberal arts students. More specifically, respondents provided their perceptions of interaction with instructors, peers, and the virtual platform. Our research was guided by the CoI framework which states that the construction of knowledge depends on social, teaching, and cognitive presences. Teaching presence, which relates to feedback, learning activities, and assessments, was incorporated into the research variables *interaction with instructors* and *quality of instruction*, which included questions on feedback and content. Social presence, which relates to communication and collaboration, was incorporated into our research variable *instructor with peers*, which included questions regarding group presentations, group discussions, and netiquette. Cognitive presence is an aggregate of feedback, learning activities, communication, student interaction, and course design, and questions on these were included in our research questions. Student interaction as part of cognitive presence was also incorporated into the variable (interaction on virtual platform), as the ease of use of technology facilitates effective interaction.

Based on the results, student perceptions of *Interaction with Instructors* were positively associated with satisfaction with *Quality of Instruction*. Based on our research measures, when instructors provide adequate feedback on the virtual platform, regularly meet on virtual office hours, periodically ask for feedback from students on content comprehension, and provide a conducive learning environment where students are free to express their views and opinions, satisfaction with quality of instruction increases. This result confirms literature which suggests that successful online learning requires interaction and teaching support that sustains social and cognitive presence (Miller et al., 2014).

The results showed that compared to females, males tend to have lower perceptions of quality of instruction. Previous research on the effects of gender on online learning outcomes has shown that females achieve higher learning outcomes than men because they exhibit more persistence and commitment than males (Richardson & Woodley, 2003). In addition, Alghamdi et al., (2020) concluded that females had stronger self-regulation than males which contributed to better achievement in online learning outcomes.

Hypothesis 1, which predicted a positive relationship between student perceptions of *Interaction with the Virtual Platform* (video conferencing) and satisfaction *Quality of Instruction* was not supported. This result is supported by previous research on video conferencing in synchronous online learning, that has shown both positives and negatives of this mode of instruction. While videoconferencing has been used as an alternative to face-to-face communication during the COVID-19 pandemic, research has found that interpersonal communication behaviors that are shown through video conferencing are unnatural and unsettling for many users (Massner, 2021). In addition, video conferencing platforms have been described by students as exhausting or bringing intense feelings of tiredness. Videoconferencing requires more energy than in-person classes and can affect learning outcomes (Massner, 2021). In their research, Ghazal and Aldowah (2015) note that their students mentioned that virtual conferencing tools could not replace the traditional mode of instruction because of technical problems, including internet connection issues, resulting in the preference of face-to-face classes.

Hypothesis 3 which predicted a positive relationship between students' perceptions of *Interaction with Peers* and *satisfaction with Quality of Instruction* was not supported. This result is contrary to research and theory which have suggested that peer interaction is an essential part of learning (Aghaee & Keller, 2016). According to Rapanta, Botturi, Goodyear, and Koole (2021) student interaction on online platforms predicts successful learning outcomes, as social support is a crucial coping mechanism for students and student interaction creates an active learning environment and helps students develop (Rovai, 2004). Ascough (2002) noted that delivering effective online instruction requires an interactive, collaborative, and multidimensional thinking and learning environment. However, other research has found that student-to-student interaction may be affected because videoconferencing lacks the aspect of personal interaction, and students may miss important facial expressions and body language which are important cues to determine learning effectiveness (Correia et al., 2020; Vandenberg & Magnuson, 2021).

Results From Open-Ended Questions

The survey had two open-ended questions; the first question was, "To what extent do you think synchronous online learning is an effective replacement for the traditional face-to-face instruction?" Of 141 participants, 132 (94%) responded to this question. Responses were categorized under three themes: *effective, not effective, somewhat effective.* A total of 52 of 132 (39%) noted that synchronous online learning was an effective replacement for traditional face-to-face instruction. One participant explained that "It is very effective, because more interaction with the class as a whole is possible via chat and when the board is open for writing." Another indicated the convenience of synchronous online learning by explaining that "It is quick and easy like on the go, and it is easy to work around schedules easier. It also makes it convenient for people who can't travel to the school." Interestingly, another student explained the effectiveness of synchronous online learning by noting that "I feel like I am just as connected in the virtual platform as the actual classroom." Furthermore, another student pointed out that synchronous online learning was so effective that it should remain post COVID-19. It was also noted that effectiveness was dependent on the type of class. For example, one student wrote, "In the classes that don't require a bunch of memorizations or studying, it's great." Overall, students who agreed that synchronous online learning was effective cited reasons of convenience, type of class, and a sense of connectedness with teacher and peers.

Some students (44 of 132, 33%) believed that synchronous online learning was ineffective. For some, it seems a matter of preference for face-to-face instruction and ability to grasp information in a classroom setting, as one student wrote "It is not effective, I prefer learning face-to-face, as it's easier for me to retain information that way." Another issue raised as a reason for ineffectiveness was the inability of faculty members to effectively teach via synchronous online platforms; one student wrote that "Most professors aren't equipped to teach online." Another reason given was the distractions at home, as one student explained that "… at home or in a dorm there are a lot more distractions that you would not have in a classroom. For me personally, even though I tell my family that I am in class, they still try to come in my room and talk to me, it is so much easier not to pay attention when we can control our audio and video." Similarly, another student noted that "it is way easier to zone out and lose focus from the computer screen." Other explanations were that with synchronous online learning, students miss out on hands-on learning, which is provided in a physical classroom. Health concerns were also cited as other reasons; for example, one participant explained that "I have ADHD, bad anxiety, OCD tendencies, and some depression, therefore online learning for me isn't an option." Another concern was missing the college experience; as a student explained, "For me and others I know it has ruined the college experience and replaced motivation with thoughts of just getting the semester over, with not caring if we learn or not." Another student indicated that "The engagement between professor and student is not and cannot be as good via virtual platforms as it is in person. There are student facial and body expressions indicative of confusion or questions, that are identified in a classroom setting but not perceived by professors via Zoom." These explanations shed light on the perceptions of synchronous online learning during the COVID-19 pandemic.

The perceptions of the remaining students (36 of 132, 23%) were that synchronous online learning is *somewhat effective*. Some of the responses were: "It is better for those that can get work done at their pace"; "I think synchronous online learning has the potential to be an effective replacement to traditional face to face. However, many instructors lack the knowledge on how to run a virtual platforms and still make content in the class understood to students"; "I think it helps when you're a visual learner, however, nothing will replace that need for face-to-face learning"; It is a safe option, but it is definitely not a replacement for face-to-face class"; "I don't think it's a great replacement; it hinders learning and group discussion"; "It is an adequate replacement until we can use in person"; "It's a decent replacement, but it still lacks the intimacy of a classroom"; and "I think synchronous online learning is a moderate substitute for in person learning."

The second survey question was, "What kind of recommendations would you make to improve your virtual learning experience in synchronous online courses?" Out of the 141 survey participants, 122 (87%) responded to this question. The responses were categorized under three themes: R*ecommendations*, *No recommendations/changes*, and *End synchronous online learning*. A total of 75 of 122 (61%) students provided recommendations for improving the virtual learning experience. The common recommendation provided by most students was the need for more interaction and engaging classes on the virtual platform. For example, it was noted that, "I think that lectures should be more interactive, since lack of paying attention in an online setting is clearly an issue. For example, I think that most lectures should enforce breakout rooms for students to review the discussed material by themselves and then discuss their review in the main room." Similarly, other students indicated that "Instructors should make class time more fun rather than just lecturing"; "Encourage the use of the chat features and interact with students

via chat, professors do not keep an eye on the chat and ask that students just speak if they have a question. This often leads to crosstalk and disorganization"; "Professors need to learn how to make synchronous online classes more engaging and less monotonous"; "I think it is best to be as interactive as possible while keeping the actual video lectures shorter than typical lectures. Incorporating other interactive sites, quizzes, games etc... is also helpful for student attention span and mental well-being."

Another recommendation was about the length of time spent on the virtual platform. Students noted that it is important to reduce the time spent because their attention span is diminished on a virtual platform. The following responses were recorded: "Reduce the amount of time dedicated to zoom conferences"; "do not have four-hour long classes, students cannot stay focused in their home environment with distractions"; "I noticed around an hour and a half to two hours, my mind would start to stray off and I found it hard to maintain focus throughout the whole lecture, due to any distractions at home"; and "Shorten video conference lengths (it doesn't make sense that a class that is usually an hour long in person goes for 2 hours online)." Some students recommended the need for training about how to use the technology and how to teach on the virtual platform. The following responses were given: "Proper training for professors on how to use Zoom and Canvas, have set office hours that students can pop in to chat with the professor"; "Some teachers aren't ready or built for virtual learning so those instructors need training or to stay in the face to face environment"; and "I do believe the University needs to provide training for professors on the technology used, though it has gotten better there are some instructors who still have challenges. Some students also face challenges with the technology, and it disrupts the flow of the class." It was also recommended that instructors make supplemental resources, such as study materials, PowerPoints, and other documents, available.

Forty-one of 122 (34%) either did not have any recommendations or were content with the synchronous online learning experience. Finally, 6 of 122 (5%) of the participants noted that there should be an end to synchronous online learning. For instance, some students advised the following: "Do not try to compensate with zoom, simply continue like other online only classes"; "Return to face to face"; "bring back in person classes"; "I would recommend everyone to wear their masks and social distance, so we don't have to remain in synchronous online courses." Based on the responses noted above, while synchronous online learning is a good substitute to face-to-face instruction, particularly during the pandemic, it also contains challenges that can impact effective learning and satisfaction with quality of instruction.

Discussion and Implications

Most online learning research has focused on asynchronous learning effectiveness in general terms. This research expands on previous studies and investigates student perceptions of synchronous online learning and satisfaction with quality of instruction specifically in the field of liberal arts. This was the mode of learning widely adopted by educational institutions during the COVID-19 pandemic. As indicated by the literature, taking a deeper look at synchronous online learning in that discipline is especially important considering the nature and mission of liberal arts. Calling for a dynamic learning community featuring liberal teacher-student interactions and a pedagogic environment that is learner centered and filled with vibrant student activities and engagement, and as liberal arts professors ourselves, we felt especially compelled to address the research gap in online learning. The findings from the open-ended questions indicate varied responses concerning student perceptions of synchronous online learning. Besides the positive perceptions and experiences regarding synchronous online learning

noted by students, others noted various challenges or disadvantages. These include faculty preparedness to teach online, time spent on virtual learning platforms, distractions, and technology. Moving forward with synchronous online learning and to fulfill the liberal arts mission, it is important for institutions to ensure that faculty members receive adequate training on the use of technology and effective delivery of classes on a virtual platform, including engaging and interacting with students. When faculty members receive adequate training and learn the skills to teach online it will benefit institutions in the future whenever there is need to transition to synchronous online learning. Another important takeaway from the open-ended responses and recommendations in this study was related to health concerns. Synchronous online learning places all students in one box, disregarding specific health concerns that can affect students from effectively learning. One student noted that because of anxiety and ADHD (a disorder of performance typified by dysfunction and poor self-regulation), online learning is not an option. Since synchronous online learning is affected by distractions and possible technological malfunctions, students with ADHD may be affected. It is recommended that institutions make provisions for students with health concerns, which may deter them from effectively learning on virtual platforms. An example of such an accommodation would be more one-on-one time, like extra tutoring services.

The empirical results showed that interacting with instructors increases satisfaction with quality of instruction. It is therefore important that instructors come up with various strategies to ensure that they interact well with students on the synchronous online platform. Lowenthal, Dunlap, and Snelson (2017) suggested interactive activities such as starting the synchronous online sessions with ice breakers, providing both informal and structured time, and opportunities for students to interact with each other through presentations and discussions.

Limitations and Future Research

The current study is not without limitations. This research focused on undergraduate Liberal Arts and Science students from three Universities in Florida; therefore, the results cannot be generalized to a greater population of students nationwide. In addition, the low response rate limits our analysis and ability to draw causal inferences regarding the relationships among variables. Given the smaller sample size, future research should be conducted with a larger sample of students from a wider geographical scale.

Conclusion

The COVID-19 pandemic saw many institutions of higher learning using synchronous virtual learning as a new platform for disseminating knowledge. The present study examined Liberal Art and Science students' perceptions of synchronous virtual quality of instruction during the pandemic. This study provides valuable information for both researchers and educators in the field by identifying the challenges and making recommendations for virtual classes to ensure a superior learning experience. As discussed in this research, synchronous learning allows students to access instruction from their computers using web conferencing tools and to engage with peers and instructor the same way they would in a traditional classroom setting. In addition, it allows real time sharing of information and learning, and students can instantly communicate with the instructor. From the findings, students noted several advantages of synchronous virtual learning, including convenience, immediate feedback, health safety during the pandemic, and for some, it was a good substitute to face-to-face classes. Recommendations include shortening video conferencing time, providing more faculty training opportunities with instruction on effective

online teaching and interactive and engaging classes, and providing students with more partner or group projects.

Declarations

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

All three participating higher education institutions approved the study. Applicable national and institutional guidelines for the care of use of human subjects in research were followed.

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Appendix A
Data Collection Instrument, Qualtrics Survey Questions

I.   Closed Ended Questions (Scale 1-5; 5 = 'strongly agree' =1 being 'strongly disagree'

Category 1: Interaction with the virtual platform (video conferencing)

1. It is easy to access the video conferencing software used in the course (Zoom, Canvas Conference, Microsoft Teams, Cisco WebEx, etc.)
2. It is easy to share my screen in the video conferencing.
3. It is easy to enable the video and/or audio in video conferencing.
4. It is easy to use the chat feature in video conferencing.
5. The video conferencing sessions are too long for my attention span.
6. It is easy to use emoticons to indicate my engagement in the video conferencing sessions.
7. It is easy to use emoticons to express my understanding of the material being covered in the video conferencing sessions.

Category 2: Interaction with content

1. The synchronous communications are integrated well with other course materials (ex. e-textbooks, supplemental course materials)?
2. The supplemental materials outside of video conferencing sessions are thought provoking.
3. The video conferencing sessions are thought provoking.
4. The content of supplemental material outside of video conferencing is well put together and easy to understand.
5. The instructor uses additional learning methods to enhance the learning experience during the video conferencing sessions (ex. videos, games, educational online simulations).

Category 3: Interaction with instructor

1. The instructor provides adequate feedback to my questions/ comments in virtual conferencing?
2. The instructor is available for virtual conferencing office hours.
3. The instructor periodically asks for feedback from students on content comprehension.
4. The instructor provides aid to students struggling with navigating the virtual conferencing software.
5. The instructor maintains the easy flow of the video conferencing sessions (ex. no awkward silent moments)
6. The instructor provides a conducive learning environment where students feel comfortable to express their views and opinions.
7. The instructor provides a conducive learning environment where students feel comfortable to ask him/her questions.

Category 4: Interaction with peers

1. The instructor encourages group discussions and debates in the video conferencing sessions in breakout rooms.
2. The instructor allows for individual and / or group presentations in the video conferencing sessions.
3. The instructor establishes and maintains video conferencing netiquette by telling students to turn on their cameras.
4. The instructor establishes and maintains video conferencing netiquette by telling students to make eye contact with the camera when talking.
5. The instructor establishes and maintains video conferencing netiquette by telling students to mute their microphones when they are not contributing.
6. The instructor establishes and maintains video conferencing netiquette by telling students to use the chat feature for constructive comments and relevant questions.

II.   Open-ended questions

1. To what extent do you think virtual synchronous learning is an effective replacement for the traditional face-to-face instruction?
2. What kind of recommendations would you make to improve your virtual learning experience in synchronous courses?

Student Satisfaction and the Future of Online Learning in Higher Education: Lessons from a Natural Experiment

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Abstract
Although there is substantial research on the effectiveness of online learning at the individual class level, there is little reliable data on how a shift to a mostly or fully virtual campus would impact undergraduates' satisfaction, engagement, and academic achievement. Until the COVID-19 pandemic, the limited adoption of widespread online learning at selective schools and challenges of selection bias hindered a reliable assessment of such a shift in selective institutions. After the initial period of "emergency remote learning" in 2020, many selective institutions continued widespread online learning in the second year of the pandemic. Treating the expanded deployment of online learning as a natural experiment, the present study assesses the impact of frequent online learning during the spring semester of 2021 on representative samples of undergraduate students at three selective, four-year universities. The study finds that students who participated in classes that met in person at least once a week had higher evaluations of faculty engagement and higher overall levels of academic satisfaction, compared to those who never or rarely participated in an in-person class. This relationship appears less pronounced for Black and Asian students than for White students but does not vary significantly by gender. Although online learning has great potential, these results suggest a need to better understand the conditions that will support an expansion of online learning that can maintain student satisfaction.

Keywords: higher education, student satisfaction, virtual campus, COVID-19

Long before the COVID-19 pandemic made online learning an essential part of college education, the internet and educational technology were disrupting the monopoly of the "brick-and-mortar" classroom (Anglin, 2012; Nguyen, 2015). Scholars and administrators recognized that online teaching had the potential to address the rising costs of postsecondary education and make it more widely available to traditionally underrepresented populations (James, Swan, & Daston, 2016; Jung & Rha, 2000). Some argued that technological developments were undermining the idea of "location-dependent" teaching altogether, pointing the way towards a fully "deconstructed campus," unconstrained by the requirement that members of the campus community be physically present in the same location (Mazoué, 2012; cf. Shrock, 2012). Although there is a substantial body of research on the effectiveness of online learning at the level of individual classes (e.g., Bernard et al., 2004; Lack, 2013; Means, Toyama, Murphy, Bakia, & Jones, 2009; Spencer & Temple, 2021; Xu & Jaggars, 2014), fewer studies have been undertaken to understand how taking *many* of their classes online (versus in-person) affects undergraduates' overall college experience. This research has been hampered both by the limited adoption of widespread online learning, especially among selective, four-year institutions, and concomitant selection bias issues related to the types of students who choose to take online classes.

The onset of the COVID-19 pandemic in 2020 has had profound implications for online learning in higher education. Whether they were prepared or not, higher education institutions had little choice but to embrace online education modalities to a degree that had not been previously considered. For many, the idea of a "virtual campus," where students learn without ever being physically present in the same location, moved from hypothetical to real (Means & Neisler, 2020). The sudden and often haphazard deployment of "emergency remote teaching" during the early phase of the pandemic illustrated the potential of remote learning, as well as its challenges. The emergency use of online modalities did not, however, provide much insight into the efficacy of systematically designed online courses that require longer periods of preparation (Hodges, Moore, Lockee, Trust, & Bond, 2020). Following the initial "emergency," with the threat of the pandemic still open-ended, academic institutions were forced to make more methodical decisions in preparation for the 2020–21 academic year. Based on their experiences during the spring of 2020, institutions had to consider whether and how to use online teaching to mitigate the health threat to students and faculty in the upcoming academic year.

In the spring of 2021, a year after the onset of the pandemic, many students at institutions that had previously made limited use of online learning were still taking most or all their classes online. Because students had little or no choice with respect to the modality of classes or the proportion of online versus in-person classes in their course load for the semester, this situation can be treated as a "natural experiment," mitigating the effects of selection bias with respect to student preferences for online or in personal modalities that have challenged previous research. The present paper leverages this "natural experiment" to study the effects of a shift from a "brick-and-mortar" campus to a largely or entirely virtual campus at selective institutions that had not previously relied on online learning.

The present study compares educational experiences during the spring semester of 2021 among representative samples of undergraduate students at three selective, four-year private universities that made use of online learning to different degrees. Based on the results of previous research (Dumford & Miller, 2018; Paulsen & McCormick, 2020) we hypothesize that participating in a greater number of classes in person (as opposed to online) will be associated with *higher* student evaluations of the pedagogical quality at their university. Our findings

indicate strong support for this hypothesis: students who participated at least once a week in classes that met in person had higher evaluations of faculty engagement at their school and higher overall levels of academic satisfaction, compared to similar students who never or rarely participated in an in-person class. This relationship appears less pronounced for Black and Asian students than for White students but does not vary significantly by gender. These results suggest that the expansion of online learning at selective institutions should be implemented with care to ensure the preservation of existing student satisfaction.

Literature Review

Debates over the effectiveness of online teaching in higher education have been contentious. Much of the empirical literature that reports differences between online and in-person learning has focused on academic outcomes, such as final grades. However, student satisfaction and perceptions of faculty engagement are also seen as critical measures of success for online teaching (Alqurashi, 2019; Moore, 2005) and can be predictors of higher academic performance (Jaggars & Xu, 2016). Some of the studies focusing on academic outcomes have concluded that there are "no significant differences" between online learning and in-person teaching (Bernard et al., 2004; Pei & Wu, 2019; Russell, 1999), while others suggest that online learning is associated with lower academic performance (Lack, 2013; Nguyen, 2015; Spencer & Temple, 2021; Xu & Jaggars, 2014; Zhao, Lei, & Yan, 2005). Research on the relationship between online learning and student satisfaction or engagement is similarly equivocal. Some studies argue that there are few differences between online and in-person modalities in terms of student satisfaction (Dinh & Nguyen, 2020; Yen, Lo, Lee, & Enriquez, 2018), but other studies find that online learners lagged behind in-person students in terms of collaborative learning and interaction with faculty (Dumford & Miller, 2018; Paulsen & McCormick, 2020)

The motivating question for most extant studies is whether holding a particular class online, as opposed to in person, impacts students' perceptions of, or performance in, that specific course. However, translating and integrating knowledge *across* multiple classes, and building connections with study-partners and mentors outside the classroom is also an important component of a student's overall pedagogical experience (Kerr, Tweedy, Edwards, & Kimmel, 2017). Thus, a student's overall educational experience is more than the sum of individual class experiences. Taking a class online is likely to affect students' social relationships with peers, interactions with faculty, and campus support staff, as well as students' performance in and experience of *other* classes on related topics, regardless of whether those other classes are online or not. In the debate over the viability of a "virtual campus" model (Anderson, 2021; Mazoué, 2012; Shrock, 2012), or the widespread adoption of online learning, the increasingly important question is not whether and how taking a particular class online affects a student's experience or performance in *that* class; rather, it is whether or not taking *many* (or all) of their classes online impacts a student's *overall* educational experience at their institution.

Several studies have explored the impact of taking multiple online courses on student engagement using the National Survey of Student Engagement (NSSE). The questions ask about students' *overall* evaluation of several measures of engagement, including interactions with faculty and other students, as well as the deployment of key learning strategies. Some of these studies found that students who took *all* of their classes online had more interactions with faculty than in-person learners, but fewer interactions with peers (Chen, Gonyea, & Kuh, 2008). Other studies suggest that exclusive online learners interact less with faculty and peers (Paulsen & McCormick, 2020). Dumford and Miller (2018) also found that taking a larger proportion of

online courses was associated with lower student engagement across a number of measures, including student-faculty interaction and collaborative learning, although only a small percentage of respondents (7.2%) took *all* of their courses online.

The generalizability of these studies is, however, limited. Many of these studies, and investigations of online learning in general (e.g. Xu & Jaggars, 2014), have been limited to the less selective institutions that have made the most intense use of online teaching (Bettinger, Fox, Loeb, & Taylor, 2017). Other work (James et al., 2016) also suggests that the effects of online learning at community colleges may not be generalizable to other types of institutions. The more limited adoption of widespread online learning at selective four-year institutions (in particular, highly selective private colleges and universities) has meant that there have been few opportunities to study what would happen if these institutions were to expand dramatically the proportion of classes that were taught exclusively online.

At the same time, the frequency of online or in-person classes is unlikely to have a uniform effect, even on students at the same school. Theory and existing evidence strongly suggest that the effectiveness of online learning at the level of individual classes varies by student characteristics including gender, race, and ethnicity (Nguyen, 2015). A number of studies that found a negative association between online learning and academic performance at the level of individual classes also argued that this relationship was more acute for Black and Hispanic students (Figlio, Rush, & Yin, 2013; Xu & Jaggars, 2014), who may face additional barriers to academic success at traditionally White educational institutions (Hurtado, Milem, Clayton-Pedersen, & Allen, 1998). At the same time, similar studies also suggested that online learning may have different effects on the academic performance of male and female students (Brown & Liedholm, 2002; Figlio et al., 2013; Xu & Jaggars, 2014). Spencer and Temple (2021), by contrast, found that the negative relationship between online learning and academic success they identified did *not* significantly vary by race or gender. While these studies examined the impact of demographic characteristics on the relationship between online learning and *academic outcomes*, few, if any, studies have analyzed whether race or gender impacted the relationship between online learning and *student satisfaction or engagement*.

In summary, there continues to be disagreement among researchers about how a shift to a mostly or fully online campus would impact students' perceptions of satisfaction or engagement. Furthermore, there is little or no research exploring whether the positive or negative effects of such a shift would disproportionately impact students of different demographic backgrounds. Explicit investigation of these questions would seem to be a prerequisite to any dramatic expansion of the use of online learning in higher education.

Selection Bias

Attempts to understand the effect of online learning on students' overall educational experience also face persistent challenges in accounting for selection bias about the types of students who choose to take courses online or in person, and the types of courses that are offered in each modality. Although many studies of online learning do not control for selection bias (Nguyen, 2015), it clearly has the potential to influence results, since students are likely to self-select into the course modality that best fits their current situation and learning style. Insofar as this is true, the effectiveness of online learning among students who willingly sought it out may not be a reliable predictor of its effectiveness among students who would have preferred to learn in person (see Morgan & Winship, 2007).

Other work has directly investigated this phenomenon and has tended to find that failing to account for selection bias leads to overestimation of the positive effects of online learning. Anstine and Skidmore (2005) and Coates, Humphreys, Kane, and Vachris (2004) show that failing to account for these selection effects can lead to a substantial overestimation of the effectiveness of online learning relative to in-person learning in terms of academic achievement. Paulsen and McCormick (2020) likewise show that when propensity score matching is used to account for selection effects, many of the positive effects of online learning identified by earlier work with respect to student engagement (e.g. Chen et al., 2008; Rabe-Hemp & Woollen, 2009) diminished in magnitude or disappeared entirely, while negative effects on collaborative learning remained.

Although randomized assignment may be an effective mechanism to control for selection bias at the level of individual classes (see, e.g. Bowen, Chingos, Lack, & Nygren, 2013; Figlio et al., 2013), it is infeasible for studies analyzing the overall effect of taking multiple classes online. Furthermore, even more sophisticated analytic methods such as regression analysis (Dumford & Miller, 2018) or even propensity score-matching (Paulsen & McCormick, 2020) cannot adjust for bias on variables that are unobserved in the data, such as the student's own preference for online or in-person learning styles (Fan & Nowell, 2011; Reiffel, 2020). Thus, the issue of selection bias remains a key challenge for investigating the overall effectiveness of online learning, including dropout, academic achievement, satisfaction, and engagement.

Regardless of whether they were learning online or in person, student experiences during the pandemic were clearly unique. Nevertheless, the deliberate expansion of online modalities by a wide variety of institutions during the second year of the COVID-19 pandemic provided an opportunity to address some of the major limitations in existing research, including reducing the threat of selection bias. The present study thus examines how taking all or most of their classes online during the spring of 2021 impacted students' overall satisfaction with their pedagogical experiences and faculty interactions at their institution. It also explores whether and how this impact varied across student demographic characteristics.

Method

Research Design

In response to the sudden onset of the COVID-19 pandemic during the spring semester of 2020, administrators and faculty were called upon to rapidly deploy "emergency remote teaching" to safeguard the health of community members (Hodges et al., 2020). Many faculty members with little or no prior experience in online teaching were forced to move their classes online, with scant preparation. Notably, this shift was not limited to community colleges or for-profit institutions that had traditionally embraced online learning, but also occurred among highly selective, private, four-year colleges and universities (Vigdor & Zaveri, 2020). Over the summer of 2020, with the pandemic still raging, institutions had to decide proactively how to balance in-person and online modalities for the coming academic year. Unsurprisingly, differences in administrator views about COVID-19 safety, as well as political and budgetary considerations, had a major impact on whether the classes available to students at particular institutions were held online or in person during the 2021–21 academic year (Felson & Adamczyk, 2021). The spring semester of 2021 thus represents a unique opportunity. Unlike the situation in the spring of 2020, where instructors were not given sufficient time to prepare for online instruction (Tsang, So, Chong, Lam, & Chu, 2021), by spring 2021, most faculty and students had nearly a year of practice in adapting to online teaching and learning. At the same

time, the continued threat of the pandemic meant that many students who would previously not have chosen to take online courses were still forced to do so, and many selective institutions that previously made limited use of online learning embraced it, even as they allowed for some classes to take place in person.

This situation provides an imperfect but valuable "natural experiment" that enables us to study the impact of a dramatic expansion in online learning at selective institutions, while reducing the threat of selection bias. In particular, student preferences for online or in-person classes, which have contributed to selection bias in earlier work (Anstine & Skidmore, 2005; Coates et al., 2004), were far less likely to be correlated with students' propensity to take online classes during the 2021 spring semester. Even at schools where students had some discretion about attending classes in person, these decisions were likely influenced more by concerns related to COVID-19, which can be more easily controlled for, than by prior preference for online or in-person learning styles, which are more likely to be strongly correlated with potential outcome variables. By studying multiple schools with different COVID-19 mitigation policies, and by controlling for COVID-19 related concerns, it is possible to use the pandemic to study how a shift to a mostly "virtual" campus affected student perceptions of pedagogical quality at selective institutions that had never previously made widespread use of online learning.

Our focus is on students at three private, selective universities in the northeast United States. Our outcome of interest is students' perceptions of their pedagogical experience. To develop a measure of this construct, we conducted exploratory factor analysis on a set of six questions adapted from the UCLA HERI first-year and senior surveys (Higher Education Research Institute, 2021a, 2021b). Following James et al. (2016), our key independent variable distinguishes between three types of students: those who *never* had in-person classes in spring 2021, those who had in-person classes occasionally in spring 2021, and those who had in-person classes once a week or more in spring 2021. The frequency with which students in spring 2021 had in-person classes was unlikely to have been strongly influenced by traditional confounders related to personal preference and was more likely to be driven by university policy, faculty discretion, and concerns related to COVID-19. Including university fixed effects and controls for concerns about COVID-19, financial stress, and demographic characteristics helps to minimize selection effects associated with student preferences.

Existing research generally analyzes the impact of taking classes online as opposed to in person. However, during the spring of 2021, online learning remained the "default" mode of instruction at many schools, with in-person learning allowed only in particular contexts. As such, we consider in-person learning the "treatment" condition and analyze the impact of taking classes in person as opposed to online. Earlier work that attempts to account for selection bias has generally found that more frequent online learning is associated with lower levels of student engagement across a number of measures (Dumford & Miller, 2018; Paulsen & McCormick, 2020). Considering these results, we hypothesize that taking more classes in person (as opposed to online) will be associated with *higher* student evaluations of the pedagogical quality at their university. These hypotheses are tested using OLS models on the scales developed from the HERI instructional satisfaction questions. We also specify additional models with interaction terms to explore whether, as suggested by earlier research, the effect of in-person learning on student evaluations varies significantly by gender or race/ethnicity (Brown & Liedholm, 2002; Figlio et al., 2013; Xu & Jaggars, 2014).

Data Collection

Data for this study come from online surveys of undergraduate students at three private, selective research universities in the greater Boston area: Brandeis University (Brandeis), Boston College (BC), and Northeastern University (Northeastern).[1] At each school the unique links to the survey were sent to the official ".edu" email addresses of a simple random sample drawn from the population of full-time undergraduate students ages 18 or older enrolled in the 2021 spring semester. The Brandeis and BC surveys were conducted while classes were in session during the 2021 spring semester, while the Northeastern survey was conducted shortly after the end of the semester. Approval for this research was granted by the researchers' home institution's Human Research Protection Program and accepted by the other two institutions.[2]

Students at Brandeis and BC were informed that upon completion of the survey they could choose to receive a $10 Amazon.com gift card or have $10 donated on their behalf to the Greater Boston Food Bank. Due to university policy, respondents at Northeastern were not offered a gift card or a donation option. The response rate (including complete and partial respondents) was 40.2% at Brandeis (achieved N = 817), 20.9% at BC (achieved N = 836), and 8.5% at Northeastern (achieved N = 715). For each school, weights were calculated to adjust for differences between the characteristics of respondents and known characteristics of the undergraduate student body with respect to gender (at all three schools), international student status (Brandeis and Northeastern), and class year (Brandeis only).

All three schools deployed both in-person and online learning modalities during the spring 2021 semester but to different degrees due to differences in university "re-opening" plans announced at or before the beginning of the 2020 fall semester. Brandeis policy required that the "majority" of undergraduate classes be taught online, "with the opportunity for in-person elements of those courses for students who live on or near campus," but also noted that "[s]elect courses will occur primarily in person" (Office of the President, 2020). Northeastern emphasized a more flexible approach whereby "some students will be present in the classroom and others will be participating remotely," with the aid of "a dynamic scheduling tool….[to] allow students to indicate and inform faculty whether they will be participating face-to-face in-class in a given week, or whether they'll attend remotely" (Madigan & Henderson, 2020). At BC, classes were taught "in a mix of in-person, online, and hybrid modes, using Zoom or other technologies," with classrooms "reorganized to ensure social distancing, and…limited to 50 percent capacity" (University Communications, 2020).

Measures

To develop a measure of students' perceptions of the quality of instruction at their university we asked six questions, drawn from the 2021 UCLA HERI senior and first-year surveys (Table 1). We used exploratory factor analysis to create measures of the underlying latent variable or variables driving student responses to these six items. The "satisfaction" item was measured on a four-point scale ranging from "not at all satisfied" to "very satisfied."[3] The

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[1] Following Wolf (2003) and Walford (2005) we have not created pseudonyms for these three institutions in order to allow other researchers to better gauge the external validity of our results. IRB approval for this research was granted by the researchers' home institution and the three universities discussed here.
[2] IRB Protocol #21121R-E.
[3] Because it was part of a bank that asked about other specific issues, this question also included a "not applicable" option. Approximately 1% of respondents chose this option for the satisfaction question and were excluded from the analysis.

remaining items were measured on a five-point scale, ranging from "never" to "all the time." Because of the difference in measurement scales, all variables were z-scored prior to being entered into exploratory factor analysis.

Table 1
Pedagogical Quality Questions

Please rate your satisfaction with your school's overall quality of instruction.
This semester how often have you felt that your courses inspired you to think in new ways?
This semester how often have you felt that faculty provided you with feedback that helped you assess your progress in class?
This semester how often have you felt that your contributions were valued in class?
This semester how often have you felt that faculty encouraged you to ask questions and participate in discussions?
This semester how often have you felt that you were bored in class? (reverse coded)

To measure students' experiences with in-person/online teaching we asked students: "Thinking about all of your classes THIS SEMESTER, how often did you participate in a class in person?" with options of "never," "1–2 times during the semester," "once a month," "2–3 times a month," and "at least once a week."[4,5] The effects of the different policies related to online and in-person instruction discussed above can be clearly seen in the different frequencies of in-person learning reported by students at different schools (Table 2). At none of the schools was weekly in-person classes *or* completely online learning universal, limiting the danger of multicollinearity between modality and school. Following James et al. (2016), responses to the question regarding frequency of online instruction were collapsed into three categories: never, more than once a semester but less than once a week, and at least once a week. This is a fairly coarse measure of the amount of in-person/online learning students experienced during the semester and does not, for example, distinguish between students who had all of their courses taught fully in-person at every class and those who only had a single course that met in person each week. Nor does it distinguish between different class types, subject matters, or different types of online instruction (e.g., asynchronous versus synchronous). As such, the measure is likely to produce a conservative estimate of differences between online and in-person learning during this semester. All models also control for student characteristics that could confound the relationship of interest. This includes the student's maximum class size, class year, housing situation, four-point ordinal questions measuring level of concern about becoming hospitalized with COVID-19 or spreading COVID-19 to others,[6] race/ethnicity (White, Hispanic, Black,

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[4] This question was asked as part of a larger bank, which also asked students how frequently they watched pre-recorded lectures, watched virtual lectures delivered live, or participated in small group virtual discussions in a breakout room.

[5] In the Northeastern survey the question wording was adjusted to refer to the "SPRING SEMESTER."

[6] Answer options for both questions were "not at all concerned," "not too concerned," "somewhat concerned," and "very concerned."

Asian, other),[7] gender, and an index of financial stress.[8] All models also include dummy variables for schools, which control for any unobserved differences between schools that could bias results.

Table 2

Frequency of In-person Instruction by School

	Brandeis	**BC**	**Northeastern**	**Total**
Never	55%	10%	44%	34%
1–2 times during the semester	3%	4%	13%	8%
Once a month	4%	2%	5%	4%
2–3 times a month	5%	7%	10%	9%
At least once a week	33%	77%	28%	46%
Total	100%	100%	100%	100%
Unweighted N	803	836	546	2185

Note. Weighted percentages.

Results

Factor Analysis

To develop a measure of student perceptions of the pedagogical quality of their academic experience exploratory factor analyses were conducted on the z-scored versions of the six items adapted from the UCLA HERI survey (Table 1). A scree plot of unrotated eigenvalues recommended a two-factor solution. After orthogonal varimax rotation, the first factor explained 26% of the common variance, while the second factor explained 17%.[9] Table 3 presents loadings and variances for the rotated solution. Based on the rotated factor loadings, Factor 1 is interpreted as *perceived faculty engagement*, since it is primarily measured by questions concerning the faculty's responsiveness and encouragement. Factor 2 is interpreted as a measure of *overall academic satisfaction*, since it is primarily measured by items related to the overall quality of courses at the students' institutions, including satisfaction with the quality of instruction, whether students were often bored, and whether their classes inspired them to think in new ways. These results were used to calculate regression-based factor scores to serve as measures of both latent constructs. Table 4 presents descriptive statistics of the two resulting measures.

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[7] The "other ethnicity" category includes American Indian, Middle Eastern, Pacific Islander and "other" ethnicities. Respondents were also offered the opportunity to select multiple racial/ethnic identities. Respondents who selected multiple identities were sorted into mutually exclusive categories using the following hierarchy: Black, Hispanic, Asian, other, White. This means that only those respondents who identified exclusively as "White" were coded as white, while all respondents who identified as "Black" were coded as Black, regardless of whether they also identified as another racial/ethnic group.

[8] The financial stress index represents the average of two question that relate to the financial situation of respondents during the semester: "To what extent were your financial obligations a source of stress?" and "To what extent was the financial situation of your immediate family a source of stress?" Response options for both questions were along a four-point ordinal scale ranging from "not at all" to "very much."

[9] Proportion of common variance calculations use the trace of the reduced correlation matrix as the denominator.

Table 3
Rotated (Varimax) Factor Loadings

	Factor 1	Factor 2
	Faculty engagement	*Academic satisfaction*
Variance	1.5764	1.01174
Proportion	0.2627	0.1686
Encouraged to ask questions and participate in discussions	0.6367	0.2756
Your contributions were valued in class	0.6306	0.3303
Faculty provided you with feedback	0.5903	0.3408
Inspired you to think in new ways	0.5376	0.4665
Bored in class	0.2206	0.504
Overall quality of instruction	0.2954	0.4888

Table 4
Descriptive Statistics for Constructed Variables

	Min	Max	Mean	Std. Dev.	N
Faculty engagement	-2.114	1.506	0	0.76	2,123
Academic satisfaction	-1.683	1.244	0	0.64	2,123

OLS Models

For each hypothesis, separate OLS models were run for the two latent constructs identified by the factor analysis—perceived faculty engagement and academic satisfaction. Table 5 presents models testing the overall relationship between the frequency of in-person learning and each construct. The models show that students who participated in an in-person class at least once a week had significantly more positive evaluations of faculty engagement and significantly higher overall academic satisfaction, compared to those who only occasionally participated in an in-person class ($p < .001$). For both outcomes, the estimated positive impact of participating in an in-person class at least once a week was approximately 0.4 standard deviations on the underlying scale. Students who never participated in an in-person class did not have significantly different scores on either outcome, compared to those who only occasionally participated in an in-person class.

In both models, concerns about becoming hospitalized with COVID-19 or spreading it to others were non-significant, as were school fixed effects, housing situation, and gender identity. Having a maximum class size of 30 students (as opposed to 50+) was associated with higher scores on both outcome measures, while financial stress was negatively associated with both measures. Black students had significantly higher evaluations of faculty engagement compared to White students. Asian students had significantly higher levels of satisfaction compared to White students, although the magnitude of this effect was small. Sophomore and junior students reported lower levels of satisfaction compared to first-year students, and juniors reported significantly lower perceptions of faculty engagement compared to first-year students.

Table 5
OLS Models of Faculty Engagement and Academic Satisfaction

		Model 1: Faculty engagement		Model 2: Academic satisfaction	
		Coef.	Robust SE	Coef.	Robust SE
In-person classes	Never	0.09	0.075	0.06	0.064
	Once time in semester/3 times a month	---	---	---	---
	At least once a week	0.29**	0.066	0.25**	0.055
Concern about spreading COVID		0.03	0.027	0.03	0.023
Concern about being hospitalized with COVID		0.00	0.028	0.04	0.024
Maximum class size	0–30	0.16*	0.058	0.15**	0.046
	31–50	0.06	0.053	0.01	0.045
	51 and more	---	---	---	---
Class year	First-year (1st year)	---	---	---	---
	Sophomore (2nd year)	-0.05	0.062	-0.15**	0.047
	Junior (3rd year)	-0.19*	0.069	-0.25**	0.056
	Senior (4th year)	-0.04	0.066	-0.10	0.053
Housing	School-controlled housing	-0.06	0.056	-0.06	0.045
	Off-campus	---	---	---	---
Race/ Ethnicity	Hispanic	0.06	0.080	0.03	0.068
	Black	0.32**	0.093	-0.01	0.065
	Asian	0.05	0.052	0.09*	0.045
	Another ethnicity	0.05	0.142	-0.01	0.114
	White	---	---	---	---
University	Brandeis University	---	---	---	---
	Boston College	-0.09	0.050	-0.01	0.041
	Northeastern University	-0.08	0.050	0.00	0.040
Gender	Man	-0.05	0.045	-0.04	0.037
	Woman	---	---	---	---
	Prefer to identify in a different way	0.05	0.107	0.13	0.089
Financial stress index		-0.08*	0.025	-0.07**	0.020
	Constant	0.02	0.124	-0.04	0.099
	R^2	0.05		0.071	
	N	2,051		2,051	

Note. ** $p < 0.001$, * $p < 0.05$.

Additional models of each outcome variable that include interactions between frequency of in-person classes and either race/ethnicity (Table 6) or gender identity (Table 7) are also presented.[10] The results of the interactions with race/ethnicity suggest that the effects of participating in frequent in-person classes were significantly moderated by race. In the model of faculty engagement, the interaction terms for participating in an in-person class at least once a week (as opposed to occasionally) and identifying as Black, Asian, or other ethnicity (as opposed to White) were negative and significant, although the interaction term for Hispanic students was not significant. This indicates that the positive relationship between frequency of in-person classes and perceptions of faculty engagement was significantly smaller for non-White, non-Hispanic students, than for White students. Notably, the absolute value of the interaction term coefficients for these students (.60 for Black students, .47 for Asian students, and .89 for other ethnicities) were of comparable magnitude to that of the main effect for White students (.51), suggesting that for Black, Asian, and other ethnicity students, the association between frequent in-person classes and perceptions of faculty engagement was negligible. A similar dynamic for Asian students is evident in the model of academic satisfaction, suggesting that these students realized a significantly smaller benefit from frequent in-person classes compared to White students. The coefficients for the interaction terms between frequency of in-person classes and gender, by contrast, were not statistically significant in either model (Table 7), indicating that the positive relationship between taking in-person classes once a week (as opposed to occasionally) and both outcomes was not significantly different for male students, or those who identified as neither male nor female, compared to female students.

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[10] To aid readability, the coefficients for control variables are not reported. Full model results available upon request.

Table 6

OLS Models of Faculty Engagement and Academic Satisfaction with Interactions Between In-person Classes and Race/Ethnicity

		Model 3: Faculty engagement		Model 4: Academic satisfaction	
		Coef.	Robust SE	Coef.	Robust SE
In-person classes	Never	0.25*	0.100	0.19*	0.082
	Once time in semester/3 times a month	---	---	---	---
	At least once a week	0.51**	0.085	0.41**	0.072
Race/Ethnicity	Hispanic	0.19	0.181	0.29	0.206
	Black	0.73**	0.189	0.22	0.150
	Asian	0.38*	0.134	0.31*	0.110
	Another ethnicity	0.66*	0.298	0.35	0.214
	White	---	---	---	---
In-person classes x Race/Ethnicity	Never*Hispanic	-0.12	0.258	-0.29	0.234
	Never*Black	-0.45	0.253	-0.21	0.177
	Never*Asian	-0.34*	0.158	-0.21	0.128
	Never*Another ethnicity	-0.62	0.394	-0.52	0.278
	Never*White	---	---	---	---
	At least once a week*Hispanic	-0.19	0.202	-0.35	0.216
	At least once a week*Black	-0.60*	0.216	-0.38*	0.169
	At least once a week*Asian	-0.47**	0.148	-0.32*	0.124
	At least once a week*Another ethnicity	-0.89*	0.331	-0.44	0.270
	At least once a week*White	---	---	---	---
	Constant	-0.15	0.131	-0.17	0.108
	R^2	0.075		0.082	
	N	2,051		2,051	

Note. Coefficients for concerns about COVID, maximum class size, class year, housing, financial stress, university fixed effects, and gender omitted. ** $p < 0.001$, * $p < 0.05$.

Table 7

OLS Models of Faculty Engagement and Academic Satisfaction with Interactions Between In-person Classes and Gender

		Model 5: Faculty engagement		Model 6: Academic satisfaction	
		Coef.	*Robust SE*	*Coef.*	*Robust SE*
In-person classes	Never	0.02	0.076	0.04	0.062
	Once time in semester/3 times a month	---	---	---	---
	At least once a week	0.17*	0.066	0.19**	0.057
Gender	Man	-0.19	0.113	-0.12	0.101
	Woman	---	---	---	---
	Prefer to identify in a different way	-0.11	0.281	0.13	0.206
In-person classes x Gender	Never*Man	0.12	0.141	0.05	0.118
	Never*Woman	---	---	---	---
	Never*Prefer to identify in a different way	0.14	0.311	-0.03	0.245
	At least once a week*Man	0.21	0.126	0.12	0.110
	At least once a week*Woman	---	---	---	---
	At least once a week*Prefer to identify in a different way	0.32	0.338	0.03	0.235
	Constant	0.08	0.123	-0.01	0.102
	R^2	0.0525		0.0725	
	N	2,051		2,051	

Note. Coefficients for concerns about COVID, maximum class size, class year, housing, financial stress, university fixed effects, and race/ethnicity omitted. ** $p < 0.001$, * $p < 0.05$.

Discussion

In line with our hypotheses, students across the three universities who had in-person classes at least once a week reported higher levels of faculty engagement and academic satisfaction, compared to those who only had in-person classes occasionally. After controlling for student backgrounds and school-level differences, there was an approximately 0.4 standard deviation increase on both measures for those who participated at least once a week in an in-person class. The size and significance of these effects are notable given the limitations of our measure of online/in-person learning experiences, which merely indicates whether students participated in an in-person class at least once per week as opposed to only a few times per semester.

We also find no significant difference between those who never participated in an in-person class and those who did so only occasionally, suggesting that holding in-person classes only a few times a semester does not confer the same benefits to students as holding them weekly. As discussed below, both online and in-person learning environments during the second year of the COVID-19 pandemic were clearly distinctive. Yet, the fact that the disruptions of the pandemic took many of the decisions about whether to take a class online or in person out of the hands of students suggests that these results are less likely to be biased by the selection effects impacting earlier research. Perhaps surprisingly, the dummy variables for schools were not

significant in any models, indicating that, after accounting for other factors—including differences in the proportion of students who had frequent in-person classes and differences in the demographic make-up of the student population at each school—students at these three schools did not significantly differ in their average levels of academic satisfaction or perceptions of faculty engagement.

This study is one of very few efforts to explore the effect on students of taking many online classes at highly selective, private, four-year institutions. Nevertheless, our findings are in concordance with earlier results indicating that online learning is associated with lower levels of student engagement at public and less selective four-year institutions (Dumford & Miller, 2018; Paulsen & McCormick, 2020). We also found that differences in student satisfaction and engagement associated with online learning were significantly moderated by race/ethnicity, as suggested by earlier work on the relationship between online learning and academic performance outcomes (but contrary to the findings of Spencer and Temple (2021)). However, while Xu and Jaggars (2014) and Figlio et al. (2013) found that differences in academic outcomes between online and in-person learning were larger for non-White students compared to White students, we find that differences in student satisfaction and engagement were significantly *smaller* for Black and Asian students (and those of other ethnicities) compared to White students. This suggests that the positive relationship between in-person learning, and student perceptions of academic satisfaction and faculty engagement was concentrated among White and Hispanic students. Regarding gender identity, we found no significant interaction for either outcome, suggesting that the positive effect of frequent in-person learning was of similar magnitude for male and gender non-binary students as for female students.

In addition to differences in our outcome variable of interest, there are other reasons why care should be taken in comparing our results regarding the moderating impact of race/ethnicity on student perceptions with earlier studies of the differential impact of online learning across demographic characteristics. Most notably, the Black and Asian students who attend selective four-year institutions may come from different socioeconomic backgrounds and face different challenges, compared to Black and Asian students who attend the community colleges studied by Xu and Jaggars or the large, public, land-grant university studied by Spencer and Temple. It should also be noted that Black and Asian students at elite schools, especially those who are first-generation college students, may have dramatically different *expectations* about faculty engagement compared to White students. At the same time, creating a healthy and welcoming campus climate for students from marginalized racial or ethnic backgrounds remains a challenge for traditionally White higher education institutions (Hurtado et al., 1998; Park, 2009). Even if online learning can provide additional flexibility and opportunities to these students, more research is needed to ensure that a shift to a largely or fully virtual campus does not raise further barriers to the formation of robust social connections within and across racial and ethnic identities on campus.

Although the spring semester of 2021 provided a "natural experiment" that helped reduce the threat of selection bias, the pandemic still potentially limits the external validity of the study. While faculty in the schools included in our study had over a year to prepare for teaching their courses online, it seems inarguable that more robust preparation and training could mitigate some of the disparities identified by our analyses. More broadly, the pandemic limited the extent to which online teaching during this semester could be effectively integrated into a broader educational ecosystem that could support students effectively (Hodges et al., 2020).

At the same time, the disruptions of the pandemic were not limited to the expansion of online teaching modalities; they also affected teaching and learning at classes that were held in person. Restrictions related to testing, masks, and social distancing inarguably hampered the enjoyment and quality of in-person learning relative to a "typical" semester, in which students and faculty could congregate freely in classrooms, offices, or other physical locations on campus. The fact that, even with such restrictions, attending a single in-person class as rarely as once a week was associated with a substantial increase in student evaluations of the *overall* academic quality of their entire institution suggests that, even in a "typical" year, in-person teaching has substantial value at selective institutions.

Implications for Online Education

In innumerable ways, the pandemic demonstrated the important role online learning has come to play in higher education, including at selective schools that had previously eschewed widespread adoption. Regardless of its efficacy in comparison to in-person learning, it seems likely that, in some form, online learning will be an increasingly important part of the future of higher education, especially because of its potential to facilitate greater access and flexibility for marginalized student populations. Existing research strongly indicates that the effectiveness of online learning varies for different types of classes, different types of students, and different types of schools, and whether online classes are taken exclusively or in combination with in-person classes. Thus, the question facing administrators, as well as faculty, is not whether to make use of online learning, but how to use it most effectively and promote students' educational development.

This paper treats the continued disruptions of the pandemic as an opportunity to study the impact of a particular way that online learning might be deployed in higher education: a dramatic shift away from "brick-and-mortar" classrooms in favor of online teaching modalities at selective, four-year institutions. Our results suggest that more selective institutions should carefully examine the conditions that could support such a shift while continuing to maintain student satisfaction. Future work should continue to explore how the effects of online learning depend on context and implementation, while appropriately accounting for selection bias and including data from students at different types of institutions. This work can provide a more nuanced understanding of some of the situations under which online learning can be deployed with the most benefits and fewest costs.

Declarations

The authors declare no conflicts of interest.

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Establishing a Student Evaluation of Online Teaching and Learning Framework Through Analysis of Existing Instruments

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Abstract

This study aims to establish a framework for student evaluation of online teaching and learning (SEOTL) through an analysis of SEOTL instruments implemented by universities and colleges. From a list of 131 R1 and 135 R2 institutions, we searched, reviewed, and identified 27 instruments for student evaluation of online teaching. A five-dimensional evaluation framework with 24 categories of elements was developed through an analysis of these instruments. There were 278 evaluation elements among the 27 instruments. We found that most instruments focus more on the Course and Instructor dimensions, with Instructor Facilitation and Learning Goals and Objectives elements occurring most frequently. However, Organization and Technology dimensions with Advising Availability and Adequacy, Registration Procedures, Support Services, and Online Help Desk elements were least included. This study has implications for administrators, instructors, instructional designers, and students.

Keywords: Student evaluation, online teaching and learning, instrument development and validation

The sudden shift in course delivery modality to a fully online learning environment in response to the COVID-19 pandemic has cemented online learning as one of the essential forms of education. As such, many more university faculty members are currently teaching online and will continue to do so. One necessary component of the online modality is evaluation of online teaching. Measuring the quality of online teaching is an essential step in continuous improvement of online teaching which enables better monitoring of efforts to increase student learning and engagement and develop faculty expertise. In many higher education institutions, faculty members are mandated to participate in course evaluations of their online teaching as part of their evaluation process. Though online teaching has been occurring for decades, universities often do not have a differentiated evaluation measure for online teaching and learning (Berk, 2013; Rothman et al., 2011). As such, faculty members, educational program directors, administrators, and online learning researchers are likely to utilize inadequate measures to assess the effectiveness of online courses and programs. Given recent growth in educational programs and research on interventions geared toward improving online teaching and learning outcomes, improved evaluation instrument is a pressing need.

Student evaluation of teaching is one measure used to inform both formative and summative decision making and assists educators in several important ways (McMahon et al., 2007). For example, better instruments are needed to support ongoing efforts to improve and assess online teaching quality. Student course evaluations play an essential role in the ongoing maintenance and improvement of courses for promoting student success, which factors into program and university measures of retention and progression. Additionally, they serve as an important evidentiary source for personnel management such as the reappointment of adjunct and clinical faculty as well as tenure and promotion decisions. However, if evaluation-based educational ratings data are used for high stakes decision making, then more research is needed to support the validity of such measures (Harris et al., 2014). Current research on student perceptions of online teaching effectiveness has relied on general questions which do not consider the complex, systemic nature of online courses (Lowenthal et al., 2015).

Given the accepted practice of using quantitative student evaluations of teaching in Western cultures (Darwin, 2017) and their increasing use for high-stakes evaluation of teaching effectiveness (Kogan, 2014), there is a need to advance the evaluation of teaching for the online modality to consider the full scope of factors contributing to teaching and learning. Due to the unique nature of online teaching (Stewart et al., 2004; Martin, Sun, et al., 2020), existing evaluation systems for online teaching must be expanded to measure and report on the relevant dimensions associated with online teaching effectiveness. In the present study, the research team aims to synthesize existing student evaluations of online teaching instruments and report existing practices by identifying evaluation dimensions and elements. Through this study we also aim to synthesize existing practices into a theoretical framework for online teaching and learning as a necessary first step in establishing a basis for future instrument development and use.

Literature Review

Student Evaluation of Teaching

Student evaluation of teaching instruments measures perceptions of course and/or instruction. The first implementation of student evaluation of teaching in universities dates to the 1920s (Galbraith et al., 2012). Evaluation results can be used for both formative and summative purposes. Course instructors use the evaluation results to improve their teaching (Spooren et al.,

2013). Institutions and universities also utilize evaluation results to implement administrative and personnel decision making such as hiring and promotion of faculty members (Spooren et al., 2013) based on the assumption that highly rated instructors produce positive learning outcomes among learners.

There is a general agreement that teaching is a multifaceted and complex practice which needs to be evaluated from multiple dimensions (Spooren et al., 2013). Chickering and Gamson (1987) noted that teaching practices that contribute to student success included student-faculty contact, cooperation among students, active learning, prompt feedback, time on task, high expectations, and respect for diverse talents and ways of learning. However, no consensus exists on the number and content of the dimensions. Spooren et al. (2013) reviewed research on student evaluation of teaching (SET) in the context of higher education and found the factor numbers in SET instruments ranging from two to twelve. For example, Students' Evaluations of Educational Quality (SEEQ; Marsh et al., 2009) has nine factors (i.e., Learning/Value, Instructor Enthusiasm, Organization/Clarity, Group Interaction, Individual Rapport, Breadth, Exam/Graded Materials, Readings/Assignments, and Workload/Difficulty) and two overall ratings (i.e., overall ratings of the course and the teacher), whereas Student Instructional Report (SIR II; Centra, 1993) has six factors (i.e., Course and Planning; Communication; Faculty/Student Interaction; Assignments, Exams, and Grading; Course Outcomes; Student Effort and Involvement) and one overall evaluation item.

Student evaluation of teaching was considered a valid measure for teaching effectiveness and research has been conducted on the validity and reliability of student evaluation of teaching instruments (Onwuegbuzie et al., 2009). Cohen (1981) made an initial effort to examine the relationship between student ratings of instruction and student achievement by conducting a meta-analysis. Both overall course evaluations and overall instructor evaluations were highly and significantly correlated with student achievement in this meta-analysis. Here, overall course evaluations and overall instructor evaluations refer to the overall effectiveness concerning course dimension (e.g., This course is an excellent course), and teaching and instructor dimension (e.g., This instructor is an excellent instructor), respectively. However, this meta-analysis was not specific to online teaching.

A few researchers have examined student evaluations of online teaching based on student and instructor characteristics. Seok et al. (2010) found female students had statistically significantly higher perceptions of the effectiveness of online courses in six subscales (i.e., user interface, getting started, technical assistance, communications, online instructional design, and content). Researchers further noted that students' native language was a factor associated with online course evaluation. There were also statistically significant differences among students with varying educational levels in the rating of instructional design and content. In addition, Carle (2009) employed multilevel growth models to examine student evaluations of teaching effectiveness across time, instruction modes (i.e., online and face-to-face), and faculty characteristics (i.e., gender, ethnicity, tenure status). Data collected from 10,392 classes across three years revealed that although students tended to rate minority instructors significantly lower in face-to-face classes, no statistically significant differences in students' ratings were found between white instructors and minority instructors in online classes. Similarly, in another study, Weinkle et al. (2020), when studying 163 undergraduate students from six institutions and 21 graduate students from one institution, found no statistically significant differences in instructor evaluations across older male, older female, younger male, and younger female instructors. Feistauer and Richter (2018), examining the validity of student evaluations of teaching, found

that likeability had a substantial bias on student evaluation of teaching and prior subject introduced a weak bias. These findings show that there are variations in student perceptions and each student might interpret the criteria differently when evaluating online teaching.

Instruments on Students' Perceptions of Online Teaching

While there is a large body of research on the student evaluation of teaching, only a few studies focus on the development and validation of instruments specifically designed for online teaching and learning. Table 1 provides an overview of the literature on the development and validation of student evaluation of online teaching.

The Student Evaluation of Online Teaching Effectiveness (SEOTE) developed by Bangert (2004) was among the initial endeavors to measure student perceptions of online teaching quality based on the framework of Seven Principles of Effective Teaching (Chickering and Gamson, 1987). This instrument has four factors (i.e., student-faculty interaction, active learning, time on task, cooperation among students) with 26 items. Bangert (2005; 2006; 2008) conducted a series of studies and provided evidence for content validity and internal consistency reliability (Cronbach's alpha ranging from .80 to .95). Specifically, a principal component factor analysis and a confirmatory factor analysis revealed a satisfactory global fit of the four-factor model to the data with various samples of undergraduate and graduate students, providing validity evidence based on internal structure.

In the same year, Stewart et al. (2004) constructed the Questionnaire for Student Evaluation of Web-Based Instruction following four steps: initial instrument development, data collection, validation, and final instrument development. This instrument has 44 items in seven elements. Multiple sources of validity were evidenced. Consultations with four content experts provided validity evidence based on content. Responses from 1,405 participants showed high internal consistency measured by Cronbach's alpha (ranging from .75 to .92). The seven-dimensional construct (i.e., instructor and peer interaction, technical issues, appearance of Web pages, hyperlinks and navigation, content delivery, online applications, class procedures and expectations) also displayed empirical support for the internal structure-based validity based on factor analyses.

Studies were also conducted to develop and validate measures for distance teaching. Cheung (1998) identified four factors (i.e., student development, assessment, learning materials, face-to-face components) after a review of existing literature and instruments on distance teaching evaluations. This instrument demonstrated a set of good psychometric properties. Specifically, the instrument was found to have high reliability with respect to interrater reliability (ranging from .759 to .893) and internal consistency reliability (ranging from .824 to .948). A hierarchical confirmatory factor analysis resulted in a satisfactory fit of the four-factor model to the data (e.g., RMSEA = .053, GFI = .90, & CFI = .92). Similarly, Roberts et al. (2005) developed an instrument to evaluate distance education courses based on the methods proposed by Biner (1993), which consists of four procedures: item generation, dimension identification, essential item selection, and instrument writing and presenting. With this measure, students assessed the instructor, overall course effectiveness, and specific technical dimensions of distance education on a five-point Likert scale.

Through a thorough review of literature on best practices in online learning, Rothman et al. (2011) developed a survey measuring students' perceptions of online courses. This instrument consists of six factors (i.e., appropriateness of readings and assignments, technological tools, instructor feedback and communication, course organization, clarity of outcomes and

requirements, content format) with 25 items. Satisfactory evidence for reliability (Cronbach's alpha = .98) was reported.

Most recently, Blackman et al. (2019) developed the Online Teaching Effectiveness Scale (OTES) based on a review of literature on measures of online teaching effectiveness. OTES measures student perceptions of online teaching effectiveness in four aspects (i.e., presence, expertise, engagement, facilitation). Multiple sources of validity and reliability evidence of OTES was provided by Reyes-Fournier et al. (2020). Satisfactory internal consistency reliability (ranging from .68 to .95) and test-retest reliability (ranging from .74 to .89) were found with a sample of undergraduate and graduate students. Confirmatory Factor Analysis resulted in a satisfactory fit of the four-factor model to the data (RMSEA = .143, CFI = .912). Validity based on relations to other variables was evidenced by the significant and positive relationship between expertise and course grade ($r = .1$, $p = .05$). However, course grade did not significantly correlate with the other three dimensions.

Although a few instruments have been developed to be utilized for SEOTL, the review of the relevant literature suggests that most of the existing instruments on student evaluations of online learning are over ten years old. Besides, the most recent instrument (Reyes-Fournier et al., 2020) focuses only on the dimensions of instructor, course, and student without paying attention to Organization or Technology dimensions, which are important factors pertaining to the student experience in the online learning environment. Thomas and Graham (2017) reviewed literature on online instructor evaluation and found instruments of student evaluation of online instructors focused on two dimensions (i.e., course and instructor) and eight categories of elements (i.e., learner-instructor interaction, instructor expertise, student-student interaction, assignments are meaningful, clear expectations and instructions, technical concerns, visual design and function of the course, effective use of technological tools).

Table 1

Literature on the Development and Validation of Student Evaluation of Online Teaching Instrument

Measures	Authors	Theory	Factor	Dimension	# Items	Scale
Student Evaluation of Online Teaching Effectiveness (SEOTE)	Bangert (2004; 2005; 2006; 2008)	Seven Principles of Effective Teaching (Chickering & Gamson, 1987)	student-faculty interaction, active learning, time on task, cooperation among students	Learner Course Instructor	26	6-point Likert scale

Student Evaluation Instrument for Distance Teaching	Cheung (1998)		student development, assessment, learning materials, face-to-face components	Learner Course Instructor	35	5-point Likert scale
Online Teaching Effectiveness Scale (OTES)	Reyes-Fournier, et al. (2020); Blackman et al. (2019)		presence, expertise, engagement, facilitation	Instructor	12	
An instrument to evaluate distance education courses	Roberts et al. (2005)	Biner (1993)	instructor, overall evaluation, specific technical dimensions of distance education, student background, open-ended questions	Learner Course Instructor Technology Organization	20	5-point Likert scale
Students' Perceptions of Online Courses	Rothman et al. (2011)		appropriateness of readings and assignments, technological tools, instructor feedback and communication, course organization, clarity of outcomes and requirements, content format	Course Instructor Technology	25	5-point Likert scale
Questionnaire for Student Evaluation of Web-Based Instruction	Stewart et al. (2004)	Driscoll (1998) and Khan (1997)	instructor and peer interaction, technical issues, appearance of Web pages, hyperlinks and navigation, content delivery, online applications, class procedures and expectations	Learner Instructor Course Technology	44	5-point Likert scale

Comparing Evaluations of Online with Face-to-Face Courses

Several studies compared student evaluations of online courses with those of face-to-face courses or blended courses, and mixed findings were noted. First, instructors received different ratings across modalities of course delivery. Lowenthal et al. (2015) analyzed student evaluations of face-to-face and online courses at a university over seven years, and found online instructors were rated statistically significantly lower in each item of the End-of-Course Evaluation Questions (i.e., Course Overall, Instructor Overall, Grading Fairness, Instructor Access, Workload, and Course as Learning Experiences) compared with their ratings of face-to-face courses. This finding, however, contradicted other studies (e.g., Carle, 2009; Liu, 2006). Carle (2009) conducted multilevel analyses with 10,392 classes at a university over three years and found no statistically significant differences in student ratings of teaching effectiveness between the two modes of instruction. Moreover, online course evaluation had lower completion rates compared with face-to-face courses. Online teaching and learning are distinct from face-to-face teaching and learning in other aspects. Martin, and Sun, et al. (2020) conducted a systematic review of literature on online teaching and learning and highlighted the significant role of infrastructure to promote engagement and success, including organizational resources and technology for each course-specific participant.

Existing student evaluations of online teaching instruments are either more than 10 years old or, more recently, focus only on one dimension (e.g., instructor). With an increase of online courses in higher education, there is a need to conduct a review of the instruments for student assessment of online teaching and learning, based on which a multidimensional online course evaluation framework can be constructed. The current study aims to establish a student evaluation of online teaching and learning framework from analyzing existing online course evaluation instruments implemented by universities and colleges. The research questions guiding the current study are as follows:

1. What evaluation dimensions are included in student evaluation of online teaching and learning instruments used by universities?

2. What were the evaluation elements in the university student evaluation of online teaching and learning instruments based on the learner, course, instructor, and technology, and organization dimensions?

3. How is the distribution of the evaluation elements across the dimensions used in student evaluation of online teaching and learning?

Methods

This study used a systematic review process and included a) identifying instruments, 2) screening instruments, and 3) coding and analyzing instruments.

Identifying Instruments
Identifying University Lists

A list of Doctoral Universities: Very High Research Activity (R1 universities) and Doctoral University: High Research Activity (R2 universities) were obtained based on the Carnegie Classification of Institutions of Higher Education (2021). A total of 131 R1 universities

and 135 R2 universities were included in this list. We initially planned to target a random sample of 26 R1 institutions and 27 R2 institutions. However, this random sample only yielded six evaluations of online teaching in total because not all institutions considered had a specific form of online course evaluation, so we decided to use all the 266 R1 and R2 institutions to identify available instruments.

Search Terms Used

We used the search terms "Online Course Student Evaluation" or "Student Evaluation of Online Teaching" and the university name in the Google search engine to search for publicly linked course evaluation instruments used by a university. We also entered the two search terms in the institutions' websites to identify potential instruments. This procedure was implemented by two researchers, with one researcher searching for instruments in R1 universities and the other searching in R 2 universities. The search endeavor resulted in 17 instruments in R1 universities and 14 instruments in R2 universities, which were publicly available instruments for student assessment of online teaching.

Sending Emails

In a related attempt to locate instruments, we directly contacted directors of the Center for Teaching and Learning or equivalent department at universities. We recorded names and email addresses of directors of the Center for Teaching and Learning for each university from their website. A total of 76 emails were sent and 7 responses were received. From this correspondence, one additional instrument was obtained. Six of the other directors who responded mentioned that they did not have a differentiated instrument for online course evaluation.

Screening Instruments

The inclusion and exclusion criteria used for screening identified instruments are presented in Table 2. First, the instruments were included if they were used to evaluate online/distance courses or includes items evaluating online/distance courses, so instruments for the evaluation of face-to-face courses were excluded. Second, we only examined student evaluation of online teaching, so peer evaluation or self-evaluation instruments were excluded. Two researchers implemented the screening of the 32 instruments independently by applying the two inclusion criteria specified. Five instruments in R2 universities were excluded because three were guidelines or standards for the design of online/distance courses and two were peer evaluations of online teaching. The final sample, consisting of 18 instruments from R1 universities and nine instruments from R2 universities resulting in a total of 27 instruments which was submitted for coding and analysis.

Table 2
Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Evaluation of online/distance courses or have items evaluating online/distance courses	Evaluation of face-to-face courses
Student evaluation	Peer evaluation or self-evaluation

Coding and Analyzing Instruments

Instrument coding occurred in two intentional phases. In the first phase, two researchers reviewed the 27 instruments in their entirety. Open coding was adopted to locate and identify codes for each individual item. After code identification and exploration, coded information was reread to identify underlying connections between codes and the codes were categorized into elements and elements were placed into dimensions. The following five dimensions (learner, course, instructor, technology, and organization) were identified and adopted as an overall scheme for sifting and organizing elements emerging in the process. A total of 24 categories of elements emerged from the process.

In the second phase, we coded the 27 instruments based on the framework of five dimensions and 24 categories of elements. The second phase of coding was implemented by recording whether an instrument had a specific element or not. To ensure the quality of coding, a subset of six instruments (22%) was randomly sampled and independently coded by two researchers. We obtained an interrater reliability of 94% for percent of agreement and 89% for Cohen's Kappa, indicating a satisfactory coding consistency. Differences and disagreements were resolved through group-level discussions with the entire research team that included two additional researchers. We encountered a few challenges in the process of sorting some of the elements into one of the dimensions. For example, there was a subtle distinction between the elements of Course Activities and Instructor Facilitation when referring to items related to engagement or discussion. We decided to code an item as Course Activities when the item focused on the course and as Instructor Facilitation when it emphasized instructor. Similarly, items related to course assignment could fall into both the categories of Course Activities and Course Assessment.

Once coding was completed, a series of descriptive analyses were conducted. The number and percentage of instruments for each element were recorded. A distribution was plotted for the 24 categories of elements across the 27 institutions. The variations of the number of elements for each instrument were displayed. Further, a distribution was examined in terms of the number of elements in each dimension for each of the 27 instruments.

Methodological Limitations

This study examining online course evaluations has a few limitations. The research team examined mostly evaluation instruments available publicly online. Though attempts were made to reach directors of Centers for Teaching and Learning to request a copy of instruments not available, in many cases responses were not received. Also, we included only R1 and R2 universities to manage the scope of the project. Further work should explore instruments from other types of institutions such as teaching universities and community colleges. During the coding of the evaluation elements and dimensions, only two researchers were involved. Though interrater reliability was calculated and there were periodic discussions among the researchers, there could be a bias on how these items were coded. Also, while a framework was proposed for the dimensions these were not validated as part of this study. Researchers may explore the factor structure of the construct and evaluate internal validity in future studies.

Results

Overview of the Instruments

A list of instruments identified is presented in Appendix A. Among these 27 institutions, only six have a complete evaluation form while the other 21 institutions have only supplemental items on online teaching added to their original evaluation form for face-to-face courses. The number of items in these instruments ranges from two (supplemental items) to 56 (complete forms). Most items in those instruments are Likert scale questions.

Dimensions and Elements of the Instruments

A *Student Evaluation of Online Teaching and Learning (SEOTL)* framework was constructed through an analysis of the 27 instruments. There are five dimensions in this framework: learner, instructor, course, organization, and technology. The fifth dimension, technology, could be part of any of the other four dimensions. These dimensions collectively capture all relevant aspects of online teaching and learning in higher education. Figure 1 depicts the framework of student evaluation of online teaching. The elements of each dimension are detailed in Table 3.

Figure 1

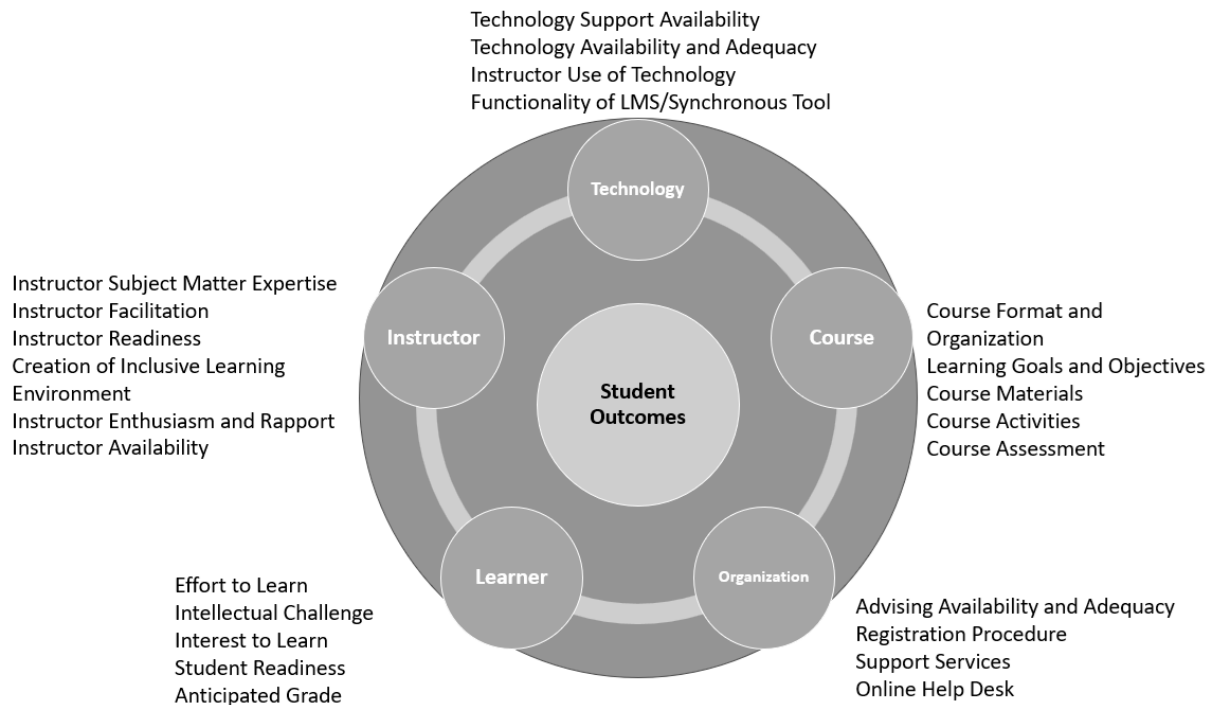*Student Evaluation of Online Teaching and Learning (SEOTL)Framework*

Table 3

Dimensions and Elements of Students Evaluations of Online Teaching

Dimension	Element	Explanation
Learner	Effort to Learn	Effort to Learn has items on measuring the amount of effort that learners devoted to the online course, including the time they spent in and out of classes, and the degree of attendance, participation, and interaction.
	Intellectual Challenge	Intellectual Challenge measures the extent to which learners are intellectually challenged or stimulated. It includes if the course helps learners gain knowledge and skills, understand subject matter, and practice abilities in critical thinking and problem-solving.
	Interest to Learn	Interest to Learn includes items on measuring the extent to which learners' interest, motivation or enthusiasm was stimulated by the course or the instructor.
	Student Readiness	Student Readiness measures learners' preparedness for online learning, such as having prerequisite knowledge, technological skills, digital information literacy skills, or adequacy of living and study setting.
	Anticipated grade	Anticipated grade measures learners' expectations of their course grade.
Course	Course Format and Organization	Course Format and Organization measures the design, structure, and presentation of the online course, including instructional balance, instructional alignment, course content planning, appropriateness of instructional pace, and appropriateness of amount of work.
	Learning Goals and Objectives	Learning Goals and Objectives measures if the course learning goals and objectives are clearly specified and well accomplished.
	Course Materials	Course Materials measures the quality, quantity/workload, relevancy, variety, and accessibility of course materials for an online course. This element also has items measuring the extent to which course materials are aligned with learning goals and objectives and contribute to student learning.
	Course Activities	Course Activities measures the quality, frequency, depth, variety, and appropriateness of class activities such as peer work, collaborations, hands-on activities, and discussions in an online course. This element also measures if course activities create opportunities for interactions with content, classmates, and the instructor, and facilitate student learning.

	Course Assessment	Course Assessment measures the quality, variety, and appropriateness of assessment of student performance in an online course. Ideally, grading criteria and instruments are explicitly specified; assessment method is fair, accurate and appropriate; and assessment is aligned with learning goals and objectives and contributes to student learning.
Instructor	Instructor Subject Matter Expertise	Instructor Subject Matter Expertise measures the extent to which the instructor demonstrates the mastery of subject matter expertise in an online course. The Instructor needs to have a good command of knowledge in course content and clearly explain the course subject matter.
	Instructor Facilitation	Instructor Facilitation measures the quality and process of the delivery of an online course. Ideally, an online course instructor gives a clear explanation of course content, employs effective teaching methods or strategies, provides prompt and meaningful feedback, and manages classes, discussion, interactions, and communication effectively.
	Instructor Readiness	Instructor Readiness measures the instructor's preparedness for online teaching such as if the instructor has skills in the use of technology.
	Creation of Inclusive Learning Environment	Creation of Inclusive Learning Environment measures the extent to which the instructor encourages diverse perspectives, creates a positive, inviting, and inclusive learning environment, treats students with respect, and demonstrates cultural awareness.
	Instructor Enthusiasm and Rapport	Instructor Enthusiasm and Rapport measures the extent to which the instructor demonstrates interest in or enthusiasm about teaching.
	Instructor Availability	Instructor Availability measures the extent to which standards for availability are clearly specified and the instructor is accessible for consultation in and out of class.
Technology	Technical Support Availability	Technical Support Availability measures the quality and availability of technical support provided. It includes whether this course provides information about technical support services or information about technology or software use.
	Technology Availability and Adequacy	Technology Availability and Adequacy measures the appropriateness of technology use for course delivery, the adequacy of computers or other devices, the speed, reliability, and connectivity of the internet, and the effectiveness of online learning environments.

	Instructor Use of Technology	Instructor Use of Technology measures instructors' ability in the effective use of technology.
	Functionality of Synchronous/ LMS	Functionality of Synchronous/LMS measures the effectiveness of navigating the learning management system and the extent to which features and elements of online learning environments support learning.
Organization	Advising Availability and Adequacy	Advising Availability and Adequacy measures the Availability and Adequacy of advising.
	Registration Procedure	Registration Procedure measures the smoothness of registration process of online courses
	Support Services	Support Services measures availability and adequacy of services and resources (e.g., financial aid, registration, counseling, career centers) provided by various centers and institutes (e.g., Office of Financial Aid, University Bookstore, Office of Distance Education) that support students' learning.
	Online Help Desk	Online HelpDesk measures the availability and adequacy of Help Desk.

Descriptive Analysis of the Instruments

The distribution of the 24 elements is depicted in Figure 2. Table 4 displays the full coding information of the 24 categories of elements in the five dimensions across the 27 instruments. The total number of elements included in the 27 instruments ranges from 4 to 17 with an average of 10.30. The frequency of each element was also calculated. Instructor Facilitation ($n = 26$, 96.30%) occurs the most frequently, followed by Learning Goals and Objectives ($n = 23$, 85.19%), Intellectual Challenge ($n = 22$, 81.48%), Course Material ($n = 21$, 77.78%), and Course Assessment ($n = 21$, 77.78%). The elements that have the least frequency include Advising Availability and Adequacy ($n = 1$, 3.70%), Registration Procedures ($n = 2$, 7.41%), Support Services ($n = 2$, 7.41%), Online Help Desk ($n = 2$, 7.41%), Anticipated Grade ($n = 4$, 14.81%), and Technical Support Availability ($n = 4$, 14.81%). Overall, most instruments contain elements in the Course (ranging from $n = 19$ to $n = 23$) dimension and very few instruments have elements in the Organization dimension.

Figure 2

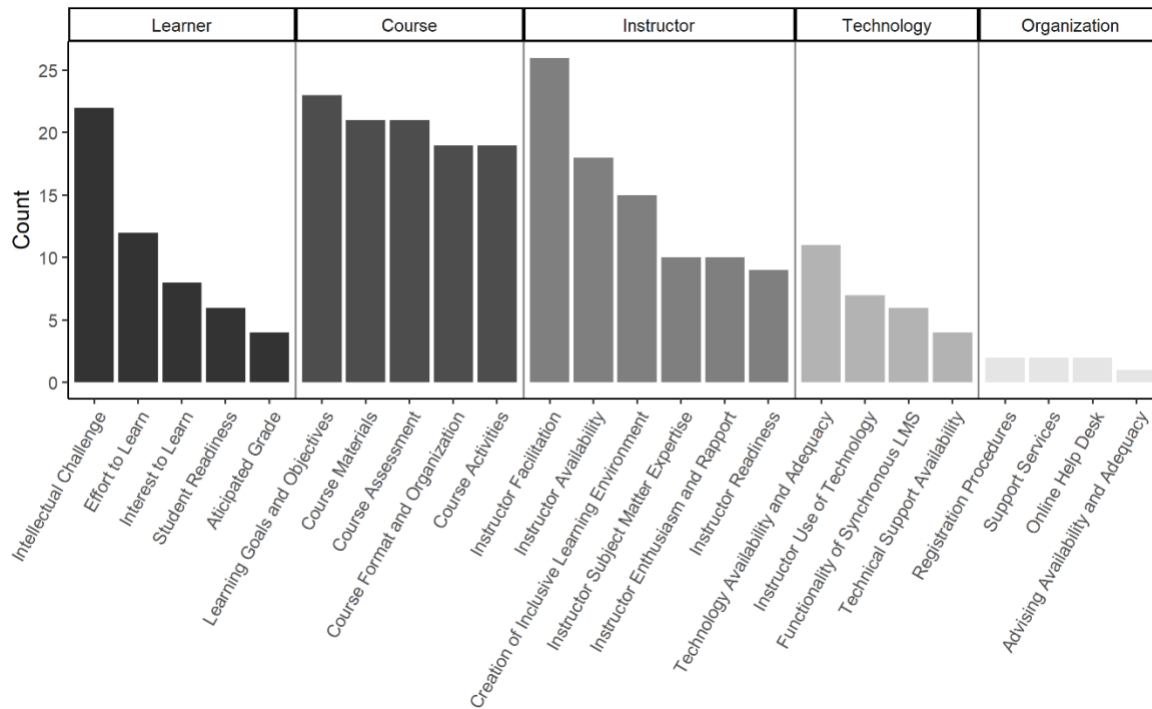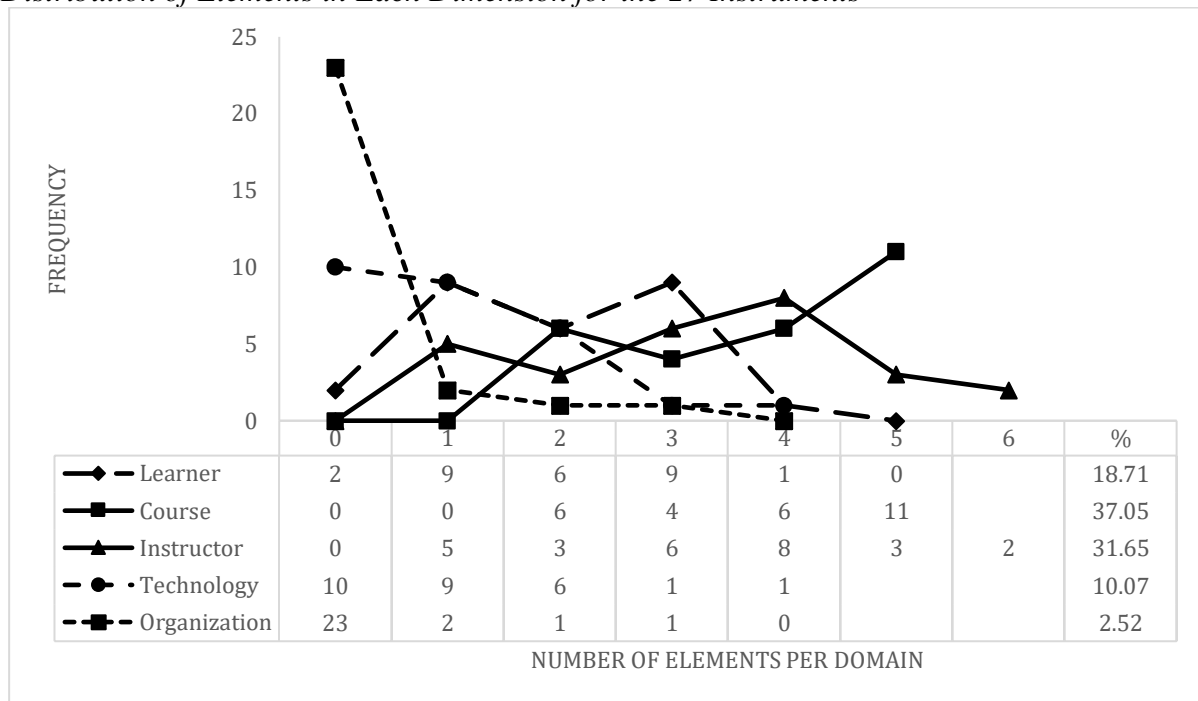*Distribution of the Elements Across the Dimensions*

Figure 3 shows the frequency distribution of the number of elements in each dimension among the 27 instruments. Overall, there are more elements in the Course ($n = 103$; 37.05%) and Instructor ($n = 88$; 31.65%) dimensions. Each of the 27 instruments has at least one or more elements in either the Course or the Instructor dimension. Nearly half of the instruments ($n = 11$) have all the five elements in the Course dimension, while some variability in frequency is noted for the Instructor domain. The number of elements in the Learner dimension shows a bimodal distribution, with around one-third of instruments ($n = 9$) having either one or three elements in this dimension. Three instruments did not address any of the elements in the Learner dimension. Generally, there is a low density of elements for the Organization and Technology dimension. Approximately one-third of the instruments ($n = 10$) do not have elements in the Technology dimension, and a substantial majority of instruments ($n = 23$) do not have elements in the Organization dimension.

Table 4

Dimensions and Elements in the 27 Instruments

Type		R1																		R2									Total	
University		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	A	B	C	D	E	F	G	H	I	#	%
Learner	Effort to Learn		X	X		X		X	X		X					X	X	X					X				X	X	12	44.44
	Intellectual Challenge	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		22	81.48
	Interest to Learn		X	X		X		X								X	X	X					X						8	29.63
	Student Readiness		X		X				X									Q					X					X	6	22.22
	Anticipated Grade								X		X	X						P											4	14.81
Course	Course Format and Organization	X	X			X	X	X	X		X	X		X		X		X		X	X	X	X	X		X	X	X	19	70.37
	Learning Goals and Objectives	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X		23	85.19
	Course Materials	X	X		X	X		X	X		X	X		X		X	X	X		X	X	X	X	X	X	X	X	X	21	77.78
	Course Activities			X	X		X	X	X			X	X	X	X	X	X			X	X	X	X	X		X	X	X	19	70.37
	Course Assessment		X	X	X	X	X	X				X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	21	77.78
Instructor	Instructor Subject Matter Expertise	X	X	X		X			X		X									X		X	X			X			10	37.04
	Instructor Facilitation	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	26	96.30
	Instructor Readiness	X	X	X	X	X	X	X						X	X														9	33.33
	Creation of Inclusive Learning Environment	X	X		X	X		X			X	X	X	X		X	X	X					X			X	X		15	55.56
	Instructor Enthusiasm and Rapport	X	X		X	X	X				X		X		X									X		X			10	37.04
	Instructor Availability	X		X	X	X		X	X	X	X	X	X	X		X	X			X	X		X	X			X		18	66.67
Technology	Technical Support Availability		X			X			X															X					4	14.81
	Technology Availability and Adequacy	X						X	X	X	X	X										X	X			X		X	11	40.74
	Instructor Use of Technology		X													X						X	X	X			X	X	7	25.93
	Functionality of Synchronous /LMS					X			X				X		X							X	X						6	22.22

Organization	Advising Availability and Adequacy	X				1	3.70
	Registration Procedures	X		X		2	7.41
	Support Services			X X		2	7.41
	Online Help Desk			X	X	2	7.41

Figure 3

Distribution of Elements in Each Dimension for the 27 Instruments

	0	1	2	3	4	5	6	%
Learner	2	9	6	9	1	0		18.71
Course	0	0	6	4	6	11		37.05
Instructor	0	5	3	6	8	3	2	31.65
Technology	10	9	6	1	1			10.07
Organization	23	2	1	1	0			2.52

NUMBER OF ELEMENTS PER DOMAIN

Discussion

This study contributes to the research and practice through the development of the SEOTL framework which can be used by both researchers and practitioners. This multidimensional framework, including learner, instructor, course, technology, and organization, provides a holistic and comprehensive model for evaluation based on all necessary aspects. In the literature, three measures exist that used prior conceptual and theoretical frameworks (Biner, 1993; Chickering and Gamson, 1987; Driscoll, 1998; Khan, 1997). However, these works are outdated, and the frameworks used by these instruments fail to capture all relevant aspects of online teaching and learning. Therefore, there is a need for a newer multidimensional framework evaluation of online teaching which this SEOTL framework aims to meet. The consequences of not having an appropriate instrument specifically designed for online courses are evident: 1) failure to provide constructive feedback for teaching, 2) a faculty promotion decision based on invalid teaching measures, and 3) failure to inform instructors with the important aspects to be prepared for quality online courses.

The online course evaluation instruments used by universities are usually not validated despite being used for several semesters and often for making high-stakes decisions. Using a research-based and validated instrument based on the SEOTL framework will help universities precisely evaluate their online teaching and learning practices and diagnose weaknesses and deficits in education. While a few research-based online course evaluation instruments currently exist, this study shows the need to develop an instrument that is multidimensional in evaluating online teaching and learning. Also, currently the instruments in the research are from several years ago except for the Reyes-Fournier et al. (2020) instrument which focuses only on the instructor dimension.

Across all the five dimensions, there were a total of 278 evaluation elements. The most frequently considered was the Course dimension followed by the instructor dimension. There were 103 elements (37.05%) in the Course dimension, and there were 88 elements (31.65%) in the Instructor dimension. This shows that when evaluating online teaching and learning, universities focus on the course and the instructor the most. In the Course dimension, learning goals and objectives were included in 23 instruments, and course materials and course assessment were both included in 21 instruments. In the Instructor dimension, instructor facilitation was included in 26 instruments. Though the overall Learner dimension was least evaluated, one element (intellectual challenge) was included in 22 instruments. This finding is consistent with the research-based online course evaluation instruments (i.e., Bangert, 2004; Cheung, 1998; Reyes-Fournier, et al., 2020; Roberts et al., 2005; Stewart et al., 2004). Research-based instruments have more elements in the dimensions of Course and Instructor. Instructor facilitation was the most frequently occurring element, included in all research-based instruments. Further, learning goals and objectives, course assessment, course activities, and instructor enthusiasm and rapport were included in most research-based instruments. Previous literature suggested that instructor facilitation was critical to students' learning in online courses. Martin, Wang, et al. (2020) noted that the instructors' timely responses to questions and timely feedback on assignments/projects were conducive to instructor presence, engagement, and learning. Learning goals and objectives was also found to be a significant component of online courses (Ndoye & Martin, 2021; Raible et al., 2016). Goals and objectives help to set learner expectations and to align instructional material and assessment. Course assessment, which is to measure student learning outcomes and overall course effectiveness, was included as an integral part of online courses (Martin et al., 2021).

The three least evaluated dimensions were the Organization dimension, followed by Technology and Learner. Organization dimension included only 7 elements (2.52%), Technology had 28 elements (10.07%), and Learner had 52 elements (18.71%). This suggests that when evaluating online learning, universities often care less about the organizational support, the technology, or the learner. All organizational elements were least used in the evaluation instruments. Advising availability and adequacy was included only in one instrument. Registration procedures, support services, and online help desk were each included in two instruments. In the Technology dimension, technical support availability was included in four instruments, and in the Learner dimension, anticipated grade was included in four instruments. This finding is also aligned with research-based online course evaluation instruments. A few instruments focused on the Technology dimension (Roberts et al., 2005; Stewart et al., 2004) and only one instrument reviewed in the literature paid sufficient attention to the Organizational dimension (i.e., Roberts et al., 2005).

It has been consistently documented in the literature that the (unplanned) shift from face-to-face instruction to online teaching, due to the recent COVID-19 pandemic, has caused an increased burden on instructors and educators (Nasri et al., 2020) to design courses, facilitate learning, and provide appropriate instruction (Rapanta, 2020). Organizational support plays an important role to offer quality education in the virtual environments. However, existing course evaluation forms failed to account sufficiently for some important aspects of online teaching and learning, placing too much emphasis on the instructor's responsibility while devaluing support and services that can be offered by organizations. Evaluating teaching practices is often used not only to provide summative assessments of instructors for promotion, tenure, and salary decisions but also to diagnose deficits in a support system for assisting faculty and students. Thus, including all relevant aspects in online course evaluations is crucial.

The thorough review of the literature suggested the unique nature of online learning environments (Kreitzer & Sweet-Cushman, 2021; Martin, Sun, et al., 2020). Unlike face-to-face instruction, additional factors such as technology and organization support come into play in virtual settings, collectively determining the quality of online education. Thus, each dimension of the SEOTL framework must receive appropriate evaluation. We recommend that online course evaluation forms contain enough items assessing each dimension. Also, though it is a common practice to derive a composite overall score by simply summing all ratings on an instrument to represent overall teaching quality, we suggest giving an equal weight to ratings on each dimension. This assists instructors and organizations to correctly identify where and what to improve.

Implications for Practice and Research

This study has implications for administrators, instructors, instructional designers, and students.

Administrators can benefit from reviewing the currently used instruments, comparing their university evaluation instrument with the findings of this study and add/remove items as needed. The findings of this study will benefit administrators at all higher education institutions though only instruments at R1 and R2 universities were examined. It is important for student evaluation of online teaching instruments to include all five categories of items: students, course, instructor, technology, and organization. Administrators also play a role in the elements related to technology and organization and making sure organizational support is available for the students and the instructors for online teaching and learning.

Instructional designers play an important role in supporting instructors in designing online courses. Instructional designers, when designing online courses or supporting online instructors, can use the findings from this study to include the various evaluation elements in the design. In addition to design, instructional designers can also recommend various additional strategies that the instructors can use during the facilitation of the online course.

The findings have direct implications for *online instructors* as evaluation ratings provide them with feedback to strengthen the courses they teach. Online instructors can examine and implement the various dimensions and evaluation elements that are commonly used and design and deliver their courses. The process of examination and implementation of these evaluation elements earlier in their courses will strengthen their courses. In addition, they can use feedback from initial implementations to add missing elements to support the students.

In the end, *students* will benefit the most from well-designed and effective online courses. They can specifically also think about the five evaluation elements that were learner

focused, effort to learn, intellectual challenge, interest to learn, student readiness and anticipated grade. These are also helpful in a successful online learning experience.

Declarations
The author(s) declare no conflicts of interest or external funding.

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Appendix A
List of Instruments Used by Universities

Instrument	Sections	#Items for Online Evaluation	Scale	Entire Survey or Supplemental Questions
Course and Teacher Survey	Instructor Your own work Overall evaluation Instructor (distance learning, hybrid format, simulcast format) Open Ended Feedback	3 Item	5-point Likert scale item	Supplemental Questions
CALS Course Evaluation	Instructor Evaluation Online Instruction Instructor-Designed Question Final Comments	8 Items	5-point Likert scale	Supplemental Questions
Student Perceptions of Instruction		9 Items	7 4-point Likert scale and 2 open-ended items	Supplemental Questions
Student Feedback Form	Student Feedback Form-Primary (Course, Instructor) Supplemental Questions for Online Courses (Course, Instructor)	5 Items	4 5-point Likert-scale items and 1 open-ended item	Supplemental Questions
Core Questions and Distance Core Questions	Core Questions (Instructor, Yourself) Distance core questions (Instructor, Yourself)	15 Items		Supplemental Questions
Questionnaire for Distance Education Classes	Questions Related to the Instructor Questions Related to the Course Questions about your Distance Education Experience Final Thoughts	20 Items	16 5-point Likert-scale items and 4 open-ended items	Entire Survey
Standard CPS Course Evaluations	Student Self-Assessment Questions Course Related Questions Learning Related Questions Instructor Related Questions Online Experience Questions	5 Items	4 5-point Likert-scale items and 1 open-ended item	Supplemental Questions
Student Instructional Rating Survey		3 Items (send by email)	5-point Likert scale	Supplemental Questions

Course Feedback Form	Questions Common to All Evaluations Suggested Remote Learning Questions	10 Items	1 3-point Likert-scale item, 8 open-ended items, and 1 Yes/No item	Supplemental Questions
Online Course Evaluation Questions		18 Items		Supplemental Questions
Student Evaluation of Course and Instructor		2 Items	5-point Likert scale	Supplemental Questions
TNVoice Core Questions TNVoice Online Questions	Experience Instructor/Course Online	6 Items	5 5-point Likert scale items and 1 open-ended items	Supplemental Questions
UB Core Questions	Course Instructor	9 Items	5-point Likert scale	Supplemental Questions
University of Colorado Faculty Course Questionnaire	Instructor Course Overall Modality Core Narrative Responses	3 Items	5-point Likert scale	Supplemental Questions
The GatorEvals Question	Student Self-Evaluation Questions Instructor Evaluation Questions Course Evaluation Questions Free Response Questions Supplemental Questions for Online Courses	4 Items	5-point Likert scale	Supplemental Questions
Student Evaluation of Teaching During COVID		6 Items	4 5-point Likert scale items and 2 open-ended items	Supplemental Questions
Course Feedback for Instructors Question Bank	General Questions Questions about Online Teaching Student Learning Assignment and Readings Use of Technology Group Work Classes with TAs Open-Ended Questions	10 Items		Supplemental Questions

School of Education Teaching Survey	Self-Ratings Instructor Course Teaching comments Course Comments	30 Items	24 5-point Likert scale items, 2 4-point Likert scale items and 4 open-ended items	Entire Survey
Course Evaluation	Course Questions Instructor Questions Open Comment Questions			Supplemental Questions
Remote Course Evaluation	Summative Items Formative Items Student Engagement Items Open-Ended Items	30 Items	21 6-point Likert scale items, 4 multiple choice items, and 5 open-ended items	Entire Survey
Course Evaluation Questions	University Core Questions Student Participation Student Comments DE Specific Questions Lab Course Specific Questions Field-based Course Specific Questions	5 Items	5-point Likert scale	Supplemental Questions
MOCES Distance/Blended Instrument	Course-based questions Instructor-based questions Student comments	20 Items	18 6-point Likert scale items and 2 open-ended items	Entire Survey
DistanceLearning.EDU Course Evaluation Survey	Course Content and Structure Instructor Evaluation Communication, Rapport, and Interaction Assessment and Evaluation Course Management System Evaluation Support Service Evaluation Overall Evaluation of Your Distance Learning Experience	56 Items	50 5-point Likert scale item and 6 open-ended items	Entire Survey
Student Evaluation of Faculty Instruction	Instructor and Student Interaction Course Effectiveness Comments Online Course Survey Section Service Learning/Service to Leadership Section	6 Items	5-point Likert scale	Supplemental Questions

Student Instructor Evaluations	Core Questions Online Courses	9 Items	5-point Likert scale	Supplemental Questions
Online Course Design Evaluation Online Course Teaching Tool	Course Instructor	21 Item	19 4- and 5-point Likert scale items and 2 open-ended items	Entire Survey
SPTE Online Scale Supplement	Online design Collaboration Online suitability	12 Items		Supplemental Questions

Student Perceptions of Online Engagement

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Abstract
This paper reports on research that extends knowledge about higher education students' perceptions of online engagement. In particular, the study aimed to identify what students thought engagement was and how they experienced it. Understanding students' views about online engagement will provide a more comprehensive understanding of the topic and should assist instructional designers to support academic staff to develop online courses that are more likely to engage their students. Using a mixed-methods approach, the study found that students felt most engaged with learning when doing practical, hands-on activities. Additional findings from the qualitative and quantitative data are highlighted, with some differences between the students' perceptions in the different types of data, particularly concerning social engagement. This suggests that further research is warranted. The paper offers several practical implications for student learning.

Keywords: distance education, online learning, post-secondary education, regional university, engagement

The purpose of this research is to extend knowledge of online student engagement in higher education by listening to what students say. In other words, this study set out to privilege the student voice, by specifically asking about their perceptions of learning engagement in an online environment and how they experience it. Whilst the term *engagement* has become a catch-all term used in a range of institutional and learning support strategies, the student perspective is rarely considered.

Student engagement has been used to assess and predict the quality of student learning experiences and outcomes (Gay & Betts, 2020; Hussain et al., 2018), and has been linked to persistence, retention, classroom motivations, course achievement and improved graduation rates (Ferrer et al., 2022; Flynn, 2014; Jung & Lee, 2018; Lee, 2014; Pinchbeck & Heaney, 2022). Its alternatives—low engagement and disengagement—have been found to have a profound negative effect on student learning outcomes, cognitive development, and the quality of the student experience (Crampton et al., 2012; Higher Education Standards Panel, 2017; Ma et al., 2015; Pittaway & Moss, 2014). Thus, student engagement is an important consideration for teaching and learning.

Moreover, digital technology has become a fundamental feature of higher education, especially since the COVID-19 pandemic, which caused many universities to instigate "emergency elearning" (Murphy, 2020, p. 492; see also Ahshan, 2021), and this highlights the necessity to consider student engagement in online environments. For most universities, offering courses or programs online has become a mainstream operation (Shelton et al., 2017; Stone, 2019). However, while digital technology is increasingly used to distribute content, link learners, and enable anytime/anywhere learning, keeping students engaged in online learning is challenging. Indeed, studies have consistently found that, despite the increasing popularity of online options and the push for more online content, retention for online courses is lower than for face-to-face instruction (Atchley et al., 2013; Kahn et al., 2017; Murphy & Stewart, 2017; Wanner, 2014). Nevertheless, as we move towards a post-COVID-19 world, we may very well expect that the online/face-to-face dichotomy will no longer be relevant.

Defining engagement, however, is complex and contested, and has evolved over time. It has been considered as student investment or commitment (Northey et al., 2018), psychological effort (Lee et al., 2019), participation (Bergmark & Westman, 2018), effortful involvement in learning (Kim et al., 2019; Reschly & Christenson, 2012), and/or quality of effort (Sun & Rueda, 2012). Bond et al. (2020) suggested that, due to the complex nature of student engagement in the online environment, research has struggled to find a shared definition and vocabulary, and this has resulted in inconsistency across the field. However, engagement has come to be recognized as a process in which students, through their interactions with the instructional environment, experience a positive state of mind that is characterized by dedication, absorption, and vigor in an academic setting; this also leads to the achievement of learning goals (Colvin Clark & Mayer, 2016; Schwarz & Zhu, 2015). This broader definition is useful here, as it acknowledges engagement as a multifaceted concept that has social, cognitive, behavioral, collaborative and emotional elements (Redmond et al., 2018).

The benefits of student engagement have been linked to student learning and online course satisfaction (Martin & Bolliger, 2018). Thus, understanding how students perceive and experience engagement is an essential issue for research into educational technology and has benefits for learning. To strengthen teaching practices and improve students' outcomes in technology-mediated learning experiences, calls have been made to better understand the role technology plays in affecting student engagement (Bond et al., 2020; Castañeda & Selwyn, 2018;

Henrie et al., 2015). The current research contributes to this endeavour by applying readily available frameworks in relation to student perceptions of engagement.

As the term engagement has been used widely, higher education students would arguably have some familiarity with the term and its importance to their learning. However, even though various theoretical dimensions, subconstructs, techniques, and indicators have been developed to define and operationalize online student engagement, the student perspective is rarely considered. This can have potentially significant implications in terms of the extent to which technology-mediated, student engagement practices capture students' perspectives. The result of this is a lost opportunity to capture vital student understandings about engagement and, in turn, recognize the value of these to student learning (Tai et al., 2019).

Indeed, the investigation of students' conceptualizations of engagement is essential for developing engagement measures that reflect the everyday language teachers and students use to do tasks and learn (Fredricks, Filsecker, et al., 2016). As recognized by Fredricks, Filsecker, et al. (2016), studies that examine how students think about engagement can also help move the discussion beyond behavioral indicators to consider how engagement may change over time and in different fields.

This paper presents research that explored student perceptions of engagement in an online setting to consider how these align, or misalign, with the literature and to contribute to discussions about student engagement in technology-mediated learning environments. The paper begins with a brief background on engagement. It then examines the study's methods and limitations and describes the results, before moving to the discussion. Finally, implications for online course design are presented.

Dimensions, Techniques, and Indicators of Online Student Engagement

As discussed, there is a high level of divergence in definitions of student engagement across the research literature. This divergence is complicated by the range of learning modes now on offer to students: face-to-face, online, and blended. We begin by considering engagement in a general sense before considering online engagement more specifically.

Many researchers view student engagement as a meta-construct that includes three sub-constructs or types of engagement: cognitive engagement, emotional engagement, and behavioral engagement (Chan & Bose, 2018; Fredricks, Blumenfeld, et al., 2004; Henrie et al., 2015; Reeve, 2012; Reeve & Tseng, 2011). According to Fredricks, Blumenfeld, et al. (2004), behavioral engagement includes the observable behaviors necessary for academic success (e.g., attendance, active participation, and task completion) and emotional engagement includes both the feelings learners have about their learning experience (e.g., interest, frustration, or boredom) and their social connection with others. Cognitive engagement is the focused effort learners give to understand what is being taught effectively, including such behaviors as self-regulation and metacognition. The three types of engagement are dynamically interrelated (Fredricks, Blumenfeld, et al., 2004), and researchers have agreed that instructors must engage students on all three levels to engage students in their coursework (Chan & Bose, 2018).

More recently, however, researchers have proposed additional dimensions of engagement, including social engagement, relating to students' affect and behavior during collaborative group work (Fredricks, Wang, et al., 2016; Linnenbrink-Garcia et al., 2011), agentic engagement, related to how students proactively contribute to learning and teaching activities (Reeve, 2012; Reeve & Tseng, 2011), and volitional engagement, used to theoretically

justify engagement as "energy in action" (Filsecker & Kerres, 2014, p. 452). The research thus highlights that student engagement is a complex construct.

More specifically from an online learning perspective, Redmond et al. (2018) have developed a framework for engagement in higher education, which includes five key engagement elements considered essential to effective online learning: social engagement, cognitive engagement, behavioral engagement, collaborative engagement, and emotional engagement. In this framework, collaborative engagement is about developing a range of relationships and networks that support learning, such as collaboration with peers, instructors, industry, and the educational institution. In contrast, social engagement refers to students' social investment in the tertiary experience. In the online environment, this often occurs when students talk about themselves and their contexts, for example, through ongoing interactions in social media.

Researchers (Chan & Bose, 2018; Kennedy, 2020; Lear et al., 2010; Martin & Bolliger, 2018; Robinson & Hullinger, 2008) have also suggested that student engagement in online classes can be boosted through regular student-instructor interaction, frequent peer interaction, and challenging tasks and activities. Based on a framework developed by Moore (1989), the trifecta of student engagement (student-instructor interaction, student-student interaction, and student-content interaction) postulates that students need to regularly and meaningfully interact with their course curriculum content, their peers, and their instructor, to be fully engaged in their learning. A fourth interaction, student-interface interaction, was added by Hillman et al. (1994), to consider the interaction between the learner and the technologies used to deliver instruction. Indeed, due to the extensive use of technology in contemporary education, the student-interface interaction is both a foundation and a condition of online learning and often serves as a basis and precondition for other interactions (Wang et al., 2014). It is therefore regularly considered by researchers as a fourth interaction for student success and engagement (Hirumi, 2002; Joksimović et al., 2015; Wang et al., 2014).

This body of research indicates the challenges of understanding the complex interactions involved in online student engagement and considering what educators might do to facilitate student engagement in learning. Finding out about student perspectives is an important component of understanding these complexities.

Student Perspectives of Online Engagement

Only a small body of research has explored the meaning of engagement from a student perspective (Buelow et al., 2018; Fredricks, Wang, et al., 2016; Tai et al., 2019). Through qualitative interviews with school-aged students, Fredricks, Wang, et al. (2016) investigated how students conceptualized maths and science engagement and disengagement. They found that the students' views reinforced the multidimensional concept of engagement outlined in the academic literature; however, their analysis also revealed further indicators that have been included less frequently in prior measures of engagement, with the most important of those being the social dimension to engagement. The authors suggested that "because social interactions, collaborative learning, and help seeking from peers are playing an increasingly important role in education …, conceptualizations of engagement should move beyond just emphasizing individual aspects to also consider social dimensions" (p. 12). Similarly, Buelow et al. (2018) found that connections were important to students' experiences of engagement, including connections to people and to course materials and wanting practical applications of their learning.

Through survey-based research with postgraduate students, Martin and Bolliger (2018) explored student perceptions on various engagement strategies used in online courses, based on Moore's (1989) interaction framework. While the study confirmed the importance of all three types of engagement strategies in online learning, it also showed that learner-instructor engagement was significant. Engagement strategies that supported exchanges with instructors were valued more than approaches that aimed at interactions with learning materials and their peers. The authors found that engagement can be enhanced in online courses' interactive design and facilitation. They suggested that instructor facilitation is critical, and instructors need to have strategies for engaging discourse.

Tai et al. (2019) investigated student perceptions of engagement in two blended learning Initial Teacher Education programs. Students were asked explicitly to define engagement through interviews and a survey. The authors found that some students provided concise descriptions focussed on behavioral elements, such as participation, attendance, and effort devoted to their studies and, in contrast, others mentioned cognitive aspects, such as being able to understand and connect topics. A strong theme was that the value and relevance of the task was an aspect that defined engagement. The findings also supported previous work that found that multiple levels and meanings of student engagement exist.

Tai et al.'s (2019) research also explored facilitators of and barriers to student engagement. Facilitators, or enablers, are considered important to engagement and included the relevance of learning content to individual needs, flexibility/convenience of timetabled learning activities, feedback (informative responses for the benefit of the individual), and the mutually rewarding dialogic role of social interaction in learning. Barriers, or inhibitors, that negatively impacted engagement included workload, time management issues, and feeling overwhelmed.

Despite the limited field of research investigating student perceptions of online learning, the studies cited here provided important starting points for our investigation. In particular, the previous studies suggested that we should be prepared for a diversity of student understandings about engagement and its interactions with people, resources, and learning experiences. This influenced our thinking about research design and the tools we would use.

Method

The research aimed to empirically investigate student perceptions of learning engagement in an online setting. The overarching question guiding the research asked: How do online students perceive effective online engagement? This was supported by three subquestions that specify the details we wanted to investigate: What do online students understand by the term *learning engagement*? What types of engagement do they identify as supporting their learning? What types of interactions do they think support their learning? To answer the research question and subquestions, we drew on previous research about engagement and interactions for engagement, specifically the work of Redmond et al. (2018), Moore (1989) and Hillman et al. (1994). This is explained further in the next section.

Research Design and Data Collection

The study used a sequential mixed-methods approach (Creswell, 2009; Shorten & Smith, 2017), with data collected in two phases. Phase 1 comprised an online survey containing three questions. The first was an open-ended question (qualitative data) that asked students to explain their understanding of online learning engagement. This question was purposely placed first, so that respondents could answer without being influenced by the wording of the two subsequent

questions. The other two questions were closed-ended (quantitative data). They asked students to indicate, on a Likert scale, (1) how important different types of engagement were to their learning in the course, and (2) how important different types of interaction were to their engagement in the course. These two questions drew on Redmond et al.'s (2018) meta-constructs of engagement, and Moore's (1989) and Hillman et al.'s (1994) interactions for engagement, respectively. For the meta-constructs, the survey provided brief explanations, as shown in Table 1.

Table 1

Brief Descriptions of Meta-constructs From Redmond et al. (2018), Provided as Explanations for Survey Respondents

Types of Engagement	Descriptions
Social engagement	Building community, creating a sense of belonging, developing relationships, establishing trust
Cognitive engagement	Thinking critically, activating metacognition, integrating ideas, justifying decisions, developing deep discipline understandings, distributing expertise
Behavioral engagement	Developing academic skills, identifying opportunities and challenges, developing multidisciplinary skills, developing agency, upholding online learning norms
Collaborative engagement	Learning with peers, relating to faculty members, connecting to institutional opportunities, developing professional networks
Emotional engagement	Managing expectations, articulating assumptions, recognising motivations, committing to learning

It is important to note that, in 2018, a five-point Likert scale was used: Very Important, Important, Moderately Important, Slightly Important, and Not Important. However, feedback from research participants was that they found it very difficult to distinguish between two of the categories: Moderately Important and Slightly Important, categories that received low levels of responses. As a result, in 2019, it was deemed appropriate to use a four-point Likert scale. Slightly Important was used to provide an option between Important and Not Important.

Phase 2 of data collection provided additional qualitative data through semi-structured interviews. Participants were recruited for this part of the study through email invitations and online course announcements after the surveys had been completed. Participation was voluntary and the research participants could choose either phone or Zoom for their interviews. The two phases of the research were repeated at the end of four consecutive semesters during 2018 and 2019.

Research Participants

The research participants were students from five disciplines (Education, Science, Nursing, Engineering, and Business) in a regional Australian university with a reputation for

distance education and a "digital first" approach. Digital learning and opportunities for flexible learning are common to all students enrolled at the university, with the majority of students enrolled completely online. Twelve courses, from across the four years of undergraduate study as well as from postgraduate study, were targeted (see Appendix A). All the courses were taught by members of the multidisciplinary research team.

At the end of each of the four semesters, an email was sent to all students enrolled in those courses, inviting them to participate in Phase 1 of the study. The initial email included information about ethics and provided them with a link to the Phase 1 online survey, which was located on the university endorsed LimeSurvey platform. A total of 611 students participated in the study. In 2018, a total of 406 students completed the survey: 277 in Semester 1 and 129 in Semester 2. In 2019, 205 students responded: 88 in Semester 1 and 117 in Semester 2. Most of the research participants were female (approximately 80%), mature-age (i.e., not school leavers) and part-time, and this is representative of overall course enrolments.

Interview participants for Phase 2 were recruited via a subsequent email and participation was voluntary. A total of 17 semi-structured interviews was conducted: nine in 2018 and eight in 2019, representing all five disciplines and a similar gender balance to the survey. The interviews lasted approximately 45 minutes.

Data Analysis

The primary purpose of the qualitative analysis (open-ended question and the interviews) was to identify themes from the data that represented the ways students understand learner engagement. Themes were identified and the participants' responses were categorized and counted.

In the online survey, students were asked: "How do you define learning engagement? In other words, what activities are you doing when you feel you are highly engaged in a course and your learning?" Many students read this as two questions and responded accordingly. When the students participating in the semi-structured interview were asked what online learning engagement meant to them, most mentioned activities in which they felt highly engaged as part of their response. As a result, the qualitative data were analyzed to reflect the two, albeit unplanned, parts of the question. However, in their responses, many students also discussed factors that positively or negatively impacted their engagement, discussing both engagement enablers and inhibitors. Because of this, a third layer of analysis was completed to specifically explore the data for instances where students described learning from an enabler/inhibitor perspective. Responses were manually analyzed using both manifest (qualitative content analysis) and latent (thematic analysis) coding techniques. The coding was conducted by two researchers. One spot-checked the coding of the other to ensure intercoder reliability.

The researchers analyzed the data to identify specific words and phrases, as well as implied meanings (Vaismoradi et al., 2016; Vaismoradi & Snelgrove, 2019; Vaismoradi et al., 2013). The identified codes were categorized into broader themes to establish relationships among the codes (Bryman, 2012; Creswell & Clark, 2011). Basic counts of how often each theme appeared were then used to rank themes in order of prominence.

The primary purpose of the quantitative analysis was to summarize and identify patterns in the data related to the online survey's closed-ended questions. The responses to these questions were analyzed using multi-chart visualizations (Petrillo et al., 2011) as a comparison method. Multichart percentage stacked bar graphs were used to facilitate the visual comparison of the data collected and identify patterns in the response distributions across the two years (Anronius, 2003). In addition, because of the difficulties of comparing data that use Likert scales

with different numbers of response alternatives (Colman et al., 1997; Holmes & Mergen, 2014), the focus of the analysis was on visually comparing the response distributions of the positive responses (i.e., Very Important and Important).

Results

Student Understandings of Engagement

In both the online survey and the interview, the research participants were asked what they thought learning engagement was. Most of their responses indicated that they described engagement in terms of actions, such as "taking notes, engaging in conversation, answering questions." On the whole, their explanations of engagement were focused on concrete actions and amounted to statements such as "engagement would be going online and participating or going online and grabbing what I need for whatever course I'm doing." Most of the research participants went on to explain engagement in terms of teaching and learning activities, and enablers and, to a lesser extent, inhibitors. Tai et al. (2019) and Buelow et al. (2018) found that the relevance of the task was important to learners, while our study indicated that the students were looking for concrete activities that were doable.

Student Perceptions About Activities That Helped Them Feel Engaged

In their qualitative responses, the participants named activities in which they felt engaged. As already explained, this was in response to the question that was intended to be a clarifying question ("What activities are you doing when you feel you are highly engaged in a course and your learning?"), rather than a question in its own right. The content analysis identified 17 distinct categories of activities that made them feel engaged (see Table 2). Basic counts of how often each category appeared show that completing practice exercises or questions (e.g., answering practice or review exercises, questions, online quizzes, calculations, problem-solving, completing modules, weekly activities, worksheets) and attending tutorials (Zoom, face-to-face tutorials, labs, tutorial activities) were the most often mentioned activities.

Table 2

Themes That Emerged in Response to the Question: "What activities are you doing when you feel you are highly engaged in a course and your learning?"

Response categories	Count
Practice exercises or questions (answering questions/online quizzes/doing calculations/problem solving/review questions/worksheets)	84
Tutorials (Zoom or F2F/labs/tutorial activities)	69
Reading/s	59
Listening to, watching, or attending lectures	45
Group work/discussions or interaction with peers	43
Online forums	29
Interactive/hands-on activities	24
Practical experiences, such as placements or practical activities or applications	22
Interaction with educator	20
Videos	18
Completing modules or weekly activities/posted in virtual classrooms	17
Researching ideas/information introduced in course/class	17
Taking notes	16
Assignment work	10
Face-to-face interactions and learning	10
When involved in asking questions (and having the ability to do this)	8
Scenario-based examples, worked examples or case studies	5

Student Perceptions About Enablers and Inhibitors

The research participants also named engagement enablers and inhibitors in attempting to define learning engagement. They responded with comments such as "the way lecturers present the information," "when the content being learned is presented in an interesting way," "how much attention I suppose I am paying," and "when there are whole group discussions, listening to others and sharing my thoughts and understandings of the topic."

The analysis identified 14 themes for engagement enablers. These were categorized into four learning-related categories of factors: course, social, interface, and educator (see Table 3). Basic counts related to each theme and category show that the course-related category recorded the largest numbers of mentions. In contrast, the two themes that were mentioned most often were "activities that are interactive, hands-on, or practical in nature" (course content/design factors category) and "peer interactions/communications" (social factors category).

Table 3

Enablers of Engagement

Engagement Enablers		Count
Course content/design factors (158)	**Activities that are interactive, hands-on or practical in nature**	49
	Real-life learning: when theory and/or learning activities link to real-life practice and real-world application	29
	When learning is scaffolded: i.e., when current learning is reinforced or able to be practiced through multiple/supporting learning activities	27
	Content being learned is presented in an interesting way	19
	Relevance of content/when content is relevant	10
	Structure of the course Respondents mentioned: having set tasks that helped to keep them on track (4), and having clear course goals and a logical structure to the course and its virtual classroom (4)	8
	Activities that are challenging but achievable	3
Social factors (81)	**Peer interactions: communications and interactions with peers and educators**	39
	Face to face contact/communication with educators and peers	17
	Zoom	13
	Ability to ask questions	7
	Forum discussions	5
Interface-related factors	Online nature of learning content. This included the flexibility and ease of access of online learning (4), and having recorded lectures in an online format (6); having access to a variety of learning materials (1), and courses that used lots of visual aids (2)	13
Educator-related factors	Responses included: lecturers that are contactable and give timely responses (4); and lecturers that are themselves highly engaged with the students and interacting with online aspects of the course (5)	9

Note. The items in bold are the learning engagement qualities mentioned most often by students.

Most participants discussed enablers, but only 34 students mentioned inhibitors. Table 4 shows the themes that emerged concerning engagement inhibitors. The most common answer related to the use of pre-recorded online lectures. As only 34 students mentioned engagement inhibitors, it is difficult to make any inferences from the data or to categorize in any meaningful way. However, they align with factors identified as enablers (e.g., course content/design, social, interface, and educator-related).

Table 4

Inhibitors of Engagement

Use of pre-recorded lectures that "could apply to any year or semester" (3); or which are simply PowerPoint slides with a voiceover reading them (5)

Fully or mostly online courses: when most of the course content is provided in an online format (5)

Problems with technology or accessing online resources (4)

Perceived poor or lack of communication by lecturers (3)

Loneliness of online learning or feeling excluded or forgotten (3)

Perception that learning resources are not relevant (2), too complicated (2), or there is too much content or theory to get through (2) or too much reading involved in the course (5)

Student Perceptions About the Importance of Different Types of Interaction

Student perceptions about the importance of varying interaction types for engagement were investigated to explore which types of interaction students regarded as more important to their learning in online contexts. Concerning the four types of engagement suggested by Moore (1989) and Hillman et al. (1994), a comparison of the importance students place on each type of engagement is presented in the percentage stacked bar graph contained in Figure 1.

Figure 1

Comparison of 2018 (N = 391) and 2019 (N = 204) Student Responses to the Question that Asked Them to Rate the Importance of Different Types of Engagement
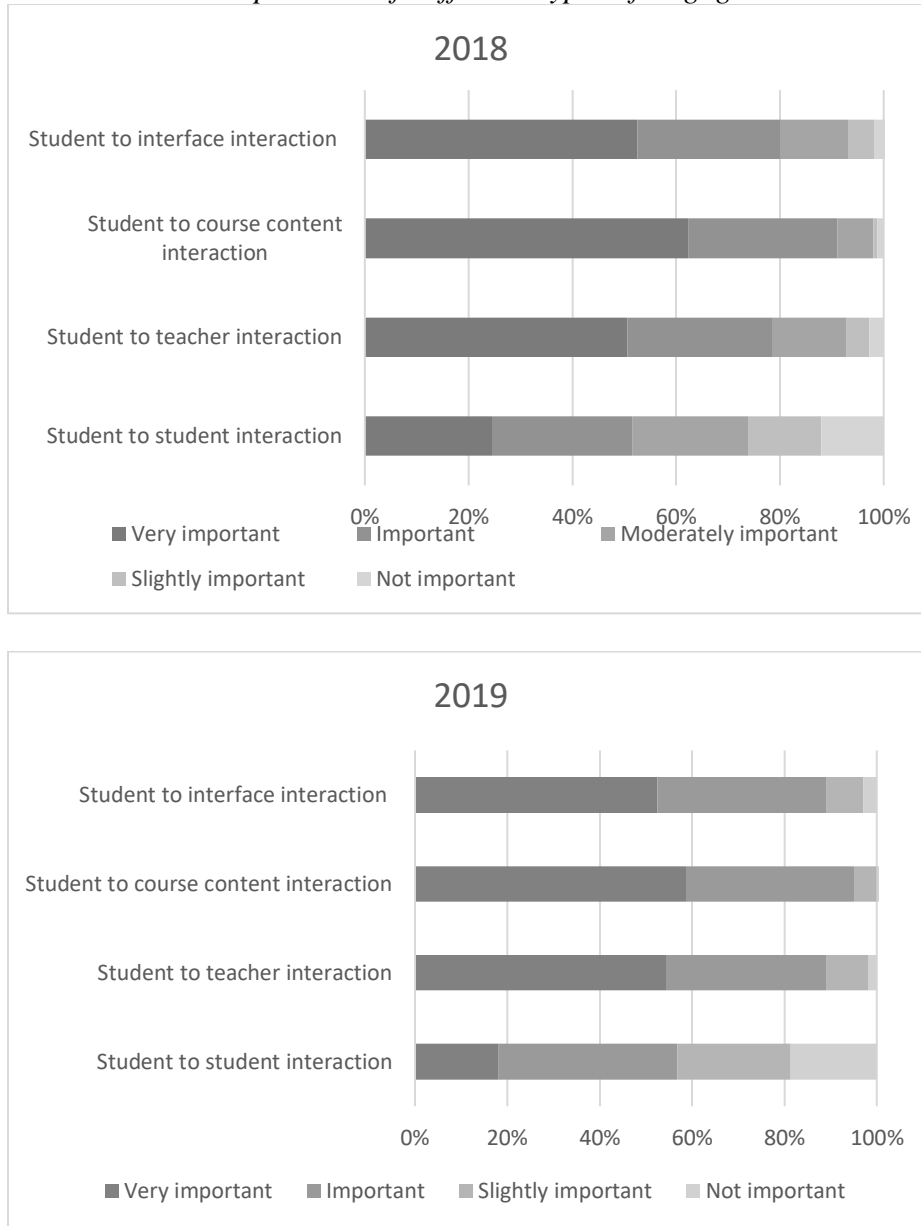
The student-course content interaction had the highest number of students indicating that this type of engagement was Very Important or Important to their learning (collectively 91.4% in 2018 and 94.6% in 2019). This seemed to match their preference for "doing" learning in concrete ways and their identification of activities evident in the qualitative data.

Likewise, across both years, the student-student interaction had the least number of students agreeing that this type of engagement was Very Important or Important (collectively 51.7% in 2018; 56.9% in 2019) and the greatest number indicating that it was Not Important (12% in 2018; 18.6% in 2019). Each year the student-interface interaction (with the study desk/virtual classroom or other ICT systems) and the student-teacher interaction received similar numbers of students agreeing that these engagement types were Very Important or Important (79.8% in 2018, 89.1% in 2019, and 78.5% in 2018, 89.2% in 2019 respectively). This suggested that the research participants preferred learning from a perceived expert of focused learning materials or activities, rather than learning with or from their peers.

Student Perceptions About the Importance of Different Types of Engagement

Student perceptions about the importance of different meta-constructs of engagement to online learning were investigated (based on Redmond et al., 2018). A distinct pattern emerged in students' responses. Figure 2 shows that three of the five engagement types can be ranked in a similar order in each year of the study, based on the number of Very Important and Important responses. Across both years, cognitive engagement received the highest percentage of combined Very Important-Important ratings by students (83.3% in 2018; 92.4% in 2019); behavioral engagement received the second most (81.8% in 2018; 88.9% in 2019); emotional engagement the third (75.8% in 2018; 81.3% in 2019); collaborative engagement the fourth (65.6% in 2018; 66.2% in 2019); and social engagement received the smallest percentage (57.4% in 2018; 58.1% in 2019).

Figure 2
Students' Perspectives of the Importance of Each Engagement Type across Years: 2018 (n = 335) and 2019 (n = 198)
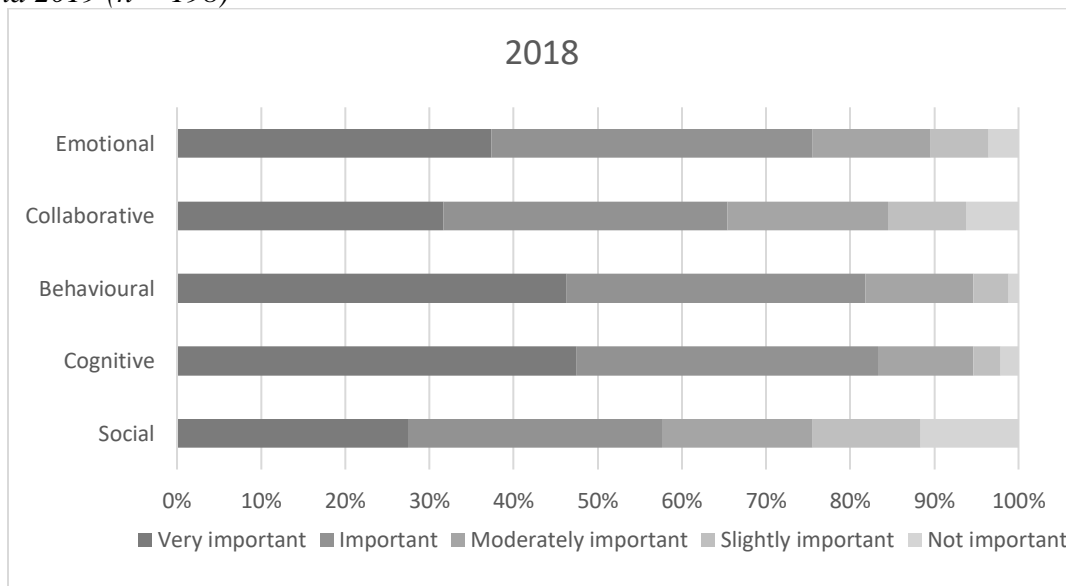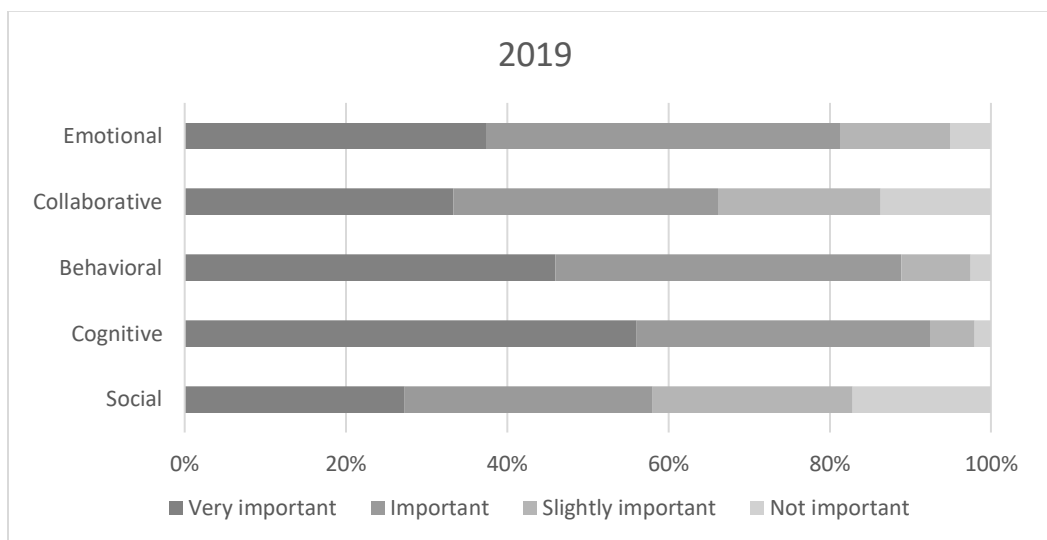
Discussion

Students were asked to define online learning engagement in both the interviews and the survey. Most defined engagement by giving examples. Some focussed on the activities they were doing when they felt highly engaged. Others described contexts or factors that enabled their engagement, such as the interactive or hands-on nature of learning tasks, or mentioned cognitive aspects in their definition, such as scaffolding learning through multiple learning activities related to current learning. Other students mentioned behavioral elements, such as attending tutorials. It was evident that students found it easier to explain engagement, which could be regarded as an abstract term, by drawing on concrete examples of what it means to be engaged in learning. The range of responses suggests varied understandings of what engagement is, and thus supports a multidimensional conceptualization of engagement amidst the complexity of students' perceptions (Buelow et al., 2018; Fredricks, Wang, et al., 2016).

When the qualitative data captured in Tables 2 and 3 are analyzed together, they illustrate that students equate learning engagement with the ability to undertake practical, hands-on activities. In both tables, the most often mentioned themes relate engagement to participatory-type activities. The finding that the highest percentage of students considered student-course content interaction to be very important to their learning engagement reflects the qualitative data in Table 3, in which "course content/design factors" was the engagement enabler category with the highest response count. This suggests that, from a student perspective, how students interact with course content is among the more important course design elements that can impact their propensity to engage with learning in a course.

When the qualitative and quantitative data from this study are analyzed together, the results relating to the importance of student-student interaction and social engagement are mixed. In the qualitative data, peer interactions or student-student interaction emerged as one of the most discussed elements as an engagement enabler or as an activity where they felt highly engaged. However, students' responses to the quantitative questions show that the social aspect of engagement (student-student interaction in Figure 1 and social engagement in Figure 2) was perceived as being the least important type of engagement in each framework. In both figures, the smallest percentage of students ranked the social aspects as Very Important to their learning.

In contrast, the largest percentage in each figure ranked the social elements as Not Important to their learning, thus indicating that student-student interaction was considered the least important interaction and social engagement was considered the least important meta-construct of engagement.

Research into the impacts of different types of interaction has produced mixed results. For example, some researchers have suggested that student-content interaction is a substantial forecaster of student satisfaction (Kuo, 2014) and has a larger effect on learning outcomes than other types of interaction (Ekwunife-Orakwue & Tian-Lih, 2014). Others have found that the quantity of student-content interactions was negatively associated with final grades, compared to student-interface interactions which had a consistent and positive effect on learning outcomes (Joksimović et al., 2015).

Further investigation into the social aspects of engagement is warranted. We recognize that the differences in the qualitative and quantitative responses could be related to how the quantitative questions were expressed in the survey instrument. For example, the question relating to social engagement included examples of "building community, feeling a sense of belonging, developing relationships, establishing trust with others." The focus in these examples was less about communicating with peers and more about building relationships. The way the qualitative questions asked students to rate the importance of each framework's various variables may have led to bias in the way students answered. Each question listed the factors relevant to each framework; that is, four factors from the Moore (1989) and Hillman et al. (1994) framework, and five factors from Redmond et al.'s (2018) framework. Listing the variables together in this manner may have resulted in students subconsciously considering each factor in relation to all factors for that framework, rather than considering each factor's value in isolation. The considerable differences observed between the qualitative and quantitative student responses in relation to the social aspects of engagement, together with the mixed results in previous research, suggest that further investigation into the importance of social engagement to student learning is necessary.

We are mindful that the project described here captured data from research participants from only one university, and that it would be useful to broaden the study to look across a range of institutions. Furthermore, the study did not consider the diversity of the research participants and their higher education study. For example, some participants were undergraduate, and others were postgraduate, and they were studying across a range of disciplines (see Appendix A). Because the majority of research participants were female and mature-age, future investigations could also consider the role of gender and age on perceptions about online engagement. In addition, although all the participants experienced a "digital first" enrolment, the study did not investigate whether perceptions about online engagement varied in relation to students with blended or fully online experiences. Further research in these areas is warranted.

The findings from this study have several practical implications. It would be prudent to design course learning environments to focus and capitalize on the learning qualities that students have identified as important to their positive learning engagement. The five themes that were mentioned most often may be those that reflect the most effective features of a learning environment for helping to engage students. Notably, the students' perceptions suggest that learning activities that have the following characteristics are most likely to encourage student engagement:

(1) are interactive, hands-on, or practical
(2) involve communicating and interacting with peers and educators

(3) provide real-life learning by linking theory to real-life practice through activities that have relevance to real-world application

(4) provide opportunities for current learning to be reinforced or practiced through the use of multiple, scaffolded learning activities

(5) present content in an interesting manner

For example, offering practice exercises, the most mentioned activity in Table 3, is a way to scaffold learning and provide real-life theory practice. Tutorials (see Table 2) are learning situations that enable engagement that regularly requires peer interaction. Tutorials are also used to put theory into practice. Groupwork (see Table 2) allows peer interaction and often requires active/interactive involvement in learning tasks.

This study, however, is limited by the small sample size and the fact that all participants came from one regional university. However, the study's cross-disciplinary nature and the quantitative and qualitative data help to minimize those limitations. The data were self-reported, and we have no way of measuring if there is any relationship between students' perceptions and their actual online engagement behaviors; thus, there is limited ability to generalize to different contexts. Future research could focus on cross-institutional studies of student perceptions of online engagement.

Conclusion

Most descriptions of student engagement consider that engagement requires productive student contributions to a learning environment. This study supports recent arguments for a rethinking—or at least a constant refining—of our understanding of student engagement (Azevedo, 2015; Fredricks, Wang, et al., 2016; Kahu & Nelson, 2018; Tai et al., 2019), especially in relation to social engagement. In addition, it contributes important information about student perceptions to reconsider what matters for students' learning within online learning contexts, particularly in its presentation of five examples of how students believe online courses can be designed to engage learners more effectively. The ways in which teaching, and learning occur within online courses influence students' perceptions of learning and their expectations of how the learning is designed, organized and facilitated; therefore, we must look beyond academic definitions of engagement to improve student learning experiences.

Indeed, when trying to develop scalable and sustainable policies, procedures and practices related to online engagement, all stakeholder voices must be heard. Future conceptualization and measurement of online engagement need to involve students in dialogue about what engagement means. The empirical findings from this research acknowledge the importance of the student voice to contemporary understandings of online engagement. This is a key starting point for discussions about student engagement in online environments via stronger partnerships between students and institutions.

Conflict of Interest
The author(s) declared no conflicts of interest.

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Appendix A

Disciplines and Levels of Study From Which Research Participants Were Recruited

Discipline	No. of Courses	Level of Study
Business (Accounting)	1	Undergraduate: Second-year course
Education (Early Childhood)	3	Undergraduate: First-year course Second-year course Third-year course
Education (Technology)	2	Undergraduate: Fourth-year course Postgraduate course
Engineering (Survey & Built Environment)	1	Undergraduate: Third-year course
Nursing	1	Undergraduate: Second-year course
Science (Mathematics)	1	Postgraduate course
Science (Physics)	2	Undergraduate: Two first-year courses
Science (Research)	1	Postgraduate course

Rising to the Occasion: The Importance of the Pandemic for Faculty Adoption Patterns

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Abstract
Technology adoption patterns, in general, have been shown to have a common set of predictive factors such as performance expectancy, social influence, voluntariness, effort expectancy, and facilitating conditions. However, the significance of such factors varies dramatically by situation and conditions. In the faculty adoption of online teaching modalities, three conditions were investigated in a university case study with 180 faculty respondents. Using the unified theory of acceptance and use of technology model, participants were asked to respond to questions about these factors prior to the pandemic, their perceptions about *continuing* pre-pandemic use in the future, and their perceptions about *increasing* pre-pandemic adoption of online teaching in the future. Critical to prior expectations were performance expectancy and level of effort. Continued use relied on all five factors, but only the negative aspects of social influence were significant. Factors affecting increased adoption (assuming voluntariness) were performance expectancy and facilitating conditions. Findings suggest that increased exposure to online teaching may not be as crucial as the quality of faculty experiences during the pandemic. The rationale for these factor shifts is provided, the effects of institutional support are discussed, the threats and limitations to generalizability are reviewed, and the ramifications for institutions trying to enhance faculty adoption are summarized.

Keywords: faculty adoption of online teaching, performance expectancy, effort expectancy, social influence, voluntariness

Online learning at the university level has been on a steady growth pattern for at least 15 years, especially in the U.S. (Inside Higher Ed, 2020; Seaman et al., 2018), until it spiked with the COVID-19 pandemic (hereafter pandemic). This growth has occurred as student perceptions have improved modestly (Dennis, 2020), despite a relatively constant rate of various concerns by faculty (Allen & Seaman, 2013; Fox et al., 2021; Inside Higher Ed, 2020; Seaman et al., 2018; Shreaves et al., 2020). Reasons may include challenges caused by constantly evolving technology (Cox & Quinn, 2021) and, more recently, by the tremendous challenges online learning presented around the world during the pandemic (e.g., Turnbill, Chugh, and Luck, 2021; Belta-Salvador et al., 2021; Rodrigues, Chimenti, & Nogueira, 2021). Given the tension between relatively constant faculty resistance and increasing usage, what predicts faculty adoption of online teaching in higher education?

While many descriptive studies have investigated the barriers, challenges, and de-motivators of faculty adoption, those studies have tended to stop at correlational analysis (e.g., Hunt et al., 2014) or regression analysis of functional domains instead of examining faculty adoption patterns per se (e.g., Lloyd et al., 2012). A limited number of studies have adapted well-tested technology adoption models.

In the 1990s, a good deal of research was conducted on technology acceptance modeling (e.g., Davis & Venkatesh, 1996; Venkatesh & Davis, 2000). Some of these researchers worked collaboratively to create the unified theory of acceptance and use of technology (UTAUT) model (Venkatesh et al., 2003). The intent was to furnish a technology model that could be applied to various technology adoption contexts and could provide a relatively high level of explanation of variance. The overall model generally explains 65 to 75% of the variance related to behavioral intention in most studies (Chang, 2012; Khechine et al., 2017; Williams et al., 2015). This widely used model has been adapted to a variety of different contexts (Dwivedi et al., 2019). For example, Venkatesh, Thong, and Xu (2012) adapted the model to fit the consumer context by adding price value and hedonic motivation and called it UTAUT2. While UTAUT2 is only better than the original UTAUT model in a narrower class of situations, it does illustrate the need for the adaption of the basic UTAUT model.

The first purpose of the study is to investigate the adaption of the basic UTAUT model to the context of faculty adoption of online teaching. How well does it perform overall as an explanatory theory, and what adaptations are useful in the context of online teaching to improve the performance of the various factors? In addition to adapting the model, this study used the adapted UTAUT model to examine the evolution of online adoption patterns as the pandemic has jolted long-term usage practices. In particular, what effect did the involuntary requirement of online teaching usage have on future intentions, and why?

The basic UTAUT model has five independent factors and two dependent factors. The five factors are social influence as moderated by voluntariness, performance expectancy, effort expectancy, and facilitating conditions. The two dependent factors are intent to use and actual use. After initial use, an important feedback loop (i.e., experience), substantially shifts the importance of factors over time (with performance expectancy becoming more important and social influence declining in importance, generally). Figure 1 provides the basic model below.

Figure 1
Basic UTAUT Model
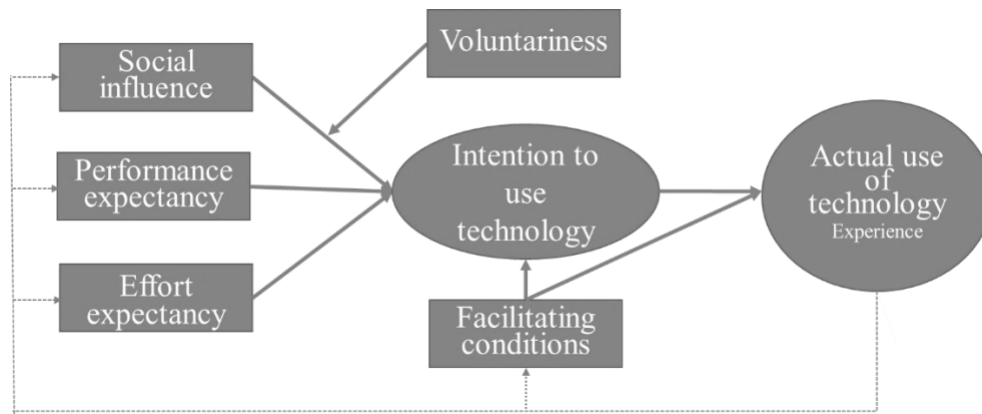
Note. The dotted line indicates the feedback loop.

The Venkatesh Model and the Online Teaching Context

    Social influence occurs when potential adopters are affected by the usage and perceptions of others who are either in positions of influence themselves or function as important role models and the perception of support by the institution. In online teaching, numerous researchers have pointed to colleagues' impact (e.g., Casdorph, 2014; Lewis et al., 2013). Some have also suggested the effect of student feedback (Moser, 2007). Several researchers have pointed to the roles of status and prestige, or lack thereof (e.g., Bailey, 2016; Maguire, 2005; Myers et al., 2004). An area of social influence that has not been empirically investigated is the role of negative social influence, which may be relevant in the online teaching context. *Negative social influence* occurs when non-adoption may not be required, but non-users believe they are perceived as poor colleagues. This negative social influence may be significant in a highly collegial environment when the demand for technology use puts pressure on the department.

    Voluntariness moderates social influence (Venkatesh et al., 2003). When voluntariness is high, social influence has a more significant role. Conversely, when voluntariness is low, a decrease in the *social* aspect of this factor occurs. Social influence plays a modest to moderate role, as reported in the online teaching literature (Johnson et al., 2011; Lewis et al., 2013). However, as voluntariness decreases, social influence becomes a more important factor; when voluntariness is eliminated, it becomes the only significant factor in adoption. This condition primarily existed during the height of the pandemic. It also exists in online teaching when no face-to-face version of a course or program is available. In the online teaching context, it is unclear if the dramatic changes in voluntariness during the pandemic affected other factors in unanticipated ways.

    Performance expectancy is a multiple-dimension category relating to utility, speed, productivity, and career success as initially articulated in the UTAUT model (Venkatesh et al., 2003). When voluntariness is high, performance expectancy is generally the most critical factor. Performance expectancy indicators are extensive in the literature but conceptualized in a variety of ways (Abdekhoda et al., 2016; Bailey, 2016; Casdorph, 2014; Horvitz et al., 2015; Hunt et al., 2014; Lawrence & Tar, 2018; Lewis et al., 2013; Lloyd et al., 2012). Utility and productivity

tend to be conceptualized as learning achievement, learning experience, and intellectual challenge. Other elements that have been loosely associated with performance expectancy that are sometimes highlighted are the ability to motivate students (e.g., Tanner et al., 2011), student access (e.g., Mansbach & Austin, 2018), and faculty satisfaction (Horvitz et al., 2015; Maguire, 2005). A technical research question is whether faculty satisfaction is roughly equivalent to career success and, therefore, an element of performance expectancy or an altogether different factor. Speed as an element of performance originally conceptualized in the UTAUT model is not directly equivalent to the online teaching adoption literature. Speed might be conceptualized as flexibility (e.g., reduction in commute times, scheduling, etc.) (Hunt et al., 2014; Mansbach & Austin, 2018; Stewart et al., 2010; Stickney et al., 2019; Tanner et al., 2011). In the online teaching context, it is unclear whether flexibility is a function of performance or loads as a separate factor altogether because of its importance (Green et al., 2009).

Effort expectancy has to do with the perceived time and energy required to learn to operate a technology system, become skillful, use it on an ongoing basis, and find the system clear and understandable (Venkatesh et al., 2003). In some technology adoption models, it is called "ease-of-use." Nearly universally, researchers report increased workload issues for faculty teaching online (e.g., Hunt et al., 2014; Maguire, 2005; Mansbach & Austin, 2018), and many researchers recommend providing reassigned time to compensate for the time to learn online teaching methods and build classes (Bailey, 2016; Lloyd et al., 2012; Orr et al., 2009). Professional surveys of faculty opinions find substantial concerns about workload (Fox et al., 2021; Inside Higher Ed, 2020), which is collaborated by most work analysis studies (Aryal & Aryal, 2015; Tomei, 2006; contrarily, see Van de Vord & Pogue, 2012).

Effort expectancy changes the overall technologies' adoption cycle, which is especially important in adopting online teaching patterns. First, initiating online teaching requires a lot of effort to learn the methods, adapt teaching approaches, and build out initial class structures (Fox et al., 2021). After these sunk costs are invested, that aspect diminishes. However, course upgrades and increased faculty monitoring may also increase perceptions of effort after the initial course, while eventually, experience/habit and some of the automated features that are rolled over from one course to the next may decrease effort perceptions (e.g., Fox et al., 2021; Lewis et al., 2013). This raises the question about the quantity of effort, which has a cost-benefit basis, versus the perceived impact of the effort. That is, is the overall perception that the effort required for online teaching is worth it (or not) and, whatever the amount of that effort, linked to effort expectancy or another factor?

Facilitating conditions refer to the resources and knowledge to use a system, assistance with initial and ongoing challenges, and the degree to which the system works well or does not interfere with other technologies (Venkatesh et al., 2003). In practical terms, facilitating conditions involve generic and customized training and tech support, so they are widely referenced in the literature. While some more rigorous studies find facilitating conditions to be significant (Hunt et al., 2014; Lloyd et al., 2012; Stickney et al., 2019), some studies have not found them to reach statistical significance in adoption situations (Abdekhoda et al., 2016; Casdorph, 2014). Unlike the other factors, facilitating conditions have little effect on the intent to teach online and a more direct influence on actual use. Further, because training tends to increase performance and support tends to reduce the perception of effort, facilitating conditions have a stronger impact on experience (i.e., the feedback loop) than social influence, and to a lesser degree, effort expectancy (Hunt et al., 2014). In the context of online teaching, examining the role of facilitating conditions is of particular interest because it is possible that the suddenness of

demand overwhelmed service providers and training support systems, exacerbating a difficult situation. This raises the issue of using a model over time because initial adoption and continued use are not identical (Lolic, 2021).

To date, only four studies use versions of the well-respected Ventaketesh et al. unified theory of acceptance and use of technology or UTAUT model context (Venkatesh et al., 2003; Venkatesh & Bala, 2008) in ways related to the online teaching context; however, they have some limitations. Two studies are less-than-ideal because of their relatively low explanation of variance rates, 56% and 47% (Abdekhoda et al., 2016; Casdorph, 2014). A third has a very small number of respondents, 47 (Lewis et al., 2013). Hu, Laxman, and Lee (2020) find that the bulk of adoption explanation comes from performance expectancy and habit, but it is in the specific case of emerging mobile technologies rather than online teaching per se.

This study sought to address some of the issues raised in the literature review.
(1) Can the Venkatesh model, as adapted to the online teaching context, achieve a high level of explanatory power?
(2) Is there any difference between positive and negative social influences in how they load on the Venkatesh factors?
(3) Is there any difference between the quantity of perceived effort versus the impact of effort?
(4) Do flexibility and/or satisfaction load as separate factors or are they subsumed under performance expectancy?
(5) How are the factors affected by the rather dramatic changes associated with the pandemic (pre-pandemic, during the pandemic, post-pandemic)?

Stating these research questions as hypotheses to be tested:
(1) When using customized items, the Venkatesh model can achieve at least a 65% explanation of variance related to online faculty adoption patterns.
(2) Social influence has positive and negative factors that will load separately and be significant.
(3) Perceptions of effort vary depending on whether it is perceived as a quantity or impact.
    a. The impact of effort will load as a separate factor from the quantity of effort.
    b. The impact of effort will load on a factor other than the quantity of effort.
(4) Flexibility and/or satisfaction will load as one or two separate factors.
    a. Flexibility will load separately from performance expectancy and be significant.
    b. Satisfaction will load separately from performance expectancy and be significant.
(5) The weight of the various factors will vary depending on the phase of the pandemic.

Methods

Setting

Participants were obtained from a public research university in Florida, an institution that has approximately 17,000 students (14,500 undergraduate and 2,500 graduate students). It offers undergraduate and graduate degree programs, including doctoral degree programs. This university reflects other midsized universities in the United States, which are the majority of higher education institutions: it is a regional university (students from Florida make up 93% of

all students) in a large city that was founded after the 1965 Higher Education Act to meet the growing demand created in the 1960s (Geiger, 1980).

Instrument Development

A Qualtrics survey instrument regarding faculty adoption was used to collect data to empirically examine the above hypotheses using the UTAUT 1 model (Venkatesh et al., 2003). The survey instrument was Beta-tested in spring 2019, approximately a year prior to the educational lockdown, at a California midsized public research university, with several hundred usable responses resulting in an unpublished, descriptive, internal report. The Beta test led to several item adjustments and refinements. The instrument (see Table 3 for a list of items included) used in the study contains a total of 52 questions. Forty-two questions addressed the UTAUT model covering performance expectancy, effort, social influence (including negative influence from the pandemic) and facilitating conditions. Six items specifically referenced perceptions that might be time sensitive by asking about prior experience and six alternate questions referenced perceptions since the pandemic related to facilitating conditions and social influence (e.g., "Prior to [since] the pandemic, good training was [has been] available about the learning platform at my campus"). Some poor-performing items were removed from the analysis. Seven demographic (i.e., age, race, gender, academic cluster, rank, distance to campus, and previous online teaching experience) and two training questions rounded out the question pool. The questions about training were not used in this study.

To examine the pre-pandemic adoption of online teaching, survey responses to "I have not taught any online courses at a university" and "I am teaching my first class online because of the Coronavirus" were used to construct a dummy dependent variable (taught online before the pandemic = 1, otherwise = 0).

Data Collection

After getting institutional IRB approval, the survey was distributed to all 886 faculty, both full and part-time, on August 19, 2020. A follow-up reminder email was then sent one week later to those who had not completed the survey. A total of 194 surveys were started (21% response rate), but any survey that was incomplete was considered to have been withdrawn from the study and discarded. That left 184 surveys completed, and 169 were analyzed after eliminating missing variables.

Demographic Makeup of the Sample

Regarding respondents' age, the survey sample fell in a bell curve centered on people aged between 42 and 57 (born from 1965 to 1980). Participants were overwhelmingly White (76%). Distribution across the colleges was relatively proportional to college size. A slight majority of the respondents were women (51%). Seventy-seven percent of the respondents live within 20 miles of the campus (see Table 1 for demographic details). The sample population was compared to the university's faculty demographic composition regarding college, age, race, rank, and gender. The sample was slightly more female, and the percentage of respondents in the 42–57 age range were more represented than university faculty in that grouping, while those in the next grouping (58–76) were slightly less represented. All other demographic data were comparable to the population studied.

Table 1

Demographic Information of the Participants

	Freq.	%		Freq.	%
Age Group			*Race*		
58–76	45	27%	White	127	76%
42–57	72	43%	Latino	5	3%
26–41	31	18%	African American	5	3%
18–25	2	1%	Asian Pacific Islander	5	3%
Other	19	11%	Other	26	15%
Total	**169**	**100%**	**Total**	**168**	**100%**
Academic Cluster	Freq.	%	*Faculty Rank*	Freq.	%
Arts and Letters	38	23%	Assistant Professor	23	14%
Business	23	14%	Associate Professor	48	29%
Education	13	8%	Professor	35	21%
Law, Architecture, and Others	13	8%	Adjunct	12	7%
Natural Sciences	40	24%	Instructor	37	22%
Social Sciences	41	24%	Other	11	7%
Total	**168**	**100%**	**Total**	**166**	**100%**
Gender	Freq.	%	*Distance to Campus*	Freq.	%
Female	87	51%	Within 10 miles	62	37%
Male	63	37%	11–20 miles	67	40%
Other	2	1%	21–50 miles	31	18%
Prefer not to say	17	10%	Over 50 miles	9	5%
Total	**169**	**100%**	**Total**	**169**	**100%**

Table 2
Faculty Online Teaching Adoption

Teaching Online	Count	Percent	Never taught, but intend to teach online in future	Count	Percent
Have not taught online	9	5%	Strongly agree	2	22%
Teaching the first online class	22	12%	Agree	1	11%
Have taught at least one online class	80	44%	Neither agree nor disagree	6	67%
Have taught between 2-10	14	8%	Disagree	0	0%
Have taught between 11-20	23	13%	Strongly disagree	0	0%
Have taught more than 20	32	18%	Total	9	100%
Total	180	100%			
Will continue to teach online	**Count**	**Percent**	**Intend to teach more online**	**Count**	**Percent**
Strongly agree	80	47%	Strongly agree	60	36%
Agree	43	25%	Agree	43	26%
Neither agree nor disagree	26	15%	Neither agree nor disagree	34	20%
Disagree	16	9%	Disagree	19	11%
Strongly disagree	4	2%	Strongly disagree	12	7%
Total	169	100%	Total	168	100%

Data Analysis

To test the robustness (RQ1) and articulation (RQ2 through 4) of a UTAUT model adapted to an online context, an exploratory factor analysis (EFA) using a principal component method and direct oblique rotation was conducted to determine best-fit, pre- and post-factor solutions. A logistic regression analysis was used to examine the effects of the independent factorial variables.

A multiple regression analysis was used to test for changes in adoption practices (RQ5). Specifically, it examines the intention to *continue* teaching online versus indicating *increased* online teaching after the pandemic. Factors for the two conditions were determined by a *p*-value greater than 0.1.

Results

Baseline Use and Future Intentions to Use Online Teaching

All but nine respondents had taught online before the pandemic. However, 46% reported being newcomers to online, either teaching a single class or just beginning to teach online during the pandemic. This reflects the percentage of faculty nationally who had taught an online course prior to the pandemic (46%, Inside Higher Ed, 2020). In addition, many of the base findings in this study align with Inside Higher Ed's national survey measuring faculty attitudes on technology in higher education institutions.

When asked about their intent to continue to teach online after the pandemic, 72% agreed or strongly agreed. This number dropped to 62% when respondents were asked whether they intended to teach online more than they had done before the pandemic.

Factor Loading and Regression Analysis: Perceptions Prior to the Crisis

A five-factor EFA solution matched the theoretical model very well and explained 68% of the variance. Six and seven-factor solutions did not perform as well theoretically, nor did they reveal a coherent sixth factor such as satisfaction or flexibility as hypothesized. The satisfaction item loaded cleanly with a 0.846 Cronbach Alpha on performance expectancy and the other teaching performance items. Flexibility for students and for "me" items loaded with only 0.633 and 0.578 values, respectively, but also loaded on the voluntariness factor. Performance expectancy was the dominant factor.

EFA results showed that facilitating conditions loaded with three substantial items: time and resources, customized training, and general training. Receiving incentives loaded both on facilitating conditions and voluntariness. Social influence was comprised of the presence of colleagues in the university, colleagues in the department, and university supportiveness—all positive aspects of social influence. Effort expectancy was reflected by the effort to teach online, additional time to teach online initially, and additional time to teach online even after the first time teaching the course. These items are essentially negative. However, the positive expression of effort reflected in the item "I believe that the effort it takes to teach online is worth it" loaded on performance expectancy.

While voluntariness had five items that loaded on the factor with individual values of about 0.3, and all those items related to the concept, only one had a relatively high item value (0.757). That item was related to teaching online beyond one's standard load. As mentioned, flexibility and incentives also affected voluntariness. See Table 3 for the adoption factor loading prior to the pandemic.

Table 3
Adoption Factor Loading: Pre-pandemic Perceptions

Survey Items	Factor 1 Performance Expectancy	Factor 2 Facilitating Conditions	Factor 3 Social Influence	Factor 4 Effort Expectancy	Factor 5 Voluntariness
I believe that online teaching does as good or better job in helping students reflect on and evaluate their learning.	0.8792				
I believe that online teaching achieves knowledge outcomes equal (or greater) than face-to-face classes.	0.8740				
I believe that online teaching can be as, or more, successful than face-to-face classes.	0.8565				
I believe that online teaching can provide an equal or greater sense of intellectual challenge than face-to-face classes.	0.8528				
I believe that online teaching does as good or better job in helping students set learning goals.	0.8487				
I believe that online teaching is (would be) as satisfying for me as teaching face-to-face classes.	0.8465				
I believe that online teaching can provide equivalent or better lecture presentations than face-to-face classes.	0.8403				
I believe that online teaching achieves an equal or greater sense of a learning community than face-to-face classes.	0.7827				

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
I believe that online teaching can provide equal or better opportunities for students to rehearse materials than face-to-face classes.	0.7246				
I believe that the effort it takes to teach online is worth it.	0.7245				0.4141
I believe that the flexibility provided by online teaching is worthwhile for students.	0.6335				0.4810
I believe that the flexibility provided by online teaching is worthwhile for me.	0.5782				0.5668
Prior to the COVID-19 crisis, time and resources were allocated for me to learn about online teaching issues.		0.8455			
Prior to the COVID-19 crisis, customized training was available when I was building an online class.		0.8177			
Prior to the COVID-19 crisis, good training was available about the learning platform at my campus.		0.7936			
I do or have received incentives for teaching online classes.		0.3890			0.3237
Prior to the COVID-19 crisis, many of my colleagues throughout the university taught online.			0.8711		
Prior to the COVID-19 crisis, many of my colleagues in the department taught online.			0.8591		
Prior to the COVID-19 crisis, the university was supportive of online teaching.		0.4265	0.5403		
I believe that online teaching requires the same or less effort than teaching face-to-face classes.				0.7930	
I believe that online teaching requires a significant investment of additional time even after the first time you teach a class.				0.7871	
I believe that online teaching requires a significant investment of additional time initially.				0.6979	
Teaching beyond my standard load (e.g., summer) may require online teaching.					0.7570

*Five factors explain 68% of the variance. Decimal places and loadings less than .30 omitted.

**All factors produce a Cronbach alpha value of over 0.7, passing the standard threshold of reliability.

In terms of the parameter estimates, only two factors reached appropriate levels of significance without adjustment: *performance expectancy* and *effort expectancy*. However, since voluntariness moderates social influence, resulting in statistical cancellation, the interaction of the two factors resulted in a *p*-value of 0.0095. In the adjusted model, four of the five factors reached levels of significance. See Table 4 for the nominal logistic fit statistics.

Table 4

Summary of Nominal Logistic Fit of Faculty Adoption

Whole Model Test				
Source	**-Log Likelihood**	**DF**	**Chi-Square**	**Prob > Chi Sq**
Difference	10.0600	6	20.1200	0.0026
Full	61.4734			
Reduced	71.5334			
Square (U)	0.1406			
AICc	137.6690			
BIC	158.6030			
Observations (for Sum Wgts)	163			
Lack of Fit				
Source	**DF**	**-Log Likelihood**	**Chi-Square**	
Lack Of Fit	156	61.4734	122.9468	
Saturated	162	0.0000	**Prob > Chi Sq**	
Fitted	6	61.4734	0.9764	
Parameter Estimates				
Term	**Estimate**	**Std Error**	**Chi-Square**	**Prob > Chi Sq**
Intercept	-2.0527	0.2891	50.42	<.0001***
Performance Expectancy	0.9437	0.2835	11.08	0.0009***
Facilitating Conditions	0.0322	0.2261	0.02	0.8868
Social Influence	0.0392	0.2476	0.03	0.8742
Effort Expectancy	0.4974	0.2219	5.03	0.0250***
Voluntariness	0.0050	0.2216	0.00	0.9821
Social Influence × Voluntariness	-0.6289	0.2425	6.72	0.0095***

*p < .10 **p < .05 ***p < .01

Perceptions of Post-pandemic Adoption

The pool of items for the EFA for the post-condition was different from the pre-condition in two ways. First, it included the seven items related to training, resources, pressure, and positive collegial influence, but with different wording (i.e., "since" rather than "prior"). For example, one item was "*Since* the COVID-19 crisis, good training has been available about the learning platform on campus." Besides, five items (i.e., concerns about being perceived as incompetent, lack of contribution, outdated, online teaching becoming normal, and pressure because of the crisis) were added to the analysis because of the dramatic change in exposure to online teaching. Given the nearly universal exposure to online teaching, the possible assumption by many respondents that higher levels of online teaching in the future would likely be expected was tested. That is, the authors wanted to investigate whether negative social influence plays a role.

A six-factor solution in the post-condition was chosen because it matched the theoretical model very well and explained 70% of the variance. The new factor, as hypothesized, was the negative social influence. Four of the five negative social influence factors loaded cleanly. The item—"I have serious concerns that online teaching will be a new normal practice in the future"—also loaded negatively on performance expectations in addition to negative social

influence. Positive social influence is loaded as a separate factor. Another key difference was that flexibility loaded on voluntariness, using the 0.3 Cronbach alpha threshold. See Table 5 for the factor loadings for post-COVID teaching perceptions.

Table 5
COVID-19 Affected Factors Loading

Survey Items	Factor 1 Performance Expectancy	Factor 2 Facilitating Conditions	Factor 3 Negative Social Influence	Factor 4 Effort Expectancy	Factor 5 Social Influence	Factor 6 Voluntariness
I believe that online teaching does as good or better job in helping students reflect on and evaluate their learning.	0.8866					
I believe that online teaching achieves knowledge outcomes equal (or greater) than face-to-face classes.	0.8809					
I believe that online teaching does as good or better job in helping students set learning goals.	0.8606					
I believe that online teaching can provide an equal or greater sense of intellectual challenge than face-to-face classes.	0.8575					
I believe that online teaching can be as, or more, successful than face-to-face classes.	0.8563					
I believe that online teaching is (would be) as satisfying for me as teaching face-to-face classes.	0.8465					
I believe that online teaching can provide equivalent or better lecture presentations than face-to-face classes.	0.8386					
I believe that online teaching achieves an equal or greater sense of a learning community than face-to-face classes.	0.7906					
I believe that online teaching can provide equal or better opportunities for students to rehearse materials than face-to-face classes.	0.7227					
I believe that the effort it takes to teach online is worth it.	0.7119					0.4696
I believe that the flexibility provided by online teaching is worthwhile for students.	0.6192					0.5118
Since the COVID-19 crisis, good training has been available about the learning platform at my campus.		0.8719				

Since the COVID-19 crisis, customized training has been available when I am building an online course.	0.8649				
Since the COVID-19 crisis, time and resources have been allocated for me to learn about online teaching issues.	0.8142				
Since the COVID-19, the university has been supportive of online teaching.	0.5669				
I do or have received incentives for teaching online classes.	0.3739				0.3140
I have serious concerns that my colleagues will think that I am not making a sufficient contribution if I do not teach online.		0.8975			
I have serious concerns that my colleagues will think that I am less capable if I do not teach online.		0.8858			
I have serious concerns that my teaching style will be outdated if I am not teaching online.		0.7292			
Since the COVID-19 crisis, there has been pressure on me to teach online.		0.5635			
I have serious concerns that online teaching will be a new normal practice in the future.	-0.5657	0.3583			
I believe that online teaching requires a significant investment of additional time even after the first time you teach a class.			0.7899		
I believe that online teaching requires the same or less effort than teaching face-to-face classes. 2			0.7608		
I believe that online teaching requires a significant investment of additional time initially.			0.7147		
Since the COVID-19 crisis, many of my colleagues throughout the university are teaching online.				0.8991	
Since the COVID-19 crisis, many of my colleagues in my department are teaching online.				0.8846	
Teaching beyond my standard load (e.g., summer) may require online teaching.				0.6702	
I believe that the flexibility provided by online teaching is worthwhile for me.				0.6146	

*Six factors explain 70% of the variance. Decimal places and loadings less than 0.30 omitted.
**All factors produce a Cronbach alpha value of over 0.7, passing the standard threshold of reliability.

Multiple regression analysis was used to examine future teaching adoption, indicating the intention to *continue* teaching online versus indicating *increased* online teaching after the pandemic. Both dependent variables are on a five-level Likert scale. The factors that were significantly varied in the two outcomes.

Some aspects of all five Venkatesh factors were significant in the *continuing outcome*. However, only negative social influence was significant; positive social influence was no longer significant. Only three factors were significant in the "teach more online" outcome: voluntariness, performance expectancy, and facilitating conditions. Neither type of social influence nor effort expectancy was significant in planning on increasing the amount one teaches online. See Table 6 for the regression analysis results related to the post-condition outcomes.

Table 6
Continue Versus More Online Teaching: Summary of Multiple Regression Analysis

Analysis of Variance	Continue Teaching Online				Teaching More Online			
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Ratio**	**DF**	**Sum of Squares**	**Mean Square**	**F Ratio**
Model	7	100.20	14.31	21.95	7.00	99.44	14.21	13.73
Error	159	103.70	0.65	**Prob > F**	158.00	163.50	1.03	**Prob > F**
C. Total	166	203.90		<.0001***	165.00	262.94		<.0001***
Parameter Estimates								
Term	**Estimate**	**Std Error**	**t Ratio**	**Prob > |t|**	**Estimate**	**Std Error**	**t Ratio**	**Prob > |t|**
Intercept	1.9619	0.0625	31.38	<.0001***	2.2939	0.0790	29.04	<.0001***
Performance Expectancy	0.6037	0.0628	9.61	<.0001***	0.6474	0.0794	8.15	<.0001***
Facilitating Conditions	0.1428	0.0624	2.29	0.0234**	0.1329	0.0788	1.69	0.0937*
Fear (Negative Social Influence)	-0.2182	0.0628	-3.47	0.0007***	0.0413	0.0791	0.52	0.6021
Effort Expectancy	0.1110	0.0629	1.76	0.0797*	-0.0151	0.0807	-0.19	0.8517
Social Influence (Positive)	-0.0298	0.0651	-0.46	0.6477	-0.1067	0.0820	-1.30	0.1951
Voluntariness	0.4083	0.0625	6.53	<.0001***	0.3987	0.0788	5.06	<.0001***
Social Influence X Voluntariness	-0.0559	0.0726	-0.77	0.4421	-0.1258	0.0914	-1.38	0.1707

*$p < .10$ **$p < .05$ ***$p < .01$

Discussion

Research Questions Associated with the Effectiveness and Structure of the Venkatesh Model in Online Faculty Adoption Patterns

The first four research questions had to do with the model's overall fit and how various factors were articulated in EFA. The first research question was whether the Venkatesh model could achieve a high degree of explanatory power since this was not the case in earlier studies. Using questions that were customized to the faculty online teaching environment and Beta-tested led to explanations of variance at 68% and 70% for the pre-and post-pandemic conditions. This was a substantial improvement over previous studies; the first hypothesis was supported.

The second research question asked if any difference existed between positive and negative social influences in how they load on the Venkatesh factors. Positive social influence

was evident in the pre-pandemic case, but negative social influence did not load as an item. That is, faculty were influenced when they saw colleagues teach online and the university provided a positive environment for teaching online. However, only negative social influence (i.e., concern about negative perceptions of others or the presence of social pressure) became significant in determining the likelihood of continuing to teach online to a modest degree. Neither positive nor negative social influence affected decisions related to increasing online teaching levels after the pandemic. Therefore, the second hypothesis that social influence is of two different types (i.e., positive, and negative) was strongly supported.

The third research question asked if there is any difference between the quantity of perceived effort versus the impact of effort in faculty adoption patterns? Yes, there is clearly a difference. The impact (when construed in a positive manner) consistently loads on performance expectancy. Therefore, hypothesis 3a was not supported regarding its loading as an additional factor, but hypothesis 3b was supported regarding its loading on another factor: performance expectancy.

The fourth research question asked, "Do flexibility and/or satisfaction load as a separate factor?" Flexibility is loaded on both performance expectancy and voluntariness in the pre-condition and solely on voluntariness in the post-condition. Hypothesis 4a was not supported. Satisfaction is loaded solely on performance expectancy in both the pre-and post-conditions. Hypothesis 4b was not supported.

The Research Question Regarding the Factor Significance Changes during the Course of the Pandemic

The fifth research question was how the factors might be affected by the rather dramatic changes associated with the pandemic (i.e., pre-pandemic, during the pandemic, post-pandemic). As the regression analyses show, there was dramatic factor variation. Thus, the hypothesis that the significance of the various factors will vary depending on the phase of the pandemic was strongly supported. The data provided a rich opportunity for interpretation, as discussed below.

Prior to the Pandemic

Adoption across the institution was at a very low proportion of all courses prior to the pandemic. In the pre-condition, *performance expectancy* is significant and the most important factor. Except for early adopters, performance expectancy is primarily based on non-experiential perceptions, or limited experiences, which may have been in the past, partial, rushed, or from receiving rather than providing online education. *Effort expectancy* is of medium importance and generally focused on the extra effort it might take to transform courses. *Voluntariness* and *social influence* have an inverse relationship. The stronger the mandate to teach online, the less positive social influence matters, and vice versa. In the pre-condition, they are statistically insignificant separately but taken together; they are of medium importance. Facilitating conditions are not significant in adoption in the *prior to* condition. For the most part, they are not a part of the adopter's calculus and have had little ability to evaluate the quality of support in any case. See Figure 2 for a visual presentation.

Figure 2
Actual Online Technology Adoption Model Prior *to Pandemic*
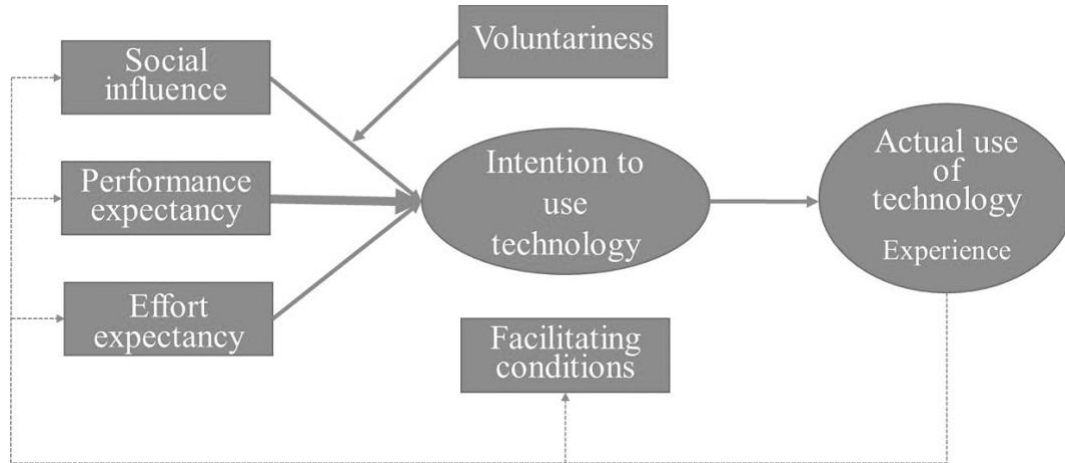
Note. The dotted line indicates the feedback loop.

During the Pandemic

The university and health authorities required all courses to go online during the pandemic except those with an exceptional need for a face-to-face presence, and even those courses were required to take extraordinary measures such as social distancing, reduced face-to-face time, etc., to protect students and faculty. Because of the online teaching mandate (high involuntariness), faculty adoption during the pandemic spikes up enormously, regardless of performance expectancy, social influence, effort, or facilitating conditions. See Figure 3. However, during this period (i.e., condition), experience occurs at vastly increased rates which affects post-pandemic adoption patterns since prolonged experience (even when neutral) is associated with increased long-term usage (McGee et al., 2017). *Performance expectancy* shifts from being largely conjectural to being based on experience, and positive "discoveries" during the pandemic can reshape opinions (Zhou, 2020). When contemplating when the involuntary condition is removed, performance expectancy is perceived not to be based on what online teaching is thought to be capable of (or not capable of), but rather on what instructors have achieved in their online courses in the rushed, and less-than-ideal, pandemic conditions. While *facilitating conditions* are not significant for adoption during the pandemic, the training and technical support received substantially affect performance capability projections once voluntariness is restored (i.e., the post-condition). During the pandemic, the ease/difficulties of teaching online also become experiential rather than conjectural. Substantial additional work and increased stress are generally experienced during this condition, which will affect later post-pandemic adoption decisions (Fox et al., 2021).

Figure 3
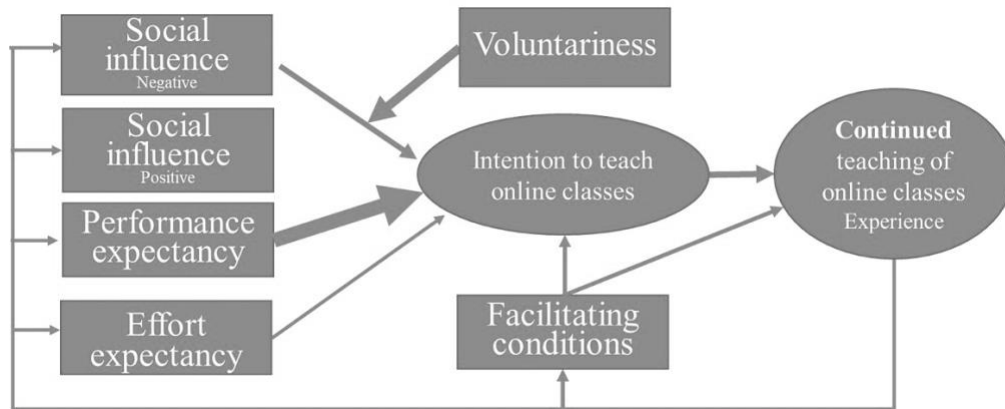*COVID-19 Effect on Online Teaching* During *the Pandemic*
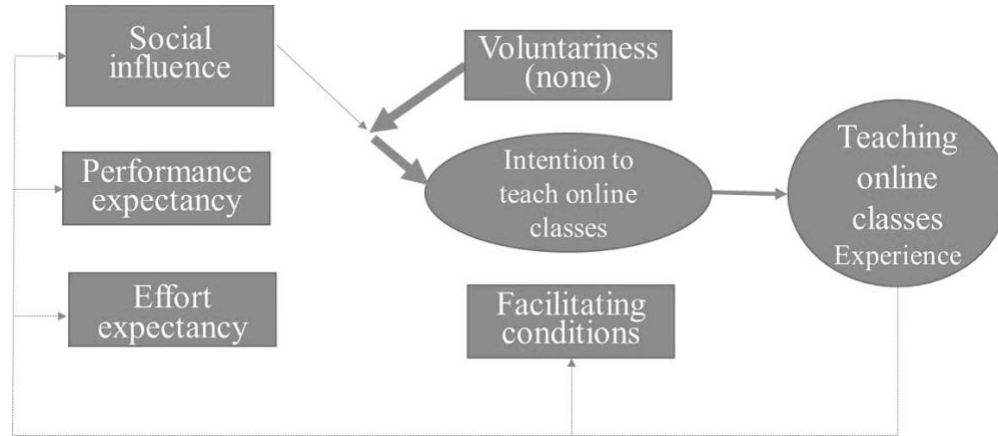
Significant Factors for those Planning to Resume Pre-pandemic Levels of Online Teaching.
After the pandemic, voluntariness might be largely restored, and faculty online teaching will either return to pre-pandemic levels (here labeled continuing) or increase. *Performance expectancy* is by far the most important factor affecting post-pandemic faculty adoption for continuance and an increase in online teaching. Those less impressed by their perceptions of the online modality performance will tend to plan to resume approximately the same level of online teaching that they did before the pandemic. Some with bad experiences will actively resist any online teaching (Botha-Raavyse & Blignaut, 2017). Others with mediocre experiences will resume past patterns or increase online adoption selectively. Such faculty may feel that they can use aspects of online teaching or use them in certain types of courses. They may not actively resist online teaching based on performance expectancy if online demand increases, but they do not actively seek to increase their online presence.
However, those who tend to resume former levels of online teaching can be influenced by its flexibility and opportunities for additional income. *Positive social influences* are of little effect on adoption decisions after the pandemic because essentially all faculty have the same exposure, so role-modeling is no longer pertinent. However, *negative social influence* does play a significantly negative role in the continuous use of online teaching after the pandemic. Faculty may adopt online teaching as influenced by both administrative pressure and concerns that colleagues will think less of them if they do not teach online (Dennis, 2020) during the pandemic. Yet, those who experienced more of those pressure and concerns are more likely to discontinue online teaching in the future. *Effort expectancy* is also a small factor, but much of the emphasis shifts from initial work in converting courses to online formats to maintaining such courses (e.g., the work of reviewing more student activities, more emails, etc.) and upgrading them (e.g., providing time-consuming, high-quality prerecorded lectures) (Fox et al., 2021). The quality of *facilitating conditions* also makes a small difference. Less likelihood of partial or total rejection of the online environment is more likely with good facilitating conditions. See Figure 4.

Figure 4
COVID-19 Projected Effect on Online Teaching After *the Pandemic:* Continued *Use*

Significant Factors for those Planning to Increase Pre-pandemic Levels of Online Teaching

After the pandemic, some faculty will adopt online teaching more extensively and tend to do so without social influence—positive or negative. They will do so even if they perceive the effort to be greater than teaching face-to-face (a nearly universal perception). *Facilitating conditions* are of little importance to their adoption decisions, most likely because they have achieved moderate to high levels of perceived success in online settings and have greater confidence levels. Like those planning on resuming previous adoption levels, they will be moderately affected by flexibility and additional income opportunities. *Performance expectancy* will again be the primary factor in driving faculty to make their decisions. However, in those increasing their level of adoption, they will have better perceptions of online courses' actual achievement and perception of even greater capacity, both with experience and over time. Poor or mediocre teaching performance experiences are relatively unlikely to change adoption patterns simply because of exposure, although they may be less actively resistant. Plans to increase online teaching use are primarily due to good performance capability perceptions during the temporary involuntary adoption period. Good support (i.e., facilitating conditions) is a significant if modest, factor in the intent to increase online teaching. See Figure 5.

Figure 5
COVID-19 Projected Effect on Online Teaching After *the Pandemic:* Increased *Use*
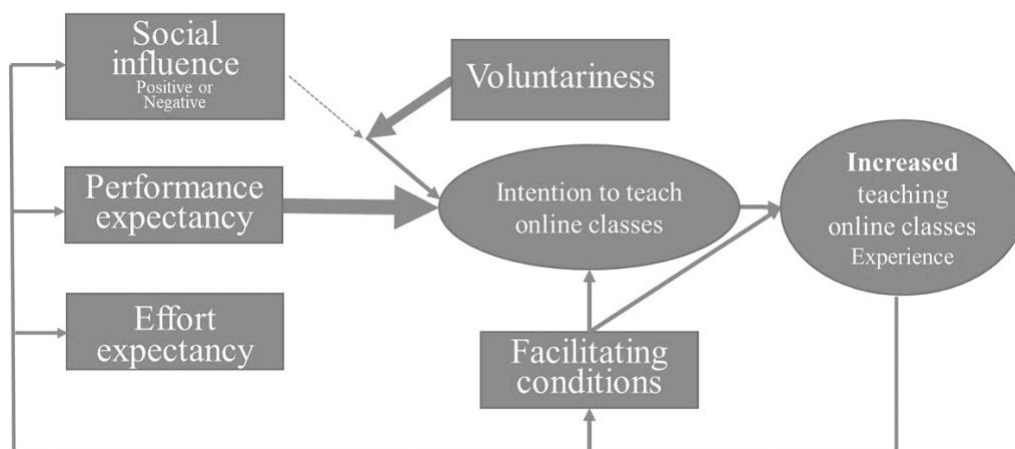
Limitations and Conclusion

One limitation occurs whenever a single institutional setting is used. This was partially addressed by conducting a significant Beta test at a separate institution in which similar results were achieved. Yet, the sample's homogenous institutional setting may partly lead to the insignificance of the *Facilitating Condition* factor in the pre-pandemic adoption model. A more substantial limitation is the use of a single survey and asking participants to reflect on past perceptions. In addition, due to the lack of empirical insights into online teaching adoption as well as how historical events affect technological adoption in the literature, the constructs of various independent variables (i.e., the five or six factors) are mainly exploratory and demand more empirical testing and improvement in future research.

In conclusion, institutional responses prior to and during the pandemic will greatly affect post-pandemic faculty intentions (Dennis, 2020; Vincente et al., 2020). That is, mere exposure to increased online teaching modalities is unlikely to alone change faculty patterns substantially under adverse, involuntary conditions. Indeed, bad experiences could make the resistance stronger once voluntariness is reinstated. Institutions that were overwhelmed because of (a) weak online teaching infrastructure, (b) few existing role models across the institution, (c) modest technical and training support resources and inability to boost them during the teaching crisis, (d) poor administrative leadership leading to confusion, and (e) inability to mitigate some of the severity of work conditions are likely to experience the least change in post-pandemic adoption patterns relative to prior pandemic patterns. To remedy these deficiencies, they should look to the standard recommendations in the literature. Qualitative responses in the current study provide a range of recommendations that are found in Appendix 1.

On the other hand, those institutions or programs that already had a strong online teaching infrastructure, numerous models and, therefore, champions in place, and strong technical or training personnel in place, or those who added to them quickly during the pandemic and had a strong administrative plan to support faculty both empathetically as well as tangibly, are most likely to see substantially less resistance, as well as much higher levels of voluntary faculty-based online teaching adoption. It is also likely that institutional patterns and efforts will disproportionately affect long-term trajectories during the pandemic. Efforts to enhance truly voluntary faculty adoption will be far less efficacious after the pandemic when institutions did not rise to the occasion during it.

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Appendix A
Ways to Enhance Faculty Receptivity to Adoption of Online Teaching
Based on the UTAUT Logic Model

Social Influence
- Recognize people for online teaching including online teaching awards
- Design online teaching initiatives at the department and college level
- Implement university, college, and departmental strategic planning to plan and improve online teaching over time
- Ensure that the support of online teaching is a top university priority with visibility of top administrators

Voluntariness
- Provide incentives for training and teaching online courses
- Provide and explain faculty choice among online options
- Ensure that online courses meet student demand
- Conduct student surveys regarding their interest and have faculty evaluate the data

Online Teaching Performance
- Disseminate best practice approaches for various disciplines
- Identify and address concerns of faculty related to online teaching as much as possible
- Provide training regarding the use of active learning approaches in online environments
- Ensure robust training is available for technology used in online teaching

Ease of effort
- Give reassign time for occasional redesign of online class
- Offer reassign time for design of initial class
- Promote group design efforts for frequently shared courses

Facilitating Conditions
- Ensure ample support for ad hoc training
- Ensure ample support for customized (one-on-one) training

Ensure robust just-in-time technology support

Faculty Transition Strategies from In Person to Online Teaching: Qualitative Investigation for Active Learning

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Abstract
In this qualitative case study, we investigated how active learning strategies discussed and practiced in the face-to-face classroom context were transferred to an online modality by four faculty fellows of Indiana University's Mosaic Faculty Fellows Program. This program is intended to support faculty members' perception of how classroom space influences approaches to active learning. In 2020, all faculty members had to transition their courses online, and the semi-structured interview findings of this study showed that faculty members used three online space types to support the continued use of active learning approaches when transitioning to online: (1) core space to replicate existing practices (e.g., video conference and text), (2) shared space to supplement existing practices, and (3) augmented space to transform existing practices (e.g., activities that merge the physical world and online space). We concluded that preparing faculty members to effectively use active learning approaches in in-person classrooms can also guide active learning approaches in online teaching environments. The study also discussed the need for professional development programs that address support for active learning in different modalities by considering augmented space and its impact on student engagement.

Keywords: Transfer practices, core space, shared space, augmented space, active learning, faculty development, active learning classrooms, online learning, design.

Instructional designers engage in various ways to identify instructional problems and apply solutions (Stefaniak & Hwang, 2021). Scholars have explored and discussed how designers make decisions by using various concepts. For example, Nelson and Stolterman (2003) proposed the idea of design judgment for effective design, Lawson (2006) discussed the principles of design thinking, and Schön (1983) developed a reflection-in-action framework to understand how practitioners think in action.

When encountering problems, how faculty members lacking expertise in instructional design select, organize, adapt, and utilize references is an important question for continuous faculty development and support. For instance, transferring a face-to-face course into a digital format requires faculty members to reconceptualize what constitutes a learning space and what characterizes their roles as effective instructors (Samuel, 2022). The active learning approach is one of these issues that needs to be reconceptualized during the transition.

Active learning refers to any instructional strategy that involves students in the learning process and allows them to take responsibility for understanding and applying the material (Prince, 2004). The learning context shapes how we interact (Baum, 2018; Cornelius & Herrenkohl, 2004), how we feel (Asiyai, 2014; Thai et al., 2017), and how we perceive the learning experience (Cho et al., 2021). Traditional views of active learning created in face-to-face classes may be challenging in online courses due to time and space separation and the mediated communication between the instructor and students (Conceição et al., 2021). For instance, in some studies, the computer-mediated context created a superficial level of interaction between online students (Vuopala et al., 2018), a negative discussion atmosphere due to lack of eye contact (Lapidot-Lefler & Barak, 2012), lower student satisfaction in randomly assigned online collaboration groups (Sadeghi & Kardan, 2015), and a lower sense of social presence in online discussion groups (Cortese & Seo, 2012).

There is a growing body of literature related to online learning environment design with active learning elements. For instance, in a literature review study, Poll, Widen, and Weller (2014) identified six strategies to support active learning in online higher education, including (1) establishing an e-community; (2) explaining course goals and expectations clearly to support students' self-regulation; (3) integrating interactive online tools; (4) encouraging group discussions for exchange of ideas; (5) providing timely and applicable feedback; and (6) promoting a student-centered environment.

The first strategy, building an e-community, has been studied and implemented by scholars in a variety of ways. For example, using collaborative annotation tools to capture learners' thinking and processing in the moment (Adams & Wilson, 2020), utilizing social networking to encourage collaborative problem solving (Overstreet, 2020), promoting interaction and dialogue (Vesely et al., 2007), and changing the instructor's role from authority figure to facilitator (Johnson, 2008) are some of the highlighted online community-building strategies.

In a similar vein, utilizing interactive learning tools outside of the Learning Management System (LMS) is another important aspect of the active learning online course design scholarship. For example, in an experimental study carried out with 140 undergraduate students, Ha and Im (2020) noted that students experience higher levels of curiosity, interest, and satisfaction with the online learning activity when they are provided a customizable difficulty level option in an interactive tool. In addition, Craig et al. (2020) argued that online students benefited from an interactive concept mapping tool (i.e., Net. create) used for the introduction of history concepts. The study highlighted that the dynamic nature of the tool allowed students to build personal connections to both content and peers throughout the course.

Finally, Koohang et al.(2016) proposed a model that explained active learning for knowledge construction in e-learning space with three main stages: "underpinning," "ownership," and "engaging." The underpinning stage refers to preparing activities that guide students to become active learners through real-life examples, scaffoldings, and exploration opportunities. In the ownership stage, the instructor helps learners to gain an identity to take control of the learning. Some strategies for the learners include setting self-goals and making self-reflection and self-assessments. Lastly, the engaging stage is the phase where learners actively create knowledge and the instructor becomes a facilitator to actively coach, guide, and mentor the learners.

Previous literature shows that "course design is the major influencer of how actively students direct their own learning, and online course designs encourage student choice and personal learning decisions" (Boettcher & Conrad, 2021, p. 6). While many research questions in the published literature about online teaching have focused on instructors' needs, perceptions, characteristics, and outcomes, fewer questions have addressed instructors' course design and delivery as highlighted by Leary et al., (2020) literature review findings. Baldwin (2019, p.198) also identified the similar gap by suggesting that "the online instructor's perspective on instructional design strategies used in higher education is missing." Particularly, she addressed the importance of why instructors make specific design decisions when developing online courses.

The purpose of the current study was to investigate how active learning strategies discussed and practiced in the face-to-face classroom transferred to online courses taught by four faculty fellows in the context of a professional development program. We aimed at deepening our understanding of instructional design considerations and practices to understand the interplay between classroom and online teaching experiences and the essence of online space for these faculty members.

From Physical to Online:
The Theory of Assimilation in Online Course Design

Baldwin (2020) created The Theory of Assimilation in Online Course Design to describe instructors' adaptation process to online course design through modifying their experiences in traditional education. Grounded in Piaget's (1954) cognitive development scholarship, Baldwin (2020, p. 206) argued that the assimilation theory in online course design would inform us "why instructors use specific design strategies" and how they "adapt what they know to the new medium." In a qualitative study with thirty-three college and university instructors, Baldwin (2020, p. 203) found that using technology to "hear" and "see" and support "intellectual engagement" via authentic offline assignments were the main assimilation strategies utilized by instructors.

Like Baldwin (2020), Jung et al. (2021) examined five faculty members' problem-solving strategies in terms of instructional design in a college located in Tokyo during emergency online teaching. Analysis of reflective faculty journals indicated differences between novice and experienced faculty members in terms of instructional design. While faculty members with less online teaching experience adopted strategies directly from their traditional classrooms, those with higher levels of online teaching experience followed an eclectic approach by combining classroom experiences, references from the relevant literature, and advice of skilled colleagues and assistants.

Similarly, Samuel (2022) examined the transition strategies of twenty-five online instructors to understand how instructors conceptualized online teaching. Samuel (2022) argued that reframing human interactions in online courses is necessary for effective online teaching. For example, "the traditional teaching paradigm views a class as a collective, and faculty feel engaged when performing in front of this collective. In the online environment, the collective interaction is replaced by multiple individual and or small group interactions" (Samuel, 2022, p. 8).

In addition to reframing faculty-student relations in online space, obtaining the knowledge of Web-based tools to operate outside of the structured LMS environment (Montelongo, 2019, p. 75) was another suggested strategy for the development of a high-impact online course.

In a literature review study on how courses have been enhanced when moved to a digital format, Kirkwood and Price (2014) identified three transferring strategies used by scholars and practitioners: (1) replicating existing teaching practices, (2) supplementing existing practices, and (3) transforming the learning experience.

First, copying "the conventional teaching strategy using some form of technology" was one of the transfer strategies discussed by Kirkwood and Price (2014, p. 10). In this transfer behavior, technology is used to deliver the same course resources and materials to the learners as are utilized in face-to-face classes. Drawing from traditional teaching practices, faculty members simply adapt what they know to the new digital setting. Technological spaces such as discussion forums and video chat tools are utilized to imitate the acts of hearing and seeing that take place in a physical classroom as argued by Baldwin (2019).

The second strategy, *supplementing existing practice*, is concerned with providing additional flexibility to the learners via recorded lectures and extra resources in addition to the replicated materials (Kirkwood & Price, 2014). As argued by Montelongo (2019), supporting learning outside of the LMS using Web tools provides more flexibility to faculty members in this transfer category.

Finally, *transforming the learning experience* refers to redesigning a course to promote online active learning and engagement via reflective and problem-based activities. In a qualitative study, Kumar et al. (2019) interviewed award-winning faculty members for their online course designs. Study findings indicated that meaningful and active learning emerged when instructors integrated authentic course materials such as radio shows and podcasts, used diverse multimedia resources, required students to create digital content, and asked students to demonstrate self-reflection on their learning.

Learning Space in the Online Modality

Learning spaces have their own codes, values, objects, orientations, and concerns (Tsoukala, 2017). As argued by Hertzberger (2008), a classroom can be stimulating, surprising, comfortable, and familiar with the use of light, color, textures, sound, smell, and temperature. He proposed the term "learning landscape" to describe the spatial diversity of a classroom such as collaborative space, individual learning space, debate space, and multipurpose space to stimulate learners' knowledge, discovery, invention, and creation.

These features of a physical learning space become a model for online environments as well. For instance, virtual communities (Hendarwati et al., 2021; Stepich & Ertmer, 2003) as collaborative spaces, online discussions (Gronseth & Bauder, 2022) as debate spaces, video

lectures (Yoon et al., 2021) as individual learning spaces, and virtual whiteboards (Meepung et al., 2021) as multipurpose spaces represent some examples of an online spatial diversity.

Similarly, the qualities of "stimulative" physical learning spaces (Tsoukala, 2017, p. 4) are also modeled in the online space. For example, *flexibility* is one quality that enables the inhabitant to change the spatial experience and adapt to the emerging needs. Bozkurt and Sharma (2020) used the metaphor of educational alchemy to highlight the importance of temporal and spatial flexibility in an ideal online space to redesign, recalibrate, and reimagine the educational components. In addition, *familiarity* and *consistency* are other crucial qualities of an active learning classroom (Tsoukala, 2017). In the online modality, scholars refer to these qualities as easy navigation and consistent course layout to achieve a sense of familiarity (Baldwin et al., 2018; Martin et al., 2021).

While Hertzberger's (2008) learning landscape creates these spatial varieties for the five sensory channels, the online learning landscape can only use sight and sound. In other words, users participate in these spaces by interacting with the interface of a Learning Management System through text, audio, and visuals. This limitation increases the importance of how faculty members perceive online spaces and experience the pedagogical transfer from a physical landscape to a digital one.

Purpose of the Study and Research Questions

While the scholarship related to online course design provides perspectives on faculty roles, skills, and strategies, we could not capture any theoretical discussion on how instructors perceive the online space and how these spaces function as pedagogical tools that inform instructional practices for active learning.

The purpose of the current study was to identify how faculty members who received professional development on the use of classroom space and active learning strategies transferred this training to the online space with the hope to identify interactions and boundaries between the physical and digital modalities. Thus, the following two research questions guided our inquiry:

1. How did Mosaic faculty members experience active learning while transferring from physical to online teaching (because of their participation in the program)?

2. How did Mosaic faculty members perceive "learning space" in the online modality?

Method

The purpose of this phenomenological study was to explore the nature of active learning for Mosaic Faculty Fellows in their online course design. We focused on "describing what all participants have in common as they experience a phenomenon" which is how active learning is perceived and experienced while transferring from physical to online teaching by faculty members (Creswell & Poth, 2018, p. 75). This phenomenological research design helped us to elicit personal descriptions of lived experience regarding online active learning design for a small group of participants who experienced it (Creswell & Poth, 2018).

Data Collection

Creswell and Poth (2018, p. 76) recommend that the heterogeneous group size for interviews with people who experienced the concerned phenomenon may vary from "3 to 4 individuals to 10 to 15." In the current study, after receiving Institutional Review Board (IRB)

approval, ten faculty members who transferred their course to an online setting were identified by the lead author. Next, a study recruitment e-mail was sent to these selected faculty members via institutional e-mail, and four of them agreed to be interviewed.

Online interviews were carried out with four faculty members using the conference software *Zoom,* and both audio and video were recorded with participant permission within the Kaltura software. Each interview lasted 45-60 minutes.

Interview Questionnaire

The focus of the interview was the direct description of the active learning strategies, activities, and motivations as experienced by faculty members in their recent online courses (see Appendix A for the semi-structured interview protocol).

The interview protocol included seven semi-structured questions to encourage two-way communication and explore participants' experiences with follow-up questions. The first and second questions asked interviewees to introduce themselves and share their motivation for participating in this professional development program. We used most of the responses to these questions in the participant stories section. The third question inquired about inspiration sources when designing an online course. The fourth question asked for a specific example of an activity or interaction they translated from a physical environment to a fully or partially online one. In the next question, instructors were asked to compare the term "learning space" for physical and digital settings. Follow-up questions mostly related to perceptions of a classroom and an LMS in terms of spatial diversity. The sixth question was about plans for other active learning strategies in the future. The interview protocol was wrapped up with comments and additional examples from participants.

Setting: The Mosaic Faculty Fellows Program

The Mosaic Faculty Fellows program is a one-year program that supports teaching in active learning classrooms, engages faculty input into classroom design, and facilitates faculty-led research on dynamic learning spaces in a Midwest university in the US. During their tenure as a Mosaic Fellow, faculty members teach in active learning classrooms, explore a variety of instruction strategies and technologies, and collaborate with colleagues on applying new instructional approaches. The goal of the program is to promote understanding of the impacts of classroom space on teaching and to inform future classroom designs through research.

The Mosaic Faculty Fellows were trained to use a variety of active learning strategies in face-to-face contexts. In this phenomenological inquiry, we were interested in these individuals' online experiences with active learning to design more comprehensive faculty training that can be applied to both physical and digital modalities.

Data Analysis

In the data analysis, we engaged "in the process of moving in analytical circles rather than using a fixed linear approach" (Creswell & Poth, 2018, p. 185 - 186) since all steps are interrelated and often happen simultaneously as presented in Figure 1. The analytic steps of the Data Analysis Spiral were followed to generate replicable and explicit data analysis outcomes.

Figure 1
The Data Analysis Spiral, Based on Creswell and Poth (2018)
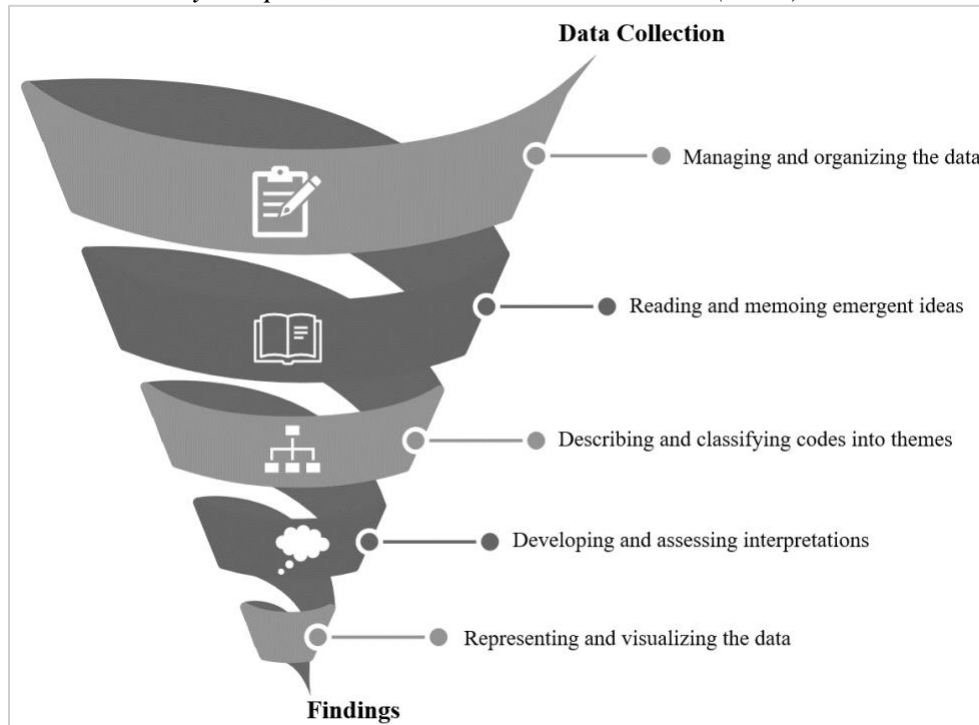
After completing the interview process, we transcribed the recordings using an institutionally approved, secure transcription company and obtained the approval of the interviewees on final transcripts. The digital files were organized in NVivo, a qualitative analysis software, and pseudonyms were assigned to protect the privacy of participants.

Following the organization of files, each transcript was read several times to get a sense of the entire dataset. During this reading process, we took notes regarding the short phrases, emergent ideas, and key concepts utilized by interviewees. For example, participants' stories were extracted in this step to elaborate their teaching pedagogies, experience with technology, and perception of learning space in course design. In the next step, we formed the codes and described the themes.

As detailed in Figure 2, collaboration, flexibility, and authenticity were the initial codes of our analysis for active learning. These codes were then expanded with sub-codes derived from transcripts and they formed final codes for the theme of online active learning strategies. In this step, we adopted a deductive approach by following the predefined set of themes identified by Kirkwood and Price (2014) including: (1) replication of existing teaching practices, (2) supplementing existing practices, and (3) transforming the learning experience to answer our first research question.

To answer our second research question regarding faculty perception of online space, we engaged in an interpretive process for alternative meanings about how these codes inform us regarding the concept of "learning space" in online modality. In this step, the similarities and differences between the nature of face-to-face and online interactions emerged as the

predominant theme. Specifically, the work of Baldwin (2019, p. 205) on the "assimilation in online course design" helped us to formulate three space types including: (1) core space, (2) shared space, and (3) augmented space to better describe how faculty members experience the notion of virtuality.

Figure 2

Coding Procedures for the Themes "Online Active Learning Strategies" and "Perception of Online Space"
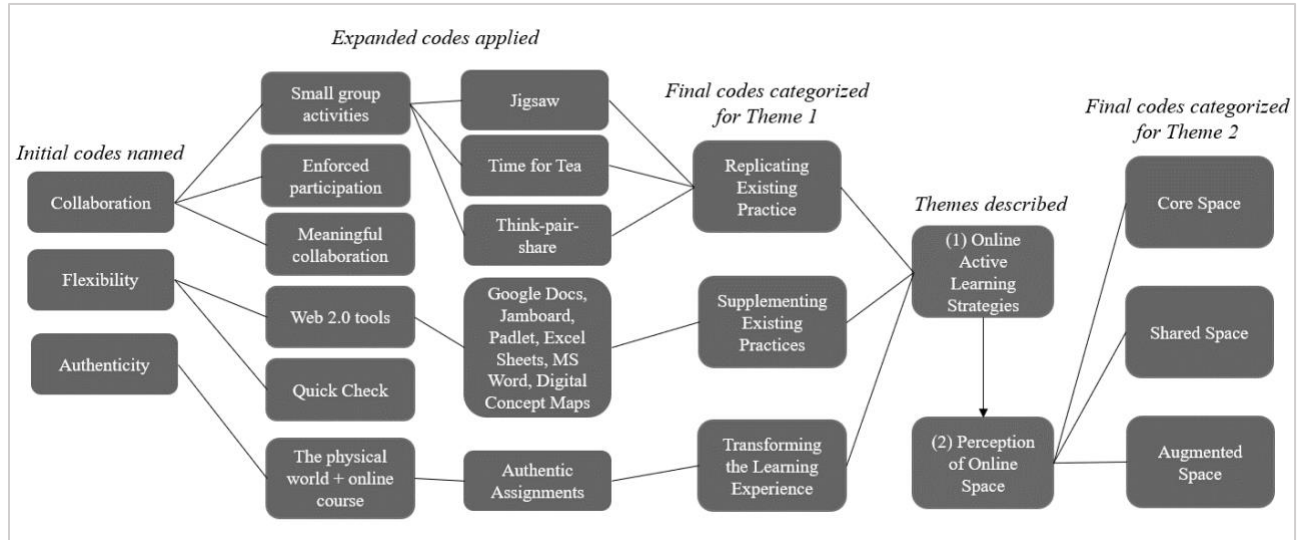
In the final phase of our research, we created a visual image (see Figure 3) of the information to represent the importance of faculty perception of digital space on their online active learning strategies.

Findings

The Participants' Stories

The following sections present a summary of the online teaching experiences of each of the four Mosaic Fellows as evidenced by the interview data. Pseudonyms are used to protect anonymity.

Olivia: Is There any Such Thing as Inactive Learning?

Olivia is a professor of practice in the Journalism Department. As a veteran journalist, she does not have a formal training background in the education field but has acquired a knowledge of learning theories, pedagogy, and instructional design in the classroom. She observed that "…[although] there [were] excellent colleagues who helped me a lot, there was no sort of roadmap. And so, I was doing a lot of work, attending every workshop I could. So, getting involved in the Mosaic Fellowship was part of that experience of just being very determined to learn as much as I possibly could." She also added, "the idea of active learning, the first time I ever had that phrase I thought it was really silly because I was like well, is there any such thing as inactive learning. What does that even mean? But I was happy to go along with

the idea because what a great way to simply explain what we are trying to do in the classroom which is to teach things that only make sense."

She had been teaching in the Media School since 2014 and taught a required Reporting class for undergraduates, Public Relations Writing, and Media Ethics fully online in 2019-2021. Olivia defines pedagogy as the combination of resources, conversations, exchanging information with people, and reflection. Learning space, on the other hand, is an abstract concept for her where instructors and students co-inhabit, such as a Zoom session, a classroom, an outdoor place, a phone conversation, or writing letters. Finally, Olivia considered technology as an assisting element that facilitates learning space interactions.

Farah: It is not the Space, it's the Teaching Approach

Farah had been a Senior Lecturer in the Computer and Information Technology Department for seven years. She mostly teaches undergraduate database and programming classes, and she is the coordinator for most of these courses. Farah is the recipient of several grants related to instructional design and experienced with teaching in active learning classrooms as well as using flipped learning models.

Farah described her first encounter with flipped learning as follows: "First time, I heard about flipped classroom from my department chair. She gave me one big file with different material, conference proceedings, some articles, and all those. It sounded interesting. Then, I started talking about other colleagues who already started using flipped classrooms, then I joined Mosaic Program. And since then, I enjoy experimenting and collaborating in my course design."

When she was asked about how she perceived the role of space in the learning processes, she prioritized teaching approach over the learning space: "So, it's not the 'space' probably, more like 'teaching approach,' how I can make sure my students are learning what I intended them to learn, whether they are learning all the learning objectives I have. It could be virtual. It could be mixed, or it could be completely online. But to me, I have to design my class in such a way [that] they are mastering what I intended them to master." She also added that if she must choose, she prefers teaching in a physical classroom since she has already refined her teaching skills in that setting.

Moana: Space and Technology as Agency Providers

Moana is a clinical associate professor in the Department of History and co-director of the Institute for Digital Arts and Humanities. Her interest in active learning pedagogies is rooted in her graduate student experiences. In her interview, she noted that, "some of the things that we did in my graduate training included active learning in large lecture classrooms, and they were all those horrible, fixed seating classrooms where there are 150 people packed in like sardines, unable to move." After becoming a faculty member, she looked for opportunities to employ active learning strategies in flexible classroom designs for her students and decided to apply for the Mosaic fellowship at Indiana University.

Moana has been teaching a course on the history of cultural and social responses to the plague in face-to-face, online, and hybrid modalities. She stated that space matters since its design provides or prevents agency. To clarify, she added the following example on the agency of space: "if you are in a classroom where somebody is on a podium, and everybody is sort of arranged semicircular to face that person. That person is the only person in the room with any kind of agency. [However,] if everybody is swiveling their head to look at a person who is

standing in the steps, in the middle, and capable of focusing on a screen, capable of then shifting their gaze and choosing when they look at you. So, space makes a difference in this case…"

In terms of the role of technology in learning and teaching, she thinks that technology is the space in an online learning setting. Thus, she claimed, "you really have to understand the affordances of what a tool does, how it pushes people to behave, what kinds of behaviors you want from them, and how you can encourage those behaviors without mandating them" for meaningful and effective technology use.

Ryan: A Controlled Chaos Approach for Active Learning

Ryan is a teaching professor of Computer and Information Technology. He has been teaching courses related to software development, programming, logic, and information technology management. He defined his teaching style as very interactive: "My courses are very conversational, it takes a lot of back and forth between myself and the students, and between the students themselves."

Once he started teaching, he joined several communities of practice for faculty professional development. One community focused on educational technology and another on flipped classrooms. Before the Mosaic Program, he also had a variety of opportunities to practice online teaching. He noted that, in contrast to the traditional engineering pedagogy prevalent in his department that includes lecturing, testing, lecturing, and testing again, he was always interested in finding engaging educational tools and teaching techniques that would lead to collaboration and hands-on activities. Ryan identifies his classroom management technique as "controlled chaos" in which all class interactions look unpredictable and disorganized but teaching and learning processes function according to the pre-defined learning goals.

Themes from Faculty Experiences

The purpose of this study was to examine instructors' transitional experiences from physical course design to online course design with an emphasis on active learning and perception of space. To answer the first research question, we identified three main themes that highlighted transfer practices as informed by the review study of Kirkwood and Price (2014) including: (1) replication of existing teaching practices, (2) supplementing existing practices, and (3) transforming the learning experience. These categories and the sub-codes from four interviews are discussed in greater detail below.

Replicating Existing Practices

Transferring face-to-face small group activities into Zoom and Canvas contexts was one of the most prevalent replication practices to support active learning reported by interviewees. For instance, Olivia carried a cooperative learning technique, *Jigsaw* to Zoom, using the breakout room feature of the software in her media ethics course:

> So, I developed group work very much the same way as I did in class. I tried really hard to think through how I can use Zoom to replicate the in-person experiences that my students have. I did a jigsaw. That was very complicated on Zoom. But I would give each group something that they had—you know, I'd break the chapter up and each group would have a piece of the chapter. But rather than having them reform into different groups, which I did do a bit, but it was so complicated, I would just have each group do a presentation after they'd had some time to discuss the material.

Due to the difficulty of group re-forming on Zoom, she developed quicker ways to make the grouping process easier by "let[ting] them join their own rooms." Moreover, Olivia copied her office hours to Zoom under the name of *Time for Tea* to approximate the online meeting experience to real life:

> I had a thing which I called Time for Tea. So, instead of having office hours, I had time for tea. So, you had to name your favorite tea, right, and then turn up, right. I mean, we stopped talking about tea after week one but still. It encouraged people to come, it became like a class joke. So, I would say that was a Mosaic-inspired move because I was trying to make it more approximate to real life, you know, that it was less formal and more informal and therefore, more appealing. So, that's one thing I will definitely continue to do online and actually in person as well.

Like Olivia, Farah replicated small group activities that she used in the face-to-face classroom on Zoom, and she reported some difficulties in relation to monitoring the performance of the group members online:

> So, with the online setting, it's different. I still try to keep the same format, still video-recorded lecture. Then in class [synchronous video conference], I put them in a group. I let them work together in a group. Even though I tried to mimic the same model, that I tried in person, I've encountered some difficulties, such as in-group, it is not as collaborative, or students do not want to talk. You know, it's not the way it was like physically. For example, one person who is sharing his or her screen on the Zoom, he is active, or she is active, but rest? It's hard to say whether they're working, they're collaborating, because they do not talk.

Farah stated that she tried to improve this replication strategy by inviting a colleague expert in the instructional design field to observe her online class activities. After the observation, she developed a strategy by telling "the group that once they are done with a particular activity, I will call them by name randomly, and someone needs to explain the solution." She calls this technique *enforced participation* since she believed that undergraduate students "need to be assigned some kind of responsibility" to encourage self-regulation.

> Contrary to Farah, Ryan expressed his discomfort with enforced collaboration in the online setting. He emphasized the significance of meaningful collaboration in the transferred activities:

> The thing that I absolutely hate the most is when an instructor creates a discussion and then says, post your answer and respond to two other students, right? Because again, the people who way and to like Friday night to post, then they go back and it's like their response sometimes is like, I agree. That's not helpful. It's not meaningful. That is *forced collaboration* for absolutely no reason. But if the discussion is framed as the four of you have this problem to solve, go solve it, and come back with a unified solution. Like that's a much more meaningful collaboration.

Finally, Moana noted that she replicated a *think-pair-share* classroom activity in her online history course by requiring students to look at each other's visual work on Canvas and reflect on their peers' work. With this strategy, she aimed to support the intellectual engagement and self-reflection skills of the learners.

> I had students think about—so one of the tasks I had them do was to take plague artwork from the 13th century and the 14th century and redraw it using either a modern art form with medieval social and cultural norms or a medieval art form with modern COVID social and cultural norms and then document the differences. But then, they had to go look at someone else's and draw in one of the things that somebody else had documented in their artwork. So, they had sort of a multistage like peer reviews type thing in Canvas—here's the thing that you did. Here's someone else's. What did you like about theirs? What did they do that you didn't do that you could incorporate into yours, given the focus that you had in your artwork?

Interview data indicated that small group collaborations are the most popular active learning strategies replicated in online teaching and learning settings. In four cases, the Mosaic faculty drew from classroom teaching experiences and adopted what they know about active learning in the digital setting.

Supplementing Existing Practices

The second theme, *Supplementing Existing Practices*, refers to providing additional resources, tools, and instructional strategies to increase flexibility and choice for students in the online setting such as Web 2.0 tools and other HTML applications. Faculty members supplemented active learning by these Web tools to allow students to create, share, and communicate in the online setting.

For example, according to Ryan, online space is different than physical space in terms of the lack of an obvious place and borders. Therefore, instructors need to develop supplemental strategies to define the limits of the space that will facilitate student learning and group regulation:

> I have to construct some kind of space for the students to share their ideas above and beyond a breakout room, right? I mean, they can use the breakout room and that's how you could do it. But I also need to be very careful when I do that. I have to make sure that I give them a link to the Google Doc, Jamboard, Padlet, Excel sheet, MS Word, or whatever to collaborate… Because if I break them up into small groups and I give them 15 minutes to do something. Sometimes they'll take that whole 15 minutes just creating and sharing one document, right by the time they type everybody's email in and get everybody to send it to their phone and that's it. It's a waste of time. So, I have to very consciously provide that space for that. So that is one huge change between online and [face-to-face].

Ryan's comments referred to the presence of shared technological spaces such as Google Docs, Jamboard, Padlet, Excel sheet, and MS Word to both record the conversations in Zoom's breakout rooms and facilitate the online interactions. Similarly, Farah shared how she

implemented an online assessment tool, *Quick Check*, to monitor and guide her students' learning and indirectly encourage students' ownership of their learning (Koohang et al., 2016).

> And I used Quick Check to make sure that they're completing their task and all those to enforce that they are completing their pre-class activity…The advantage of using Quick Check was it was integrated with Canvas, and I can see the analytic. I can see for each question what the performance rate for the whole class is. So, the question which is 50 or below the percentage of students who made it correctly, answered correctly, I got an idea that these are the topics students are struggling with.

The Quick Check tool can be interpreted as a privately shared technological space between learner and instructor. This formative feedback strategy is used to invite learners to constantly reflect on their performance.

Finally, Moana explained how she transferred a network-based concept mapping tool that she used in the classroom to the online course to maintain the connection to the learning outcomes and materials:

> I know that one of the things that active learning works well to do is to build community among students, and that comfort level and understanding of how they are—they work together as a team helps with learning outcomes. I wanted them to be able to carry that into an environment where they would be totally physically and socially isolated. I felt like that would help both me and them maintain a connection to the learning outcomes and the material itself.

Transforming the Learning Practice

Finally, the third theme, *Transforming the Learning Practice*, involved findings about Mosaic Faculty's redesigned active learning activities only for the online modality. For instance, Olivia shared an assignment on reporting that she redesigned after moving to an online format for her Media Ethics course.

> There was a student who wanted to prepare a report about how Walmart was adjusting to masking and all that stuff, but he couldn't go inside, they wouldn't let him go inside the store, you know, to talk to people. And I wouldn't let him go inside the store because I didn't want him to get sick. So, I had him sitting in the parking lot with binoculars counting people going into the store and reading the instructions on the door for masking and all kinds of stuff like that. I mean, we just used every resource we possibly could do the reporting we needed. And they came back with—I honestly think they did the best reporting I've seen in that class.

> [Another] student did a lovely story about the kids in her street and how the parents were coping with the pandemic. Her neighbor was a judge. So, they were working from home. It was amazing reporting. And it was because they took advantage of the situation, they were in.

Olivia added that she posted the results of this authentic assignment on a website created for this class and branded it as "In the Field." She concluded that "they posted their photographs, they

got pictures of people working in stores, talking about how they had adjusted to COVID" in that digital space.

Discussion

The findings in this phenomenological study offered a perspective on how faculty experienced the transfer of active learning approaches from traditional to virtual environments. As evidenced by the analysis, three transition strategies were utilized: (1) replication of existing teaching practices, (2) supplementing existing practices, and (3) transforming the learning experience. While performing these transitions, faculty members applied four main references including pedagogic references, technical references, cultural references, and contextual references.

First, Jung et al (2021) argued that the faculty with less online teaching experience replicated their face-to-face classroom experiences when shifting to an online environment. Similarly, in this study, Olive, who has less experience in online teaching, used direct transfer from classroom teaching. She copied her office hours to Zoom under the name of *Time for Tea* to replicate the in-person meeting experience, and brought *Jigsaw,* a cooperative classroom strategy in Zoom's Breakout feature. During this transfer, it is important to note that for novice faculty members, the phenomenon of active learning was first experienced in terms of pedagogical perspective. For example, Olivia initially applied **pedagogic references** such as community building and peer learning that she utilized in the classroom. After encountering problems such as difficulty with student grouping and management in breakout rooms, she used her technical references for meaningful active learning.

Second, in the supplementing existing practices, Jung et al (2021) also indicated that more-experienced online instructors, like Ryan, Moana, and Farah, adopted an eclectic approach by combining **pedagogic references** (e.g., small group discussions), **technical references** (e.g., promoting flexibility outside of the LMS such as Google Docs, Jamboard, Padlet, Excel sheet, and MS Word), and **cultural references** (e.g., how to maintain dialog). For instance, Moana's use of an interactive concept map in the history course aimed to increase students' curiosity, interest, and satisfaction with the online learning activity (Ha & Im, 2020) as well as maintain the connection to learning materials outside of the course.

Third, in transforming the learning practice, active learning was experienced through **contextual references** that depend on the nature of the learning activity and emerging challenges and opportunities during the course design. In this study, Olivia's grocery store observation assignment in the Media Ethics course was redesigned after COVID-19. Since entering the store to observe customers posed health threats for the students at the beginning of the pandemic in 2019, the instructor changed the assignment to observation and used the online course space to share the artifacts. This example demonstrates how faculty members used "ownership" and "engagement" for active knowledge construction in online learning space (Koohang et al. 2016).

Perception of Online Learning Space

The three transformations identified in the data analysis also helped us to answer the second question: how did Mosaic faculty perceive "learning space" in the online modality? In this step, Baldwin's (2020) The Theory of Assimilation in Online Course Design provided us a theoretical land to interpret how the basic human needs such as hearing, seeing, and sharing have been addressed in online course design by four faculty members with an emphasis on active learning. Figure 3 presents a summary of the three online space types (i.e., core, shared, and

augmented) and how they contributed to instructional transfer strategies to support active learning online discussed in the first research question.

Figure 3

The Summary of the Three Online Space Types and How They Contributed to Faculty's Active Learning Strategies
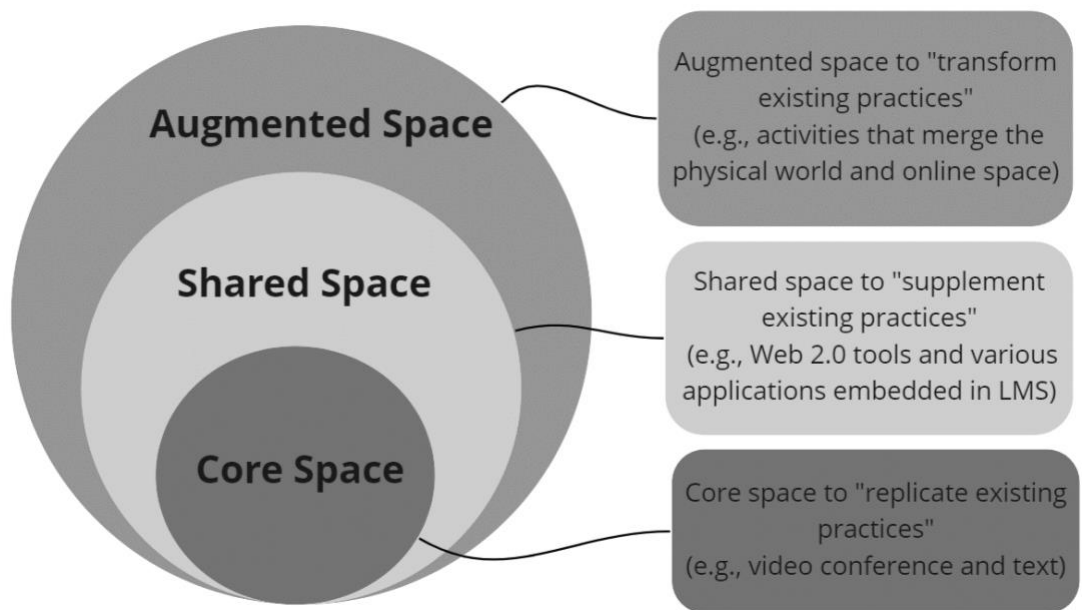
As Baldwin (2019) argued, *core spaces* such as video conferencing tools and discussion boards functioned as human "eyes" and "ears." Faculty members utilized core spaces for instructional assimilation in online course design hoping to approximate the mediated experience to real life. Since the environment is influential in shaping individuals' moods and perceptions (Bohn-Gettler & Rapp, 2011; Barrett et al., 2013), the sense of presence and immediacy were supported in the core space (i.e., video and chat) by several collaboration techniques that are familiar to both faculty and students from classroom practices.

When Mosaic faculty supplemented existing teaching practices online, they took advantage of *shared spaces* where students and instructors can produce and share content and engage in dialogs. As evidenced by the interview data, providing purposeful shared spaces seemed to help faculty members develop guidance for students despite the complex and fluid nature of the online space. While, in this study, shared spaces are seen as spaces to organize and structure the fluid online context, Montelongo (2019) referred these Web-based tools as "escape spaces" from the structured nature of LMS environment.

Finally, inspired by Manovich's augmented space definition in computer science, "a physical space overlaid with dynamically changing information" (Manovich, 2006, p. 223), we identified an *augmented space* where physical world activities are combined with the online course activities. Among the three main themes identified in the current study, examples of the transforming the learning practice theme were captured less compared to the other two themes. This result may stem from the difficulty of designing authentic assignments that connect real-life

to the course content for particular topics such as programming and historical concepts and time limitations of the course.

Interestingly, faculty members with less online teaching experience seemed to be using augmented space only. While Olivia initially adopted direct transition from the previous classroom activities, she began moving from core space activities to augmented space activities in subsequent semesters. The study by Johnson (2017) on faculty perception of online space reported that "as faculty grew in their confidence in the online environment, they described online teaching by way of specific problems they encountered" (Johnson, 2017, p.447). In other words, the specific problems encountered in online space might have contributed to shaping Olivia's perception of online active learning.

Study Implications and Future Research

Faculty beliefs, values, expectations, culture, and norms are some of the many components that contribute to their perception of online learning and teaching (Shreaves et al, 2020). The current study provided a new theoretical perspective for educational technology scholars on how faculty members perceive online space and how online spatial diversity functions as a pedagogical tool. For instance, three space types identified in the findings (i.e., core space, shared space, and augmented space) provide a useful pedagogic guideline for novice online instructors. These spaces can facilitate instructional design order (e.g., starting from the basics of the core space to plan the course, then, moving to the shared space for engagement and interaction, and finally benefiting from the augmented space for authentic learning experiences) and help faculty members to reflect on the quality of the online course. In addition, these concentric circles present a tangible visualization of the abstract and fluid nature of the online setting and provide a narrative tool to communicate the characteristics of an online learning landscape for the practitioners and faculty. For instance, it can serve as a good conversation starter in instructional consultation sessions between faculty members and instructional designers. While we chose to focus on transition strategies from physical to online space with a focus on active learning, future research could focus on other transfer patterns for the assessment strategies, learning material selections, and concerns for diversity, inclusion, equity, and justice. These comparative inquiries between the physical and digital modalities can help researchers and instructional designers to better understand the nature of online space and better describe the characteristics and qualities of an online learning landscape.

Limitations

Although we obtained rich data from four faculty members to consider how they transfer active learning strategies to the online courses and how they perceive learning space, the findings should be interpreted in the specific context of the Mosaic Faculty Fellows program where only four faculty members shared their experiences.

In addition, in pursuit of trustworthy research, the authors discussed the emerging themes in weekly meetings during the data analysis. However, our interpretive process for alternative meanings about the space types is highly subjective and might include our biases about an ideal online course design.

Finally, readers must be cautious about the time of the study. Interviews were carried out during the remote online teaching in 2021 when all faculty members were required to teach

online. Excessive exposure to online teaching and learning discourse at school and in the media might influence faculty responses to the interview questions.

Conclusion

One key conclusion can be drawn from our study. We might consider leveraging understanding of teaching in physical spaces when we prepare faculty members to effectively navigate to online teaching environments, as the latter modality appears to require important awareness of digital space types. In other words, space matters online too. Our interview findings informed us about the presence of three online spaces that can be used to support active learning; (1) core space including basic software used to *hear* and to *see* (e.g., video conference and text), (2) shared space that enables students to *create*, *share*, and *communicate* in the online setting such as Web 2.0 tools and various applications embedded in the LMS, and (3) augmented space in which the physical world and online space are *merged* to get authentic learning experiences.

Declarations
The author(s) declare no potential competing interests with respect to the research, authorship, and/or publication of this article.

Data are available on request from basdogan@iu.edu.

The study was approved by Indiana University's Human Subjects & Institutional Review Board (Protocol ID:11942).

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Appendix A: Interview Protocol

OPENING
- Greet the interview subject.
- Approve that it is OK to record: "May I ask you to give your permission to record our interview?"
    - If yes, *begin recording.*
    - If no, *thank the interviewee again and stop the interview.*

INTRODUCTION
- Read the below script:

The purpose of this study is to discover the ways that Mosaic Faculty Fellows transferred lessons learned in the program to help them teach in digital/online environments. The interview will be audio/video recorded.

1. Efforts will be made to keep the information you provide to us confidential, and your instructors will not know that you have participated.
2. The duration of the interview will be around 1 hour. An email may be sent to you for clarification after the interview.
3. Participation is voluntary. Feel free to stop the interview at any time if you are uncomfortable with any question or for any reason.

Question 1: Could you please introduce yourself briefly?

Question 2: What motivated you to attend the Mosaic Fellows Program?

Question 3: What concepts, readings, or activities from the Mosaic Fellows program directly inspired your design of aspects of your online class?

Question 4: Would you like to give me an example of an activity or interaction you translated from a physical environment to a fully or partially online one?

Question 5: How did the Mosaic Faculty Fellows program influenced your perception of "learning space?"
- Can you give an example from your teaching?
- How do you compare teaching in online or physical environments after participating in the Mosaic Fellows program?

Question 6: What aspects of the Mosaic Fellow training do you see yourself using in online teaching?
- Group work and collaborative technologies
- Active learning strategies
- Motivation
- Engagement
- Self-reflection
- Cognitive Load

Question 7: Is there anything you have not shared with me in this interview?
- Additional comments, issues, questions, examples

WRAP UP
Thank the interviewee for his/her help with the study.

Online Group Supervision in Graduate Psychology Training During the COVID-19 Pandemic

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Abstract
Group supervision, a common method in graduate psychology training, shifted abruptly to online learning due to the COVID-19 pandemic. This study aimed to increase understanding of psychology graduate students' perception of online group supervision during COVID-19 by focusing on the group process and the students' professional identity formation. Data were collected through an online survey comparing an online COVID-19 group sample with a pre-COVID-19 in-person sample. Our findings showed no difference between online group supervision during COVID-19 and in-person group supervision prior to COVID-19 in students' reports of group processes and the prevalence of professional identity statuses. However, group processes differed according to students' professional identity statuses while accounting for the supervision format. We discuss the results of our study and offer several theoretical and practical implications regarding online supervision.

Keywords: Online supervision, group processes, professional identity, COVID-19

COVID-19 brought profound changes to higher education which shifted abruptly to online learning (Crawford et al., 2020). Like other disciplines, psychology programs moved to online group supervision for their students' practical training (e.g., Nadan et al., 2020). However, knowledge about how the online supervision format works is lacking, and there is a need for more research (Parks, 2020). The current study is guided by theoretical and empirical literature that has proposed that group processes contribute to both group supervisees' learning experience (Alschuler et al., 2015) and professional identity (Ayo et al., 2010). It aims to understand psychology graduate students' perception of online group supervision during COVID-19 by comparing their perceived group processes and professional identity formation to those of students who underwent in-person group supervision training before COVID-19. This understanding may establish supervisors' knowledge of the associations between online participation and group dynamics which, in turn, may enhance their effective adoption of online modality.

Group Supervision: In-Person and Online

Group supervision is an integral part of novice psychologists' training and an essential component of learning and professional identity development (Alschuler et al., 2015; Hanetz Gamliel et al., 2020). Beyond its pragmatic advantages (Fleming et al., 2010), group supervision has promising benefits for participants' professional development (Ögren & Jonsson, 2003). Group supervision broadens the frame of clinical reference by observational learning and exposes trainees to a variety of psychopathologies and treatment approaches (Alschuler et al., 2015). It thus increases their knowledge, skills (Linton & Hedstrom, 2006), and self-efficacy (Christensen & Kline, 2001), and contributes to the development of their identity as therapists (Ayo et al., 2010; Hanetz Gamliel et al., 2020).

Online group supervision is defined as a group using digital platforms through a synchronous audio-video format in which supervisor and trainees are not located in the same physical location (Pennington et al., 2019). The flexibility, convenience, cost-effectiveness, and accessibility of online group supervision are considered major advantages, especially for isolated students and clinicians seeking advanced training (Elliott et al., 2016). Furthermore, the empirical research conducted on online group supervision, albeit limited, has demonstrated that it is a feasible and effective setting as in-person group supervision (Abbass et al., 2011; Traube et al., 2021). For example, satisfaction and relationship with the supervisor and reported self-efficacy of counseling psychology students were found to be similar in both remote and in-person formats (Reese et al., 2009).

However, online group supervision presents unique challenges that might hinder the potential contribution of the supervision. Specifically, all digital platforms are susceptible to technical difficulties and are characterized by two-dimensional interaction. Therefore, interpreting data is limited and prone to miscommunication and misunderstanding (Rousmaniere et al., 2014). Moreover, as online supervision excludes informal encounters of supervisors and supervisees before and after the meeting, interpersonal connections may be further reduced (Weinberg, 2021).

The COVID-19 pandemic added a unique aspect to the experience of online group supervision. The rapid spread of the virus and subsequent quarantine policy had adverse economic, social (Shigemura et al., 2020), and psychological consequences worldwide (e.g., Torales et al., 2020), including in Israel (Israeli Central Bureau of Statistics, 2020). College

students have, specifically, experienced additional distress due to the uncertainty and abrupt disruption of the semester and schools' closures (Zhai & Du 2020). This, in turn, has affected their relationships with the groups, e.g., familial, educational, and professional, which students rely on as important sources of self-esteem, meaning in life, and life satisfaction (Pyszczynski et al., 2021). Yet, the powerful human need to belong (Baumeister & Leary, 1995), especially in times of distress, may have increased the need to seek comfort, support, and enhanced self-esteem (Barnes, 2021) through social connections to these groups (Marmarosh et al., 2020). The scarce research data on online group supervision during COVID-19, while mainly qualitative and illustrative in nature, have supported this argument. For example, reports on online group supervision for counselors in China (Chen et al., 2021) and social workers in Italy (Cabiati, 2021) demonstrated that participation in such groups helped supervisees to process their feelings of frustration and helplessness, enhanced their capacities to cope more effectively with stressful life events, and fostered a strong sense of community among them. A report from the United States indicated that the transition to remote group supervision training created both anxiety and greater self-efficacy among trainees (Scharff et al., 2021). Finally, a reflective article from Israel on online group supervision for family therapy trainees following the COVID-19 outbreak found that the trainees reported increased responsibility and involvement in the group which enriched group discussions and enhanced their learning experience (Nadan et al., 2020).

In sum, as online group supervision and quarantines during COVID-19 may have framed students' experience of the group, the present study aimed to also assess students' COVID-19 related worries and perceived social support, which might have related to their perception of group processes in this supervision format.

Group Processes

The long-established literature relating to group processes during group supervision indicates three central group processes—group cohesion (Fleming et al., 2010), group climate (Hawkins & Shohet, 2012), and supervisor/supervisee working alliance (Livni et al., 2012)—as contributing to the group supervisees' learning experience and professional identity formation (Hanetz Gamliel et al., 2020; Mancini et al., 2015).

Group cohesion is defined as a sense of belonging and a belief that the group is important to the individual members' outcomes (Burlingame et al., 2011). Cohesion in the group supervision of novice psychologists was found correlated with their learning about patients, their identity as therapists (Fleming et al., 2010), and their experience of the supervision as significant and effective (Livni et al., 2012). Group climate, indicating the atmosphere in a group, is a multidimensional construct comprising members' perceptions of their own engagement with the group, avoidance of important or difficult topics, and conflict among group members (Gullo et al., 2015). Positive group climate in group supervision was found to promote learning (Fleming et al., 2010; Hawkins & Shohet, 2012). Working alliance, though dyadic in its original definition, has been applied to the group format and involves the presence of an emotional bond between the group leader and group members as well as agreement among them regarding the group's goals and tasks needed to achieve them (Bakali et al., 2013; Bordin, 1983). Positive supervisory working alliances were found to be significantly linked to professional development and job satisfaction for helping professionals (Livni et al., 2012), and positively associated with group members' self-disclosure and the overall group experience (Robak et al., 2013).

The limited research on group processes within online groups in general and online group supervision in particular has suggested that group cohesion and group climate can develop in

online groups but at a slower pace than in in-person groups (Weinberg, 2021). Furthermore, a working alliance with the supervisor was found to be a key factor in the effectiveness of online group supervision (Rousmaniere et al., 2014) and sometimes even stronger than that experienced in in-person supervision (Elliott et al., 2016). A recent qualitative study on online group supervision among psychological counselors found that feedback from the supervisor and peers in online group supervision contributed to professional development (Amanvermez et al., 2020).

Professional Identity

Professional identity, which is a dominant aspect of adults' self-identity, consists of personal motives, interests, experiences, and competencies that are associated with a person's professional role. Professional identity also implies adopting the associated norms and values of one's profession (Pratt et al., 2006). Hence, professional identity is constructed via both intra-individual process and intergroup processes (Tajfel, 1982), according to which individuals define their own identities within the context of their membership in social groups. It has been argued that the processes emerging in group supervision, such as group cohesion, group climate and, especially, the working alliance with the supervisor, define members' experience of the group. This experience, in turn, contributes to the formation of their professional identity (Hanetz Gamliel et al., 2020).

Various studies have shown that professional identity among undergraduate psychology students is linked to job-related and academic factors (e.g., Mancini et al., 2015). Other studies have suggested that when professional identity status is described as committed to the profession, individuals' well-being, emotional adjustment (Crocetti et al., 2011), and job-related outcomes (Crocetti et al., 2014) are more positive in comparison to less committed statuses. Contemporary research has shown that the COVID-19 pandemic was related to professional identity formation in the helping professions, such that medical students reported that, despite the challenges, their professional identity formation remained unchanged (e.g., Findyartini et al., 2020). Similarly, among nursing students, COVID-19 was identified as contributing to a higher level of commitment to the profession (Shengxiao et al., 2021; Zhang et al., 2021).

To conclude, despite the growing body of literature on online group supervision (e.g., Miller, 2020), there is a lack of empirical quantitative research addressing online group supervision in higher education programs. Given the ever-growing use of online groups, the likely continuation of online elements in higher education (Crawford et al., 2020), and our recent experience during the COVID-19 pandemic, the current study seeks to begin filling this gap. It aimed to deepen understanding of the online group supervision during COVID-19 by focusing on students' perceptions of group processes and their professional identity statuses. Since the nature of our study design does not allow determining causality, we focus on group differences and associations. Specifically, the study's questions were:

(1) Does the professional identity statuses' prevalence differ between online and in-person group supervision?

(2) Do the group processes (group cohesion, group climate, working alliance with supervisor) differ between online and in-person group supervision when considering professional identity statuses?

(3) Are COVID-19 related worries and social support associated with online group processes?

Method

Participants

A total of 250 psychology graduate students from universities and colleges around Israel were recruited after finishing both their practical training (practicum) and their group supervision that was held in the academic institutions. The study's cohort was divided between: (a) the in-person pre-COVID-19 sample, which comprised 129 students (106 females), mean age 29.73 years ($SD = 3.64$), practicum duration 11.57 months ($SD = 3.69$), and mean group supervision size 6.46 members ($SD = 1.52$) and (b) the online (via Zoom) COVID-19 group sample, which comprised 121 students (96 females), mean age 29.66 years ($SD = 3.80$), practicum duration 12.42 months ($SD = 4.12$), and mean group supervision size 6.20 members ($SD = 1.31$). There were no significant differences between the two samples in gender, age, practicum duration, and supervision group size.

The primary task of the group supervisions, above and beyond specific theoretical orientations, is to broaden group members' clinical orientation and to equip them with skills for the practice of psychotherapy. In both samples group supervision meetings were held weekly for the entire academic year with supervisors who are experts in their field.

Measures

Group Climate

The Group Climate Questionnaire—Short Form (GCQ; MacKenzie, 1983) is a 12-item self-report questionnaire assessing individual perceptions of the group environment. Each item ranges from 0 (not at all) to 6 (extremely). The GCQ comprises three-factor analytically derived subscales: engagement (Cronbach's alphas for the current samples was .76); avoidance (Cronbach's alphas = .69); and conflict (Cronbach's alphas = .67, after removing item 5). Higher scores indicate higher levels of engagement, avoidance, and conflict.

Group Cohesion

The 9-item cohesion subscale of the Therapeutic Factors Inventory (TFI; Lese & MacNair-Semands, 2000) ranges from 1 (strongly disagree) to 7 (strongly agree). The total score is the sum of the nine responses with higher scores indicating higher levels of cohesion. Cronbach's alpha for the current sample was .90.

Working Alliance

The Working Alliance Inventory/Supervision-Short (WAI/S-S; Ladany et al., 2013) is a 12-item self-report questionnaire used to assess trainees' perceptions of the working alliance with their supervisor. Each item ranges from 1 (not at all true) to 7 (very true), comprising one general scale and three subscales: goal, task, and bond. Higher scores indicate higher levels of goal, task, bond, and a general score. Cronbach's alpha for the current sample was .93 for the general score, .72 for the goals subscale, .90 for the task subscale, and .87 for the bond subscale.

Professional Identity

The Professional Identity Status Questionnaire (PISQ-5d; Mancini et al., 2015) is a 20-item self-report questionnaire ranging from 1 (not at all) to 5 (very much) that was proved to be a useful tool for the evaluation of professional identity formation among university students (Mancini et al., 2015) The PSIQ-5d comprises five subscales: identification with commitment (α

= .81); affirmation (α = .78); practice (α = .57); in-depth exploration (α = .42); and reconsideration of commitment (α = .71). These reliability levels conform with those of Mancini et al. (2015). Due to the relatively low internal consistency for practice and in-depth exploration, we eliminated these two scales from further analyses. Mancini et al. (2015) suggested a factor analysis of these subscales that formed five identity status clusters: (1) achievement—individuals who have made a professional commitment following a period of exploration; (2) foreclosure— individuals who have made a strong professional commitment without having explored alternatives; (3) moratorium—individuals who have yet to make a professional commitment but are still actively exploring alternatives; (4) diffusion—individuals who have yet to make a professional commitment and who have not engaged in exploration; and (5) searching moratorium—individuals who are vacillating between the moratorium and achievement statuses and who seek to revise commitments that have already been acted on.

COVID-19 Related Worries and Social Support

Students' worries related to the COVID-19 outbreak were measured using a 3-item questionnaire designed specifically for the current study. The questions addressed the students' reports of the impact of the pandemic on their economic state, social interactions, and academic studies ranging from 1 (no implications) to 5 (destructive implications). A higher score indicated greater experience of worries. Social support during the pandemic was measured using a 3-item questionnaire addressing the degree of support received from friends, family, and online friends with answers ranging from 1 (no support) to 5 (high support). A higher score indicated greater experience of worries. Demographic information included age, gender, practicum setting, and the size and duration of group supervision.

Procedure

The in-person group supervision sample was recruited between 2017 and 2018 and was approved by the institution's ethics committee (# 2017080). The online group supervision sample was recruited between July and December 2021 (# 2021058). Participants for both groups were mostly recruited using a snowball sample through social networks (Facebook and student WhatsApp groups). Participants were provided with a link to a Qualtrics survey (www.qualtrics.com) which they completed online. Some participants of the in-person sample were approached personally by a research assistant and thus completed the questionnaires manually and returned them in a closed envelope. An informed consent form was completed by all participants prior to completing the questionnaires.

Data Analysis

Descriptive statistics are presented as M (SD) or counts, as appropriate. Pearson correlations or Chi-square tests were used to test for correlations between quantitative and categorical measures, respectively. Research questions regarding group comparisons were performed using MANOVA models, followed by univariate analyses and post-hoc analyses using the Bonferroni correction for multiple comparisons. The additional research question regarding the associations with COVID-19 and social support was tested using Pearson correlations. Power analysis for the main hypotheses, conducted using G*Power V3.1.9.4, ascertained that the sample size provided 95% power for detecting a medium effect size for 5% significance level.

Results

To test the study's first question concerning a comparison of the prevalence of professional identity statuses in in-person and online groups, we performed a K-means cluster analysis for the online group based on the PISQ-5d identity construction subscales. In line with Hanetz Gamliel et al.'s (2020) study, we adopted the 3-cluster solution as suitable for our data. The prevalence of professional identity statuses did not differ across supervision modalities (in-person and online) (χ^2 (249, 2) = 2.24, p = .33). Most students in both the in-person groups (52 students, 40.3%) and online groups (59 students, 49.2%) were characterized by the diffusion identity status, i.e., they had relatively high scores on the identification with commitment, affirmation, and reconsideration of commitment subscales. Next, 50 students (38.8%) from the in-person supervision groups and 37 students (30.8%) from the online supervision groups were characterized by the achievement identity status, that is, by high scores on identification with commitment and affirmation subscales and a low score on reconsideration of commitment. Finally, 27 students, (20.9%) from the in-person groups and 24 students, (20.0%) from the online groups were characterized by the moratorium status and thus scored low on identification with commitment and on affirmation and high on the reconsideration of commitment subscales.

To test the study's second question concerning a comparison between group processes (group cohesion, group climate, and working alliance with supervisor) in the in-person and online supervision groups, while accounting for the professional identity statuses, we used a two-way MANOVA model to examine the joined effect. Table 1 shows the means and SDs of group process across the various identity statuses for the two modes of supervision and the comparison by mode of supervision and identity statuses.

Table 1

Group Process Means and SD by Supervision Mode (In-Person VS Online) and Professional Identity Statuses

Identity statuses		In-person (N= 129)			Online (N= 121)			F (1, 216)	F (2, 216)
		A	**D**	**M**	**A**	**D**	**M**	**Super vision mode**	**Identity statuses**
		M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)		
Group cohesion		48.51 (7.17)	47.32 (8.39)	42.58 (8.86)	49.38 (10.63)	46.97 (9.05)	47.56 (9.70)	1.22	3.45*
Group Climate	ENG	4.73 (.82)	4.39 (.78)	4.21 (1.00)	4.38 (.87)	4.20 (.93)	4.10 (.87)	2.97	3.45*
	AVO	3.52 (1.35)	3.67 (1.00)	4.31 (1.16)	3.61 (1.37)	3.62 (1.29)	3.79 (1.14)	.86	2.28
	CON	2.49 (1.06)	2.58 (.97)	2.79 (1.03)	2.50 (.97)	2.36 (.77)	2.66 (1.03)	.66	1.14
Working alliance	task	4.98 (1.21)	4.65 (1.38)	4.03 (1.37)	5.07 (1.22)	4.65 (1.12)	4.00 (1.43)	.00	8.58***

goal	4.96 (1.21)	4.69 (.99)	4.00 (1.25)	4.95 (1.00)	4.84 (.98)	4.47 (1.10)	1.80	6.48***
bond	5.24 (1.18)	4.89 (1.14)	4.27 (1.32)	5.35 (1.12)	5.07 (1.07)	4.46 (.91)	.94	9.23***

Note: A=Achievement, D=Diffusion, M=Moratorium, ENG=engagement, AVO=Avoidance, CON=Conflict *p< .05; *** p < .001

The MANOVA resulted in a significant global effect (F (14, 204) =2.89, *p* =.007)for professional identity status, such that students with achievement status reported higher group cohesion, engagement, and working alliance (task, goal, and bond) than students with moratorium status. In addition, students with diffusion status reported significantly higher working alliance (task, goal, and bond) than students with moratorium status. There were no differences between online and in-person group supervision in group cohesion, group climate, and working alliance with supervisor. Likewise, no interaction effects were found between the mode of supervision and professional identity status, namely, the differences between identity statuses held for both modes of supervision.

To test the study's final question concerning the associations between students' perceptions of COVID-19 related worries and social support and group processes, Pearson coefficients were examined (see Table 2).

Table 2
Correlations Between COVID-19 Worries and Social Support and Group Process in Online Group Supervision (N= 250)

		Group climate			Group cohesion	Working alliance		
		ENG	AVO	CON		Task	Goal	Bond
COVID-19 worries	Economic state	-.04	.09	.22*	.07	-.00	-.08	-.06
	Social interactions	.18*	-.04	.24**	.02	.02	-.06	-.06
	Academic studies	.13	.13	.21*	-.15	-.04	-.12	-.17
Social support	From friends	.13	-.09	.13	.28**	.09	.17	.10
	From family	.34**	-.18*	-.20*	.32**	.22*	.21*	.18*
	From online friends	.19*	-.08	.10	.25**	.21*	.21*	.22*

ENG=engagement, AVO=Avoidance, CON=Conflict *p< .05; ** p < .01

Significant positive correlations were found between students' worries about the impact of COVID-19 on their social interactions and their reports of group engagement and group conflict. In other words, higher concerns regarding social interactions during COVID-19 were

correlated with higher commitment to the group and higher conflict in the group. Group conflict was also positively correlated with worries about economic state and academic studies. Concerning social support during COVID-19, support from friends and family was positively correlated with group cohesion and working alliance with the supervisor. Social support from family was also positively correlated with group climate. To conclude, the more the students felt socially "held," especially by their family, the more they reported involvement and connection to the group.

Discussion

This study explored online group supervision by focusing on group processes and professional identity formation among graduate psychology students during the COVID-19 pandemic. It sought, in addition, to test the association between COVID-19 related worries and social support and various aspects of online group processes.

Our findings show no difference between online group supervision during COVID-19 and in-person group supervision prior to COVID-19 in graduate students' reports of group processes (group cohesion, group climate, and working alliance with the supervisor) and the prevalence of the three professional identity statuses: achievement, diffusion, and moratorium. Group processes only differed according to students' professional identity statuses regardless of the supervision format. Additionally, we found that students' worries about social interactions and their perceived social support were linked to involvement with the group and the supervisor.

First and foremost, the findings regarding supervision formats coincide with previous research demonstrating that, despite many concerns and challenges, online learning in general, and online group supervision, are comparable to in-person learning (e.g., Lowenthal et al., 2020; Pei & Wu, 2019) and supervision (Abbass et al., 2011; Elliott et al., 2016; Traube et al., 2021). Furthermore, the present findings stress the important intercorrelation between group processes and professional identity in both modes of supervision. Specifically, we found that the working alliance with the supervisor (i.e., task, goal, and bond) and with the group members (i.e., engagement and cohesion) (Elliott et al., 2016) had a key role in the distinction between committed and moratorium students, as was previously found by Hanetz Gamliel et al. (2020).

Drawing from the entitativity perspective, according to which some level of interactivity and similarity is needed in a group (Blanchard et al., 2021; Campbell, 1958), it may be assumed that, as in the in-person supervision format, supervisees' perceptions of the similarity of characteristics and goals within their online groups enabled them to belong and to experience group outcomes (Blanchard et al., 2021). It may therefore be suggested that while the format distinguished online group supervision from in-person group supervision, the function and goals of both are similar.

From a complementary perspective that focuses on the effects and consequences of COVID-19, it might be argued that the online supervision format demonstrates the importance of groups in times of crises, such as a worldwide pandemic and possibly other global crises (Marmarosh et al., 2020). Specifically, being in this social milieu created an opportunity for the participants to interact with their peers and supervisors and receive support, up-to-date information, and a more realistic approach toward their profession as psychologists (Brusadelli et al., 2020; Marmarosh et al., 2020). In turn, this interaction enabled them to experience therapeutic factors such as universality, support, and cohesion that have been empirically linked to better outcomes (Yalom & Leszez, 2005).

In an attempt to shed light on how group participation may be linked to coping with pandemic distress, we examined the associations between COVID-19 worries and support and group processes. We found that students' reports of more pandemic-related worries and less social support were linked to their reports of the group process as less constructive. Students who felt supported by family and friends were more involved in the group and experienced the group as more cohesive and the relationship with the supervisor as more constructive and positive. While supporting the assertion that groups often involve the re-enactment of the family cell (Yalom & Leszez, 2005), these findings possibly suggest that supervisees in the present study used social connections to friends, family, and colleagues to create an anxiety buffer and to enhance their self-esteem in times of distress (Barnes, 2021). Moreover, students who reported more pandemic-related worries were experiencing simultaneously more conflict yet more involvement with the group. This may be viewed in line with the group work perspective, according to which conflict within a group is valued as necessary for activating and enabling a working atmosphere in which negative emotions may be explored (Bakali et al., 2013).

Additionally, the fact that no associations were found between COVID-19's adverse consequences and the formation of professional identity implies that being a novice therapist during the hardships of COVID-19 may have imbued students with meaning and enabled them to construe themselves as valuable contributors to a meaningful universe (Pyszczynski et al., 2020). It may also reinforce their feeling of belonging to a valuable group, which is important for their future professional identity (Burlingame et al., 2011). This explanation is supported by recent research findings, which found that working individuals demonstrated less psychological distress during the COVID-19 pandemic than non-working peers (Shakil et al., 2021).

Interestingly, and as was found previously (Hanetz Gamliel et al., 2020), most students in both samples were characterized by diffusion status, which means that they neither totally committed to the profession nor engaged in further professional exploration. This finding may reflect the participants' "advanced student phase" attitude on finishing their practicum (Rønnestad & Skovholt, 2003). Accordingly, while appreciating their professional training, they realize that there is still much to learn and are likely to feel insecure and in need of actively seeking confirmation and feedback from seniors and peers (Rønnestad & Skovholt, 2003). In this sense, adhering to the diffusion status may be viewed as reflecting the fact that becoming a therapist is a long journey, characterized by ambiguity, unclarity, and struggle.

Limitations and Future Research

Our findings join an emerging and greatly needed body of research documenting the nature and practice of online group supervision in online higher education settings. However, sseveral caveats should be mentioned. First, the main concern regarding the interpretation of our findings lies in the artifact that identifies online supervision with the outbreak of COVID-19 in its earlier stages and thus prevents us from distinguishing between the effect of COVID-19 and the effect of online supervision. However, since no differences were found (no effect), we may cautiously assume that neither COVID-19 nor the mode of supervision are related to group processes. It may be interesting to simultaneously test these different modes of supervision and thus diminish the COVID-19 effect. Second, due to this study's cross-sectional design, we cannot determine directional influences or causality. We therefore suggest that future research focuses on interviewing the same students at repeated time points, which will enable the construction of a cross-lagged model of causality. Third, the relatively modest sample size prevented us from detecting additional significant effects and testing additional and more

complex hypotheses. All of the measures were self-report questionnaires which may have created an informer bias and shared-method variance. Future studies might benefit from using multiple informants, for example, supervisors' perspectives on the role of group processes in online supervision. Finally, the sample recruitment method did not allow for multi-level modeling at both group and individual levels.

Conclusion and Recommendations

The current study's main finding that online supervision groups closely resemble and are as effective as in-person supervision groups provides further support for the benefits of the online format of programs with practical training. This initial finding implies that training courses can be taught using online platforms. Moreover, online group supervision can be integrated into psychology graduate programs as part of the curriculum, especially in times of crises when there are challenges of isolation and distance. However, moving from the "circle" of the in-person group to the squares of the screen requires specific knowledge, and higher education institutions should prepare their teachers to teach and supervise online (Andersen & West, 2021). For example, supervisors may be encouraged to assume a role as facilitators of the group as a whole while helping members tolerate conflict, embracing vulnerability, and discussing clear goals and tasks for the group. Such training might entail increasing supervisors' self-confidence in conducting online groups and practicing how to establish the group process and overcome the lack of in-person interaction by involving all participants online. This involvement can include encouraging all group members to express their ideas at each meeting. This may allow students to feel more confident and enable an atmosphere of safety and group belonging which will advance their effective learning of basic clinical skills and the adoption of a more committed professional identity. Finally, even though the context of the COVID-19 pandemic somewhat limits the results of the study, there can be no doubt that the pandemic has changed education and psychotherapy indefinitely. In face of ongoing worldwide uncertainties, experiencing useful online group supervision can serve as a model and increase supervisees' self-confidence in providing online therapy/consultation whenever needed.

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Development and Validation
of the German Version of the
Community of Inquiry Survey

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Abstract
The Community of Inquiry (CoI) Framework describes success factors for collaborative online-based learning. The CoI Survey is a validated instrument to measure these factors from the perspective of course participants. Until now, no validated translation of this Survey to German was available. The aim of this work was to translate the original English Survey to German and to validate the translated Survey instrument. After a systematic translation process, we validated the German translation in two higher education settings in two countries (entire data set of n=433 Surveys). By conducting item analysis, reliability analysis, exploratory factor analysis, and confirmatory factor analysis, we were able to confirm the reliability and validity of the German CoI Survey. Only one item (CP6) shows cross-loadings on two factors, a finding that was already discussed for the original CoI Survey. To conclude, the validated German version of the CoI Survey is now available.

Keywords: Community of Inquiry, reliability, validity, German, survey, higher education

Online-based learning environments in higher education offer great flexibility to students but are challenging in fostering cooperative learning (Ferguson, 2012). The Community of Inquiry (CoI) (Garrison et al., 1999) is a conceptual, collaborative-constructivist framework to foster collaborative learning in online learning environments. It was initially developed in the context of computer-mediated asynchronous communication in higher education.

The CoI framework describes three overlapping elements that are seen as crucial success factors for a deep and meaningful educational experience (Figure 1): Cognitive presence is "the extent to which the participants … are able to construct meaning through sustained communication" (Rourke et al., 1999, p. 51/52) Social presence is the "ability of participants … to project their personal characteristics into the community, thereby presenting themselves to the other participants as 'real people'" (Rourke et al., 1999, p.52). Teaching presence includes the "selection, organization, and primary presentation of course content, as well as the design and development of learning activities, assessment, and the facilitation of learning processes" (Rourke et al., 1999, p. 52) The CoI framework has become a "robust guideline" to analyze and improve online-based courses in higher education (Castellanos-Reyes, 2020).

Figure 1
The Community of Inquiry Framework
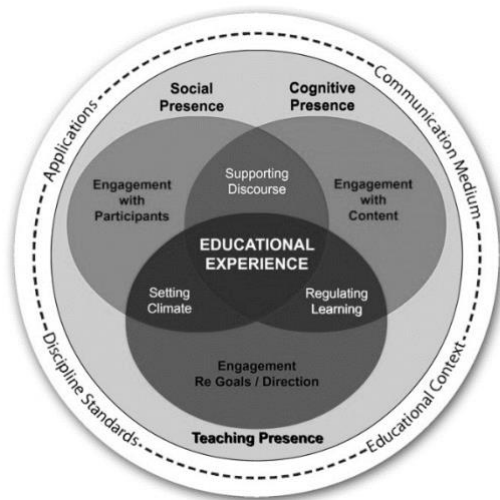
Source: http://thecommunityofinquiry.org/coi; CC-BY-SA)

Since the development of the Community of Inquiry framework, two major approaches to measuring these presences have been widely used: manual coding of online discussions and surveys (Stenbom, 2018).

Rourke et al. (1999) provided the manual coding schema with different indicators based on the three overall categories to measure and describe social presence, cognitive presence and teaching presence. Since then this procedure has been intensively used to manually code students' postings in various online learning environments (e.g. Kovanovic et al., 2018; Richardson et al., 2017; Richardson & Swan, 2003). Nevertheless, this form of measuring the three presences is time-consuming and it has been shown that inter-rater reliability is partly relatively low, as different coders may assign different indicators (Hughes et al., 2007; Swan & Shih, 2005; Whiteside, 2015).

In 2008, Arbaugh (2008) in conjunction with some of the original CoI authors developed a 34-item instrument, the CoI Survey that allows measuring the three CoI presences in larger online communities across institutions (Arbaugh et al., 2008). The CoI Survey contains 13 items for teaching presence, 12 for cognitive presence, and 9 for social presence. The reliability and validity of this English CoI Survey were demonstrated in various settings and countries, and the CoI Survey was also translated to other languages (Stenbom, 2018). The translated versions of the survey showed good results in terms of reliability and validity, for example in Turkish (Olpak & Kiliç Çakmak, 2018), Korean (Yu & Richardson, 2015) or Portuguese (Moreira et al., 2013). However, a German translation is still missing. In 2017, we, therefore, started to develop and validate a German translation. This paper aims to present the development and validation of this German translation of the CoI Survey instrument.

Materials and Methods

Development of the German Translation

We developed the German translation of the original CoI Survey in a systematic forward and backward process. First, two academic translators independently translated all items into German. Differences in translations were solved by discussion between the academic translators. The resulting German translation was then back-translated into English by a third bi-lingual and experienced academic translator. Differences between the original CoI items and the back-translated CoI items were then discussed by a fourth bi-lingual and experienced academic translator and a team member with expertise in educational research and CoI. Differences were resolved by carefully assessing whether the translations matched the intention of the CoI as a collaborative-constructivist framework. In three cases (items TP5, TP6, and SP9, see Table 1), the CoI team at Athabasca University was contacted by e-mail to clarify the specific meaning of the original items, and feedback was considered in the translation. The resulting translation of the CoI instrument was then used in a pilot survey with 16 German-speaking students in an online-based course to verify the understandability of the wording of all items. The data collected was not analysed, but the understanding of the questionnaire items by the students was verified and confirmed.

The translation was then used in two settings: at a university in Austria (since 2017) and a university consortium in Germany (since 2019). In both settings, slightly different variants of six items were used to accommodate different organizational and educational settings. In January 2020, the data with the German CoI Survey were analysed and discussed by both partners, carefully considering the original intention of the CoI, and the final consensus translation was agreed on (Table 1). After this date, this consensus CoI Survey was used at all sites.

IRB approval was received by the Research Committee for Scientific and Ethical Questions, 2309/17.

Table 1

Original CoI items in English Taken from Arbaugh et al. (2021) *and the Final German CoI Survey*

No.	Original CoI Survey	Final German CoI Survey
TP1	The instructor clearly communicated important course topics.	Die Lehrperson hat wichtige Kursthemen klar vermittelt.
TP2	The instructor clearly communicated important course goals.	Die Lehrperson hat wichtige Kursziele klar vermittelt.
TP3	The instructor provided clear instructions on how to participate in course learning activities.	Die Lehrperson hat klare Anweisungen gegeben, wie die Teilnahme an den kursbezogenen Lernaktivitäten erfolgen sollte.
TP4	The instructor clearly communicated important due dates/time frames for learning activities.	Die Lehrperson hat wichtige Abgabetermine sowie den zeitlichen Rahmen für die Lernaktivitäten klar mitgeteilt.
TP5	The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.	Die Art wie die Lehrperson half, verschiedene Sichtweisen auf Kursthemen zu identifizieren, unterstützte mich beim Lernen.
TP6	The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.	Die Art wie die Lehrperson die Gruppe unterstützte Kursthemen zu verstehen, half mir meine Gedanken zu sortieren.
TP7	The instructor helped to keep course participants engaged and participating in productive dialogue.	Die Lehrperson unterstützte die Gruppe dabei aktiv und in einem produktiven Dialog zu bleiben.
TP8	The instructor helped keep the course participants on task in a way that helped me to learn.	Die Art wie die Lehrperson half, dass die Gruppe aktiv bei der Sache bleibt, unterstützte mich beim Lernen.
TP9	The instructor encouraged course participants to explore new concepts in this course.	Die Lehrperson ermunterte die Gruppe dazu, sich mit neuen Konzepten auseinanderzusetzen.
TP10	Instructor actions reinforced the development of a sense of community among course participants.	Die Vorgehensweise der Lehrperson hat das Zusammengehörigkeitsgefühl der Kursteilnehmer/innen gestärkt.
TP11	The instructor helped to focus discussion on relevant issues in a way that helped me to learn.	Die Art wie die Lehrperson half, die Diskussion auf relevante Themen zu fokussieren, unterstützte mich beim Lernen.
TP12	The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives.	Das Feedback der Lehrperson half mir dabei, meine Stärken und Schwächen in Bezug auf die Kursziele zu verstehen.
TP13	The instructor provided feedback in a timely fashion.	Die Lehrperson hat rechtzeitig Feedback gegeben.
SP1	Getting to know other course participants gave me a sense of belonging in the course.	Das Kennenlernen anderer Kursteilnehmer/innen gab mir das Gefühl zur Gruppe dazuzugehören.
SP2	I was able to form distinct impressions of some course participants.	Ich konnte mir von einigen Kursteilnehmenden ein differenziertes Bild machen.
SP3	Online or web-based communication is an excellent medium for social interaction.	Online- bzw. webgestützte Kommunikation ist ein ausgezeichnetes Medium für soziale Interaktionen.

SP4	I felt comfortable conversing through the online medium.	Bei der Online-Kommunikation fühlte ich mich wohl.
SP5	I felt comfortable participating in the course discussions.	Bei der Teilnahme an den Kursdiskussionen fühlte ich mich wohl.
SP6	I felt comfortable interacting with other course participants.	Bei Interaktionen mit anderen Kursteilnehmer/innen fühlte ich mich wohl.
SP7	I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.	Ich fühlte mich wohl dabei, eine andere Meinung als andere Kursteilnehmer/innen zu haben, und konnte dabei die Vertrauensbasis erhalten.
SP8	I felt that my point of view was acknowledged by other course participants.	Ich hatte das Gefühl, dass mein Standpunkt von anderen Kursteilnehmer/innen anerkannt wurde.
SP9	Online discussions help me to develop a sense of collaboration.	Online-Diskussionen halfen mir, ein Gefühl der Zusammenarbeit zu entwickeln.
CP1	Problems posed increased my interest in course issues.	Die aufgeworfenen Problemstellungen haben mein Interesse an den Kursthemen verstärkt.
CP2	Course activities piqued my curiosity.	Die Kursaktivitäten haben meine Neugier geweckt.
CP3	I felt motivated to explore content-related questions.	Ich fühlte mich motiviert mich mit inhaltlichen Fragen auseinander zu setzen.
CP4	I utilized a variety of information sources to explore problems posed in this course.	Ich nutzte unterschiedliche Informationsquellen, um die im Kurs aufgeworfenen Problemstellungen zu untersuchen.
CP5	Brainstorming and finding relevant information helped me resolve content related questions.	Die Ideensammlung und das Auffinden relevanter Informationen halfen mir beim Beantworten inhaltlicher Fragen.
CP6	Online discussions were valuable in helping me appreciate different perspectives.	Die Online-Diskussionen waren für mich nützlich, um unterschiedliche Perspektiven zu verstehen.
CP7	Combining new information helped me answer questions raised in course activities.	Das Kombinieren neuer Informationen half mir bei der Beantwortung von Fragestellungen, die in den Kursaktivitäten aufgeworfen wurden.
CP8	Learning activities helped me construct explanations/solutions.	Die Lernaktivitäten halfen mir, Erklärungen bzw. Lösungen zu entwickeln.
CP9	Reflection on course content and discussions helped me understand fundamental concepts in this class.	Die Auseinandersetzung mit Kursinhalten und die Diskussionen halfen mir, die grundlegenden Konzepte dieses Kurses zu verstehen.
CP10	I can describe ways to test and apply the knowledge created in this course.	Ich kann beschreiben, wie man das in diesem Kurs entwickelte Wissen überprüfen und anwenden kann.
CP11	I have developed solutions to course problems that can be applied in practice.	Ich habe für die behandelten Problemstellungen Lösungen entwickelt, die in der Praxis angewendet werden können.
CP12	I can apply the knowledge created in this course to my work or other non-class related activities.	Ich kann das im Kurs entwickelte Wissen im Rahmen meiner Arbeit oder bei anderen Aktivitäten außerhalb des Kurses anwenden.

Research Context

Two partners from two German-speaking countries participated in this validation study of the German CoI Survey. The first partner is the Austrian University UMIT – private University for Health Sciences and Health Technology with its fully online master's program in Health Information Management. This master's program's instructional design is firmly based on the Community of Inquiry framework. This post-graduate master's program has a duration of five semesters. The master's program starts annually. Previous student numbers ranged from seven to 20 per cohort. The program consists of 13 online courses, where each course has a typical duration of six weeks. All courses comprise asynchronous e-tivities and written discussions and follow the same instructional guideline. The student groups in the courses usually remain the same, instructors (typically one instructor per course) vary throughout the courses. Moodle is used as a learning management system. The format of e-tivities is used throughout all courses (Salmon, 2013) to provide common structures for all activities and support meaningful discussions. All students are invited to three networking days at the university once a year to promote socialization and team building.

The second partner is the HiGHmeducation Consortium consortium, comprising 12 different universities in Germany that offer study programs in Medical Informatics. This consortium aims to boost Medical Informatics by jointly offering online courses. Students in bachelor's and master's programs in the field of Medical Informatics of the participating universities can voluntarily complete various online courses from different partner universities to further their education and obtain an additional certificate. The cohort size in the courses ranges from six to 41 participants, with an average of 16 students participating in each course. The periods in which the courses take place are aligned with the semester periods of the offering universities so that a course usually takes place over a period of 16 weeks. The courses are conducted according to the instructional design of the HiGHmeducation Consortium which can be characterized by the Community of Inquiry framework, the use of asynchronous e-tivities (Salmon, 2013), and by course phases that carefully introduce participants to the online setting. Within the HiGHmeducation Consortium different learning management systems are used, depending on the university: Moodle, Ilias and Stud.IP.

Participating Students

Overall, 242 students participated in this validation study (Germany: n=171, Austria: n=71). The 71 students from Austria were all participants of the online master's program, although from three different cohorts. The 171 students participating from Germany were all participants attending courses offered by different consortium partner universities.

Demographic data collected were gender and language skills in German. 123 (51 %) of the students were female, 105 (43 %) were male, 14 students (6 %) didn't specify. The language skills were relevant because participants with insufficient German language skills would have been excluded from the validation study. A total of 199 (82 %) of the students had German as their native language, but all students were sufficiently fluent in German to follow German-speaking courses.

In Austria, students were enrolled in an ongoing master's program that included multiple courses and thus typically completed several CoI surveys, one for each course. In Germany, students mostly attended only one online course and thus completed mostly only one survey.

Overall, the 242 participating students completed 433 CoI surveys (Germany: n=171, Austria n=262). All surveys used were the same German translations. Only in a few items, the translation differed (see Appendix A for details).

Data Collection

All students participating in an online course were invited to fill in the German version of the CoI survey at the end of each course. An online questionnaire was used here, and the access link was sent to the students by e-mail or by personal message within learning management systems. The survey contained the 34 items of the German CoI Survey and used a 5-point Likert scale (Strongly Agree = 5 to Strongly Disagree = 1). Participation was voluntary and anonymous, and it was also possible for students to skip items. Consent forms were obtained from all students at the beginning of their study.

Data Analysis

Overall, 433 complete datasets from 242 students were available for our data analysis. To assess whether the slightly different wording of the survey variants at both partner institutions may influence validation results, we first divided the data set based on the three questionnaire versions: the Austrian version (n=186), the German version (n=86), and—after the final consensus of the translation of all items—the final version (n=161).

An in-depth item analysis as well as an exploratory factor analysis were performed using SPSS 27 (IBM Corp., 2020).

As item analysis and exploratory factor analysis confirmed no differences in the Survey variants, confirmatory factor analysis was subsequently calculated over the entire data set of 433 surveys.

We calculated this sample size as follows: According to Kass & Tinsley (1979), five to ten participants are required per item, which would sum up to a needed sample size of 340 students given the 34 CoI items. Comrey & Lee (1992) suggest that a sample size of 200 is fair and 300 is good. Similarly, other authors also suggest that total sample sizes of N=300 are sufficient (Tabachnick & Fidell, 2007).

Item Analysis

A descriptive item analysis was conducted. Item difficulty, means, and standard deviations, kurtosis of items, discriminatory power, and mean inter-item correlation for the three different survey versions were analyzed.

Item Analysis for Reliability

As a prerequisite for the exploratory factor analysis and to check the internal consistency of the German translation, a reliability analysis of the items was conducted. In addition, we checked whether the items were sufficiently highly correlated (Kaiser-Meyer-Olkin criteria) and whether the missing values in the data sets arose by chance (Little's MCAR test).

Exploratory Factor Analysis (EFA) for Validity

After the in-depth item analysis, exploratory factor analysis was conducted using SPSS 27 (IBM Corp., 2020). Due to the positive results of the initial item analysis of each variant, the whole data set (N=433) was analyzed. EFA is a multivariate method often used in test and questionnaire construction to "identify the common factors that explain the order and structure among measured variables" (Watkins, 2018, p. 220). By EFA and scree plot, MAP test, and parallel analysis, we attempted to identify the German translation's three-factor structure (i.e., teaching, social, and cognitive presence).

Confirmatory Factor Analysis (CFA) for Predictive Validity

Based on the item analysis results and the exploratory factor analysis, a confirmatory factor analysis was conducted using R (R Core Team, 2014) and AMOS (Arbuckle, 2014). In contrast to EFA, CFA is "the foundation of structural equation modeling" (Moore & Brown, 2012) and compares models for their empirical fit to the data (Bühner, 2011).

Different fit indices are available to assess model fit and predictive validity of the item structure. For example, Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) closer to 1 indicate higher fitting between variance/covariance of the tested model with more restrictive independence model (Schreiber et al., 2006). Standardized root mean squared residual (SRMR) looks at correlation matrices and unlike root mean square error of approximation (RMSEA) does not consider model complexity, so these two should be considered in combination. Cut-off for the SRMR is < .11 and RMSEA sample-dependent, for n=>250 sample size in our case an RMSEA cut-off of <.06 (Bühner, 2011).

Descriptive Statistics and Item Analysis Over the Different German Translations

Table 1 presents the results of the in-depth item analysis of the three German CoI variants. Results show no difference in the descriptive analysis for the items independent of the wording used, which could be expected due to minor translation changes. Both the mean inter-item correlation and the reliability analysis support the final German CoI version.

All Likert scale response options were used for all items (min = 1, "strongly disagree," max = 5, "strongly agree"), but the distribution of the items is right-skewed. All students reported high levels of perceived teaching presence, social presence, and cognitive presence over all survey variants (see Table 1).

Table 1

Item Analysis of the German Translation of the CoI Survey

CoI version		Mean (min = 1, max = 5)	Std. deviation	Skewness	Kurtosis	Discr. Power	MIC
Austrian version (N=186)	TP	4.36	.75	-1.63	2.40	.70	.65
	SP	4.35	.63	-1.23	1.53	.64	.49
	CP	4.47	.57	-1.24	1.03	.79	.48
	Total	4.39	.56	-1.15	.49	.99	.40
German version (N=86)	TP	3.67	.83	-.71	-.24	.82	.54
	SP	3.40	.94	-.25	-.53	.65	.52
	CP	3.55	.84	-.46	-.11	.83	.55
	Total	3.56	.76	-.39	-.03	.99	.48
Final translation (N=161)	TP	4.15	.78	-1.04	.81	.66	.58
	SP	4.09	.81	-1.08	1.25	.65	.55
	CP	4.29	.66	-1.48	2.20	.76	.53
	Total	4.18	.62	-1.47	3.27	.99	.41

Note. TP = Teaching Presence, SP = Social Presence, CP = Cognitive Presence. MIC = Mean Inter-Item Correlation.

**Exploratory Factor Analysis (EFA) for Validity**

EFA was performed on the whole data set (n=433), as the item analysis indicated no differences in survey variants. Keyser-Meyer-Olkin (KMO) yielded .955 of sampling adequacy, implying that EFA should explore distinct and reliable factors with sample data. Barlett's test of sphericity ($\chi2$ (561)=9,805.38 , p <.000) indicated that correlations were sufficiently high for the EFA. All MAS (measure of sampling adequacy) coefficients had values higher than 0.80, indicating the suitability of the test characteristic values for factor analysis.

According to Stenbom (2018) most previous authors used principal component analysis (PCA) using oblimin rotation, followed by varimax rotation when validating the Community of Inquiry Survey. As our data was not normally distributed (teaching presence, social presence, and cognitive presence scales were not normally distributed, as assessed by the Shapiro-Wilk test and Kolmogorov-Smirnov test, $p < .05$) and based on recommendations for factor analysis (Costello & Osborne, 2005; Watkins, 2018), we choose maximum likelihood (ML) extraction and varimax rotation with Kaiser normalization. Here we follow other authors who validated other translations of the CoI Survey (Olpak & Kiliç Çakmak, 2018). Table 2 shows the results.

The scree plot shows the three factors with eigenvalues greater than 1 (Figure 2). Parallel analysis conducted in R suggested three factors for the underlying data. A minimum average partial test (MAP Test) was conducted to prove the three-factor structure, confirming three factors.

Figure 2

Scree Plot for the German Version of the Community of Inquiry (CoI) Survey
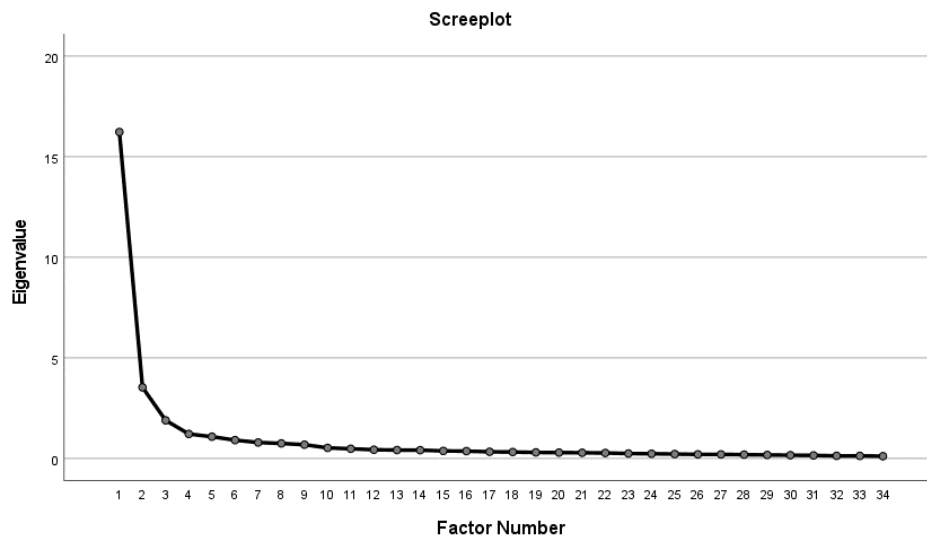
With the three-factor structure of the German CoI Survey, EFA shows that 60% of the variance in the patterns of the relationship among the items could be explained. The first factor (teaching presence) explains 24%, the second factor (social presence) 18%, and the third factor (cognitive presence) 18% of the variance.

In a sub-analysis, we conducted EFA on the final German CoI (n=161) only. KMO and Bartlett's test of sphericity again proved that the data fit the analysis, and the three-factor structure was confirmed as well. In total, findings were slightly better for this final German CoI. The three factors explained 61% of the variance: The first factor explains 23% (teaching presence), the second 20% (social presence), and the third 18% (cognitive presence).

Table 2

Factor Loadings of the Community of Inquiry (CoI) Items After Factor Reduction Procedures

Item	Factor loading		
	1	2	3
Factor 1: Teaching Presence			
TP1	.677		
TP2	.603		
TP3	.611		
TP4	.496		
TP5	.833		
TP6	.826		
TP7	.815		
TP8	.792		
TP9	.668		
TP10	.686		
TP11	.820		
TP12	.768		
TP13	.765		
Factor 2: Cognitive Presence			
CP1		.688	
CP2		.750	
CP3		.764	
CP4		.518	
CP5		.594	
CP6		*.428*	*.490*
CP7		.649	
CP8		.635	
CP9		.585	
CP10		.653	
CP11		.583	
CP12		.530	
Factor 3: Social Presence			
SP1			.664
SP2			.563
SP3			.612
SP4			.737
SP5			.771
SP6			.820
SP7			.719
SP8			.619
SP9			.688

Note. Extraction method: maximum likelihood with varimax rotation (N=433).

Item Analysis for Reliability

All 34 items were analyzed for reliability, first for the three variants and then for the overall data set (Table 3). All items showed very high internal consistencies and reliability in all variants and the final German CoI Survey.

Table 3
Cronbach's Alpha for All Variants and the German CoI Survey

	Austrian version (n=186)	German version (n=86)	Final version (n=161)	Total Sample (n=433)	Number of items
	Cronbach's Alpha (α)				
Teaching Presence	.959	.936	.948	.954	13
Social Presence	.892	.906	.913	.916	9
Cognitive Presence	.915	.936	.928	.939	12
Total CoI	.957	.969	.958	.965	34

Likewise, in comparison with the reliability analyses of the other translations, our results show themselves to be reliable and comparable (Table 4).

Table 4
Reliability of Different Translations of the CoI survey

|	Original CoI Survey (Arbaugh et al., 2008)	Portuguese Translation (Moreira et al., 2013)	Korean Translation (Yu & Richardson, 2015)	Turkish Translation (Olpak & Kiliç Çakmak, 2018)	Final German Translation
Teaching Presence	.94	.93	.96	.96	.95
Social Presence	.91	.89	.91	.95	.92
Cognitive Presence	.95	.91	.96	.97	.94
Overall	-*	.96	.97	-*	.97

Note. * These results were not reported.

Confirmatory Factor Analysis (CFA) for Predictive Validity

Following EFA, we conducted CFA for the whole sample to analyze factor structure using R (R Core Team, 2014) and AMOS (J. Arbuckle, 2014) to visualize the factor structure. Due to the findings of EFA, the item Cognitive Presence 6 was excluded in CFA and the structure of 33 items was analyzed.

CFA yielded a good fit of the model to the sample data ($\chi2$ (492, N=432)=1,505.93, $p<.001$, CFI=.87, SRMR=.06, RMSEA=.06). Table 3 presents the variance/covariance matrix for the 33 items. Figure 3 presents the standardized loadings, which are all above .60. Highest loadings were found in the items Teaching Presence 5 and 6, Cognitive Presence 2, and Social Presence 6, whereas the lowest loadings were found in the items Teaching Presence 2, Cognitive Presence 4 and Social Presence 2.

Figure 3

Factor Solution for the 33-Item Structure with Standardized Factor Loadings
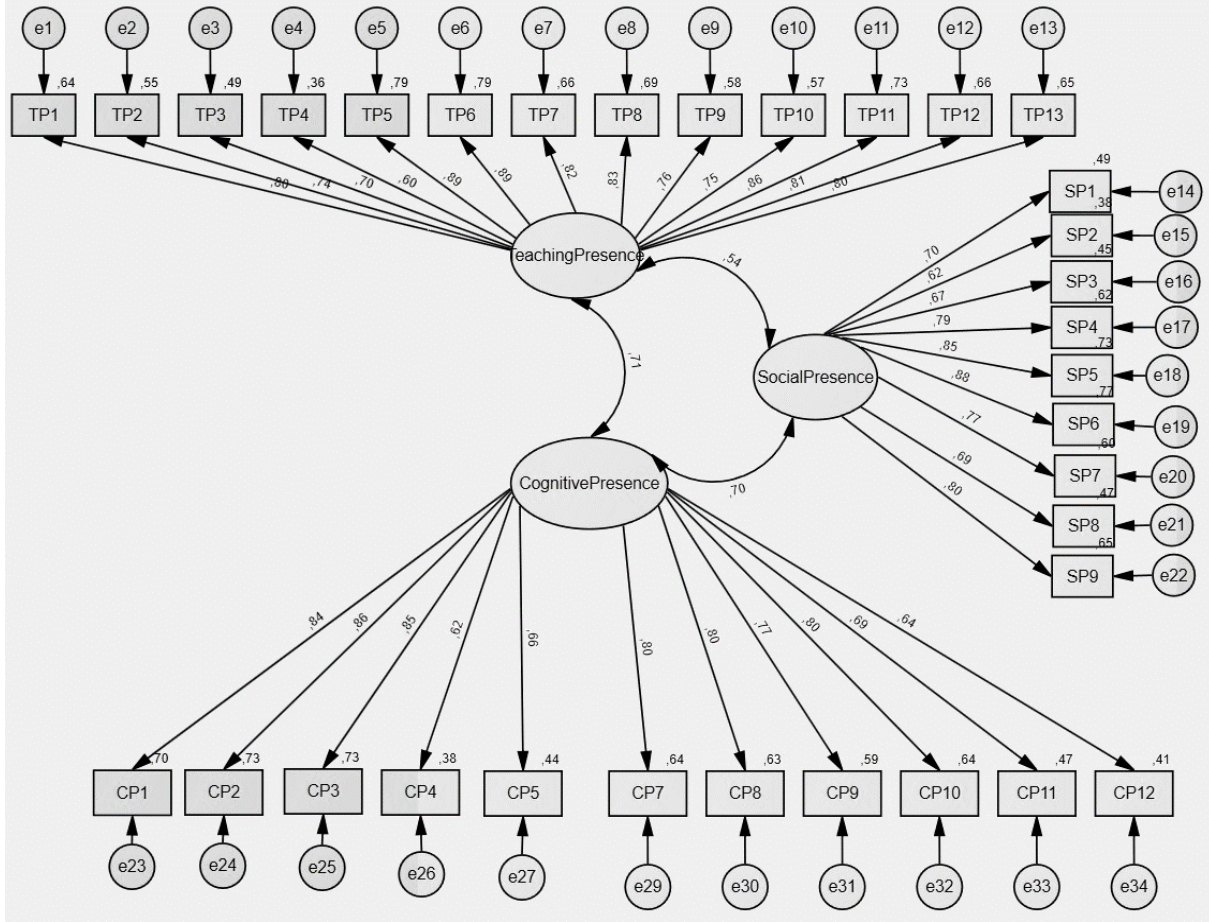
Discussion

We systematically translated, piloted, and formally validated a German version of the CoI Survey over a period of four years. The validation results confirm that the German CoI Survey is reliable and valid ($\chi 2$ (492, N=432)=1,505.93, *p*<.001, CFI=.87, SRMR=.06, RMSEA=.06). Our findings indicate that the final version is well-suited and validated.

We carefully and step-wise translated the items to capture the meaning of the original CoI items in the German translation. For some items, two possible translations were discussed and then tested. The item analysis and reliability analysis showed comparable good results for all variants. Thus, we are now able to present the final, validated German CoI Survey (Table 1).

The German CoI Survey was applied in different university contexts in Austria and Germany, thus reflecting a specific diversity of organizational and educational approaches and confirming its generalizability to different settings.

Nevertheless, certain limitations must be taken into account. In the Austrian sample, students participated in several online courses and thus submitted several CoI Surveys. The data thus may be felt to contain some connected samples. In an analysis of these samples, however, we could see that students did not use typical response patterns when answering the CoI questionnaire for different courses in which they participated, but rather evaluated each course differently. Likewise, there was typically a time delay of several weeks between various courses and the related CoI surveys. We thus considered the data as unconnected, independent samples.

We applied three slightly different variants of the survey, which reduced the overall sample size in each group. Our statistical analysis did not show any differences between the groups. Thus, we conducted the exploratory and the confirmatory factor analysis on the whole data set. Here, the sample size (N=433) is sufficiently high. However, we will continue to collect and analyze data from future courses to confirm our findings. For the final German CoI Survey (N=161), CFA was conducted and predicted a perfect model fit. Due to sample size issues, these findings are not reliable and not ready for publication at this time but will be reported and analyzed in further studies.

The analysis of the difficulty index of all 34 items reveals that most students perceived the CoI level as quite good. The distribution of the items used is right-skewed and most students reported high levels of perceived teaching, social, and cognitive presence. While not all previous validations of the CoI Survey presented means and skewness of items analyzed, some authors reported the same findings as we did (e.g. Moreira et al., 2013). Further studies would be needed to investigate whether this result reflects a good CoI in the analyzed online courses or whether aspects of social desirability play a role.

When analyzing the factor loadings of the 34-item structure of the German translation, we found that Item CP6 ("Online discussions were valuable in helping me appreciate different perspectives") showed cross-loadings with the social presence factor. First, we took a closer look at the wording in German, as well as in the original version, but we could not find any conspicuous features. When we looked at the previous validations in different languages, we noticed that this item in particular shows difficulties in some translations (e.g. Velázquez et al., 2019). Likewise, it has been shown that there seem to be cross-loadings for non-native speakers of English in the original version (Kovanović et al., 2018). It should be checked here whether the wording regarding the adoption of different perspectives shows differences in different linguistic customs. The results indicate different interpretations in non-native English speakers, as well as in German and Spanish.

Conclusion

We systematically translated, piloted, and formally validated a German version of the CoI Survey in two countries. We expect that the availability of the CoI Survey in German as well as in other languages will allow the CoI to be further validated and developed from a stronger international point of view. Future research and the application of the German CoI survey should improve the measurement and understanding of the Community of Inquiry framework in German-speaking online learning environments and thus support universities to improve online teaching. Also, in our German translation, we confirm the cross-loading of one item that needs to be investigated in more detail. We plan to continue the confirmatory factor analysis as soon as a larger sample is available, but given the previous results of the validation, the German version of the CoI Survey seems promising and suitable.

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Appendix A
Development of the Final German Translation

Table A1

Original CoI Item, Two Variants of Translation, and Final Consensus German CoI Item for 6 Slightly Different Items

No.	Original CoI	Vers. B1 ID-1 Variant used in Austria	Vers. B2 ID-2 Variant used in Germany	Vers. C ID-final Final consensus translation
TP1	The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.	Die Lehrperson half, Übereinstimmungen und Differenzen zu Kursthemen aufzuzeigen, was mich beim Lernen unterstützte.	Die Lehrperson half kontroverse Aspekte von Kursthemen zu identifizieren, was mich beim Lernen unterstützte	Die Art wie die Lehrperson half, verschiedene Sichtweisen auf Kursthemen zu identifizieren, unterstützte mich beim Lernen.
TP2	The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.	Die Lehrperson half, die Gruppe zu einem Verständnis der Kursthemen zu führen, was mich dabei unterstützte, meine Gedanken zu sortieren.	Die Art wie der Lehrperson die Gruppe zum Verständnis zu Kursthemen führte, half mir meine Gedanken zu sortieren.	Die Art wie die Lehrperson die Gruppe unterstützte Kursthemen zu verstehen, half mir meine Gedanken zu sortieren.
TP7	The instructor helped to keep course participants engaged and participating in productive dialogue.	Die Lehrperson sorgte dafür, dass die Kursteilnehmenden aktiv und in einem produktiven Dialog blieben.	Die Lehrperson unterstütze die Kursteilnehmenden dabei, engagiert und in einem produktiven Dialog zu bleiben.	Die Lehrperson unterstützte die Gruppe dabei aktiv und in einem produktiven Dialog zu bleiben.
TP8	The instructor helped keep the course participants on task in a way that helped me to learn.	Die Lehrperson sorgte dafür, dass die Kursteilnehmenden bei der jeweiligen Aufgabe blieben, was mich beim Lernen unterstützte.	Die Art wie die Lehrperson dafür sorgte, dass die Kursteilnehmenden aktiv bei der Sache bleiben, half mir zu lernen.	Die Art wie die Lehrperson half, dass die Gruppe aktiv bei der Sache bleibt, unterstützte mich beim Lernen.
TP11	The instructor helped to focus discussion on relevant issues in a way that helped me to learn.	Die Lehrperson half, die Diskussion auf relevante Themen zu fokussieren, was mich beim Lernen unterstützte.	Die Art wie die Lehrperson half, die Diskussion auf relevante Themen zu fokussieren, unterstützte mich beim Lernen.	Die Art wie die Lehrperson half, die Diskussion auf relevante Themen zu fokussieren, unterstützte mich beim Lernen.
SP7	I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.	Auch bei Meinungsunterschieden mit anderen Kursteilnehmenden fühlte ich mich wohl und konnte eine Vertrauensbasis aufrechterhalten.	Ich fühlte mich wohl dabei anderen Kursteilnehmenden zu widersprechen während ich gleichzeitig ein Gefühl des Vertrauens bewahrte.	Ich fühlte mich wohl dabei, eine andere Meinung als andere Kursteilnehmer zu haben, und konnte dabei die Vertrauensbasis erhalten.

Research Trends in the Field of Emergency Remote Teaching: A Bibliometric Analysis of Open Access Literature

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Abstract
Throughout the period of pandemic, many studies have been conducted on emergency remote teaching (ERT) in different fields and from different perspectives, which reveal that there has been a lack of a comprehensive map showing the rapid and continuous responses of these studies to the process. The purpose of this research is to analyze open access research on ERT using bibliometric method, and to reveal current trends in this field. VOSviewer software was used for data analysis; the data collection process was shaped using the PRISMA framework. 238 studies were included in the analysis. The distribution of the open access studies analyzed in the field of emergency remote teaching by year, type of publication, subject, country, and sources was examined; citation analysis (by journal and publication), authorship patterns and collaboration, common word analyses are included. It was found out that these open access publications mainly consisted of journal articles and were dated 2020 and 2021; most of the publications were in the field of educational sciences. Based on common word analysis, the most important topics that are addressed in studies on the ERT process are the process of pandemic, distance education and higher education, while the challenges experienced regarding teachers and pedagogic issues during the process, teacher education, student-related characteristics (such as self-regulated learning-motivation-academic success) and participation are found to be frequently studied topics. The concepts of instructional design, collaborative learning, social presence, and assessment are also among the topics covered. It is anticipated that the implications for policy and practice based on the examination of research trends will have a significant effect on the structuring of future online learning environments, as well as the ERT designed for emergencies.

Keywords: Emergency remote teaching, bibliometrics, citation analysis, common word analysis, Covid-19

Rapid, global advances in the development of technology have made a substantial impact on education. As information technologies develop and become more widespread, the way we learn and teach is also changing. Remote teaching, as a flexible education model in which technological opportunities can be used, is widely applied in various fields of education (Larreamendy-Joerns & Leinhardt, 2006; Avcı Akbel, 2021). Online learning is defined as a form of education that is given in an environment using the internet with the aim to learn the content through synchronous or asynchronous learning activities and is not dependent on the physical or virtual location of the student (Singh & Thurman, 2019). Well-designed online learning environments offer different potential benefits such as accessibility, affordability, flexibility, quality, and equity (Castro & Tumibay, 2021; Littenberg-Tobias & Reich, 2020). Effective design of online learning environments requires considering a variety of factors and long range planning. In order to obtain effective results with different parameters such as success, performance, and attendance rate, it is crucial to configure online learning environments by taking numerous factors into consideration: pedagogy, technology, interface design, evaluation, management, resource support, and ethical and institutional considerations (Khan, 2005), as well as the self-regulated learning skills of students in online learning environments (You, 2016), strategies that encourage interaction and socialization (Garrison & Arbaugh, 2007), and types of feedback (Cavalcanti et al., 2021).

The rapid transition of educational institutions all over the world to online education has prompted scientists to explore factors related to design, delivery, and evaluation of instruction provided during the pandemic. The online training provided to continue education during the COVID-19 pandemic was named Emergency Remote Teaching (ERT) by Hodges et al. (2020), who suggested that courses delivered online in response to a crisis or disaster are significantly different from well-planned, online learning experiences and that institutions are expected to acknowledge such differences. The rapid response of the research communities to learning activities during the pandemic has promoted the development of a broad knowledge of online learning practices in higher education during that period (Zhang et al., 2022).

Emergency Remote Teaching (ERT)

The COVID-19 pandemic has led to an unprecedented crisis across the world, fueling discussions on distance education; major effects of the pandemic have been experienced in the field of education as well as in many areas of life. With the outbreak of COVID-19, countries had to suspend face-to-face classes in educational institutions. During this process, universities and schools were closed for an indefinite period in some countries to prevent the spread of the disease (Thakur, 2020; Vandy, 2021). The closure of educational institutions and the quarantine process in many countries was soon followed by the beginning of virtual or digital education processes (Daniel, 2020). The transition to ERT usually shocked institutions, teachers, and students (Rapanta et al., 2020), which led to the inevitable need to explore new ways for teaching and learning (Abel, 2020). The educational practices during this process are usually expressed by using various terms such as distance education, e-learning, and online education; however, these terms do not fully reflect the process implemented during the COVID-19 interruption. Distance education could not be carried out fully in line with all the requirements during the pandemic, (Golden, 2020; Hodges et al., 2020; Shisley, 2020); therefore, it might be more accurate to name the period as "emergency remote teaching (ERT)", (Hodges et al., 2020). As explained by Bozkurt et al. (2020), there is a notable difference between ERT and distance education; the former is a necessity while the latter is an option. Unlike distance education, which involves a

long process of planning and creating an educational program, ERT involves continuation of education temporarily and within the means available (Akkoyunlu & Bardakcı, 2020; Bozkurt et al., 2020, p.117; Hodges et al., 2020; Tonbuloğlu, 2021). Distance education activities are configured after long processes of construction with a systematic design and development model and through a careful process of instructional design (Branch & Dousay, 2015). ERT, aims to provide temporary access to the teaching environment to prevent disruption of educational activities due to situations such as disaster, crisis, etc. (Bozkurt, 2020; Ercan and Künç, 2020; Rahiem, 2020). The rapid approach required for ERT arising from the need to bring classes online may reduce the quality of classes provided, so it is recommended that the temptation to equate ERT with online learning should be avoided (Hodges et al., 2020). In addition, it is emphasized that standard institutional policies and teaching assessment practices should be altered for ERT (Hodges et al., 2020). A good example of this is the report titled "Guidance for Interruptions of Study Related to Coronavirus (COVID-19)" published by the US Department of Education in 2020.

Bibliometric Analysis

Effective research is conditional on an awareness of previous research and technologies. Various methods are employed to analyze research. One of these methods is bibliometric analysis. As a concept, bibliometrics refers to the analysis of books, articles, and other media of scientific communication using mathematical and statistical techniques (Pritchard, 1969, p.368; Thelwall, 2008). Bibliometric analysis is a technique that helps provide an overview of the academic literature (Van Nunen et al., 2018, p. 248). Bibliometric studies are employed for a variety of purposes, such as identifying the latest developments, research directions, main topics (Wang et al., 2014), general reviews, and analyses by leading researchers (Bjork et al., 2014). The use of bibliometric methods to identify general trends in any field or subject in different disciplines is becoming increasingly common. (Bornmann & Mutz, 2015; Hallinger & Suriyankietkaew, 2018). The bibliometric analysis method is widely used for quantitative analysis of the literature (Chai & Xiao, 2012), providing a broader perspective to any specific field by mapping the characteristics and development of scientific outputs in that field (Li & Hale, 2016). The increasing use of the method reveals the connections between scientific studies by mapping them with the help of journals, documents, authors, institutions, descriptive terms and words, and the methods makes it possible to analyze hundreds or even thousands of studies (Zupic & Cater, 2015). The bibliometric analysis method allows the researcher to obtain information about a general view of the studies related to the field of research, the studies focused on by the researchers and the structure of the datasets in the field, and to make the utmost use of visual mapping. The literature contains many studies performed in bibliometric design in the field of education (Diem & Wolter, 2013; Ivanović & Ho, 2019; Karaköse & Demirkol, 2021; Köseoğlu & Bozkurt, 2018; Lopes et al., 2017; Zancanaro et al., 2015; Gülmez et al., 2020; Hallinger, Gümüş & Bellibaş, 2020; Marti-Parreño et al., 2016).

Citation Analysis

Bibliographic data obtained from databases such as Scopus and Web of Science can be analyzed by various bibliometric analysis methods such as citation analysis, co-author analysis, co-citation analysis and co-word analysis. Citation analysis is one of the best-known and most used analytical tools in bibliometric analysis, which focuses on published citations (Gülmez et al., 2020). Citation counts indicate the importance of research as effective research is frequently cited (Thelwall, 2007). The analysis of citations in journals is considered among impact factors of

the journals (Garfield, 1999). Therefore, citation analyses of documents, authors, journals, institutions, and countries are frequently searched in bibliometric studies, whereby effectiveness and efficiency analyses are performed.

Co-word Analysis

Co-word analysis determines the relatedness of items according to the number of documents in which they co-occur. Co-word analysis is a bibliometric analysis technique that helps create a conceptual structure and establish relationships using keywords in the analyzed documents (Gülmez et al., 2020). The technique involves focusing on the co-occurrence analysis of words and enables creation of semantic maps that facilitate the understanding of the cognitive structure of a field. Information is presented by way of using the most important words or keywords of the documents to explain how knowledge is organized in a scientific discipline and to examine the conceptual structure of the research field (Callon et al., 1983; Lee and Jeong, 2008). Co-word analysis is widely preferred as it uses the actual content of documents to establish a similarity measure (Aria & Cuccurullo, 2017). Co-occurrence analysis of keywords or terms in the selected literature makes it possible to identify interrelated item groups and map the dynamics of science (Tan et al., 2004; He, 1999).

Titles of the analyzed texts, keywords, abstracts, or full texts can be used in co-word analysis. The following steps are needed to perform co-word analysis: First, keywords are extracted and normalized, then the structure of their co-occurrence matrix is identified, keywords are clustered, and visual presentation of keyword sets is performed (Lee and Jeong, 2008). Cluster analysis is a technique that allows review of themes shared in studies based on the relatedness between scientific studies examined and assumes that articles in the same clusters discuss similar research topics (Kaufman & Rousseeuw, 2009). Accordingly, it may be deduced in the co-word analysis that there are strong relationships between studies in the same cluster, while studies in distant clusters are weakly related.

Text Analysis of Abstracts

Text analysis of abstracts involves computer-aided analysis of data in a large collection of written texts (Wegerif & Mercer, 1997). Basic steps of text analysis are listed as follows: data selection, corpus creation, data cleaning, computer aided analysis and interpretation of results (Popping, 2000). For the datasets to provide accurate results in text analysis, it is important to specify the synonyms file to be created for the data cleansing process and the terms that have similar meanings. Additionally, removing unnecessary sections that may affect the results of the research, such as section labels and copyright statements, which are commonly used in structured abstracts, are important for the consistency of the information to be presented by the data set. When text analysis is based solely on keyword analysis, there may be limitations in cases where the person indexing the document does not extract the relevant parts from the text or the bibliographic data of the journal does not include keywords (Zupic & Cater, 2015). Such limitations can be eliminated through text analysis of the abstracts.

Review of Relevant Literature

The effects of the pandemic still linger, and research and applications related to ERT presented during the pandemic are developing rapidly. However, even though many studies have been conducted on ERT in different fields and perspectives during the 2-year pandemic process, a comprehensive map showing the rapid and continuous responses of these studies to the process

does not exist. To provide an overall picture of the existing situation and ensure discovery of meaningful knowledge, it is important to examine many studies on the subject using various analytical methods and to perform classification, clustering, summarization, and visualization. The topic of how online teaching was implemented in the COVID-19 period has been addressed by several studies in the form of systematic literature review (Abu Talib et al., 2021; Turnbull et al., 2021; Bond et al., 2021; Bhuwandeep & Piyusa Das, 2020; Bond, 2020; Sezgin, 2021; Stewart, 2021), yet the analyses mostly included articles and empirical studies published in higher impact journals. Bibliometric studies designed to analyze subjects in the field of online education, trends of the subjects and relations between the subjects within the framework of an extensive literature are numerous in the field of distance education yet limited in number in the field of ERT (Amoozegar et al., 2018; Bozkurt & Zawacki-Richter, 2021; Pinto-López & Montaudon-Tomas, 2021; Yavuz et al., 2021) and e-learning (Cheng et al., 2014; Chiang et al., 2010; Fatima & Abu, 2019; Gupta & Dhawan, 2020; Harande & Ladan, 2013; Hung, 2012; Tibaná-Herrera et al., 2018a; Tibaná-Herrera et al., 2018b).

A review of the studies using bibliometric analysis to examine online education practices in the COVID-19 period demonstrates divergence between the focal points and research contexts of those studies. For example, Rodrigues et al. (2020) built their work on the mapping of the publications reviewed in management and education, aiming to identify the most studied topics from the management perspective during the COVID-19 period. There are also studies that examine the trends of scientific publications within the context of higher education during the pandemic by using the bibliometric method (González-Zamar et al., 2020; Zhang et al., 2022). Yaacob and Gan (2021) conducted research on the effect of technology during the COVID-19 period using bibliometric analysis. Although all those studies examined online education using bibliometric analysis, they constructed their analyses in different contexts such as management, higher education, and technology.

A review of bibliometric studies by methodology reveals that some of the studies analyzing online education research conducted during the pandemic used PubMed and WHO (Chahrour et al., 2020) databases, while others used the Scopus database (Darsono, 2020; Dehghanbanadaki et al., 2020) and Web of Science database (Al-Zaman, 2020; Kaya & Erbay, 2020; Mishra, 2021). All those searches were generally structured to cover online education practices conducted during the pandemic, and there was no limitation in the context of research specifically using the term ERT. The research aims to analyze the trends of research carried out specifically on the concept of ERT, which is based on the structural difference between ERT and online education. Online education during the Covid 19 period was named ERT in relevant studies; this nomenclature manifests that the process is regarded as "a necessity rather than an option," "a temporary phase," and "a means to provide temporary access to the teaching environment for the continuation of education within the realms of possibility" (Akkoyunlu & Bardakcı, 2020; Bozkurt et al., 2020; Hodges et al., 2020; Ercan & Künç, 2020; Rahiem, 2020), and that the online education practices in the COVID 19 process were addressed and interpreted within this framework. Moreover, the use of the term ERT in the research is an acknowledgment of the failure to fully implement distance education during the pandemic in conformity with all requirements (Golden, 2020; Hodges et al., 2020; Shisley, 2020). ERT is addressed separately from online learning, and practices such as bending the standard institutional policies and assessment activities for ERT are considered justifiable (Hodges et al., 2020). Thus, that process may be viewed from a more scientific perspective. Within this context, this research aimed to analyze the trends in research in which the concept of ERT is used as online education studies in the COVID 19 process. answers are sought to the following questions:

As for the **analyzed studies** on ERT, answers are sought to the following questions:
1. How is their distribution by year?
2. How is their distribution by type of publication?
3. How is their distribution by discipline?
4. How is their distribution by country?

As for **journals** in this field, answers are sought to the following questions:
1. Which of them have the highest levels of productivity?
2. Which of them have the highest citation count?
3. What are the authorship patterns and degrees of collaboration established in this
4. field?
5. Which patterns and meanings can be obtained from the keyword analysis?
6. Which patterns and meanings can be obtained from the analysis on abstracts of research papers?

Method

Data Collection Process

Web of Science (WoS) database, an online database in which journals, conference proceedings, and book chapters are indexed, was used for the selection of the papers to be examined in the scope of this research. This database was chosen as it allows viewing of articles of acceptable quality in the SCI-EXPANDED, SSCI, ESCI, CPCIS, BKCI-S, CPCI-SSH and BKCI-SSH indexes (Akhavan et al., 2016; Amoozegar, 2018), it has a wider historical scope than Scopus (Balstad & Berg, 2020), and offers a wide index covering all scientific fields (Zawacki-Richter & Naidu, 2016). The publication review using logical operators and keywords is shaped in line with the PRISMA framework (Page et al., 2020).

Figure 1
Selection of Papers: PRISMA Approach
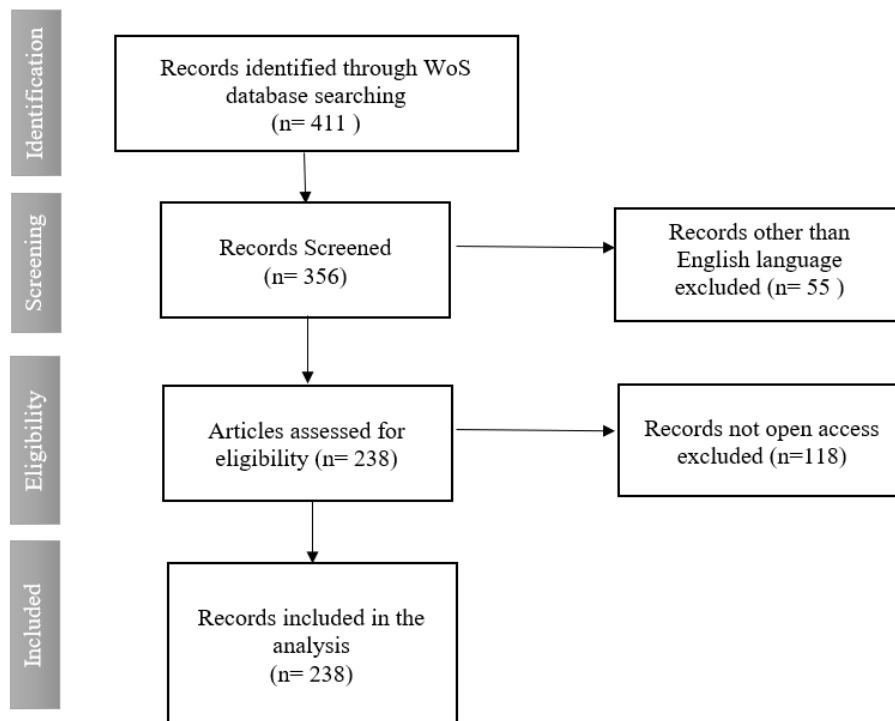
A search was performed on WoS database on 14.12.2021. The terms "emergency remote teaching," "emergency remote instruction," "emergency remote education," "emergency remote learning," "emergency distance instruction," "emergency distance education," "emergency distance teaching," "emergency distance learning," "emergency online instruction," "emergency online education," "emergency online teaching," and "emergency online learning" were search using the OR logical operator; 411 results were found. When only the records in English language were filtered, the remaining records (n= 356) were searched, and open access records were filtered (n= 238) and included in the analysis.

Analysis of Data

In the analysis of the data, distribution analyses of the publications by year, publication type, and discipline were carried out on the data provided by WoS. VOSViewer Version 1.6.2 (Van Eck & Waltman, 2014) software was used for bibliometric analysis. Bibliometric data of 238 documents obtained on WoS were uploaded to the VOSViewer software and analyzed. In this frame, the most cited papers, authors, journals, as well as countries and journals with the highest number of publications were analyzed; authorship patterns and degrees of collaboration established in this field were investigated, and common word analyses were used. Common word analysis, a commonly preferred technique in bibliometric research, is used to explain how information is organized in a scientific discipline (Lee & Jeong, 2008) and to map the dynamics of science based on co-occurrence patterns of keywords (He, 1999). *Text analysis* is a computer-aided analysis of data in a large collection of texts (Wegerif & Mercer, 1997). Text analysis basically includes the following steps: data selection, corpus creation, data cleaning, computer-

aided analysis, and interpretation of results (Popping, 2000). Within the scope of this research, the related data were reviewed, and synonyms (thesaurus) files were created prior to the analysis of keywords and summary texts; repetition of words with identical or similar meanings was so prevented.

To analyze the distribution of publications by country, the Relative Citation Impact (RCI) value, which refers to the share of a country in total citations according to the global total and is calculated by dividing the total citation percentage of a country by the total publication percentage, was also included in the analysis. Subramanyam's (1983) formula was used to calculate the degree of cooperation between the authors; the degree of collaboration was determined by calculating the ratio of the number of papers by multiple authors published in a discipline within a certain period to the total number of papers.

Findings

Distribution of Publications by Year

A review of the year-wise distribution of publications on ERT demonstrates that the publications belong only to the years 2020 and 2021, and there has been a significant increase in the number of publications in 2021 with the continuing impact of the COVID-19 pandemic. It has been found out that the terms "emergency remote/distance/online learning/ teaching/ instruction/ education" were not used in the keywords, titles, and abstracts of scientific studies before the year 2020. This result is normal when we consider the fact that the term ERT was introduced to the literature by Hodges in 2020.

Figure 2
Distribution of Publications by Years
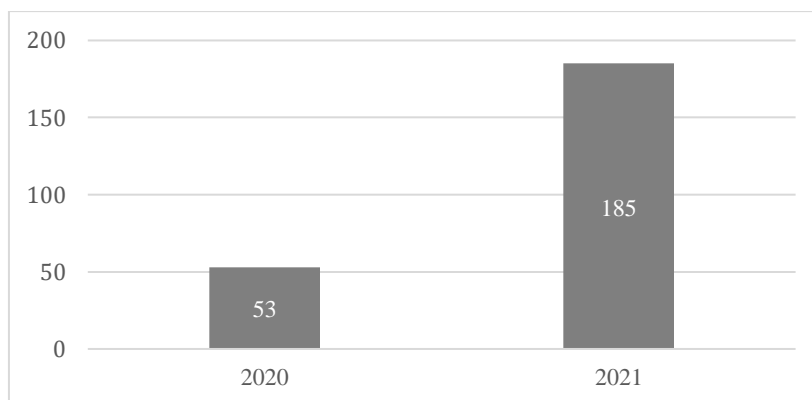
Distribution of Publications by Type

A review of the distribution by publication type demonstrates that 92% of the publications (219 publications) are journal articles, followed by review papers that cover 4% (9 publications) (Figure 2). There are also limited number of editorial materials and conference proceedings on ERT.

Figure 3
Distribution by Publication Type
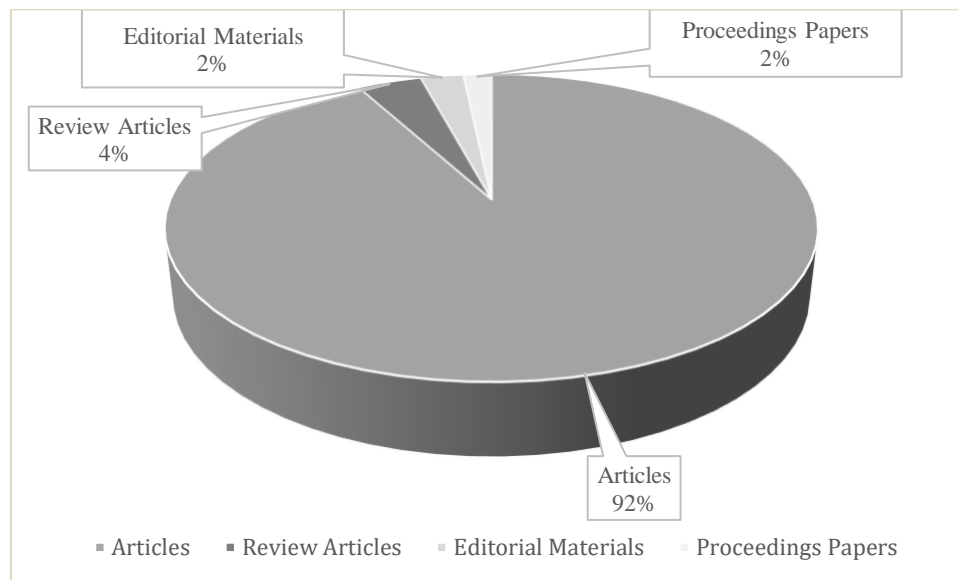
Distribution of Publications by Subject

When the distribution of publications is analyzed by subject (Table 1), it is observed that most of the publications are in the field of educational sciences (51%), which are followed by environmental sciences (18%), and medicine and health sciences (13%). Many of the publications is listed in more than one category.

Table 1
Distribution of Publications by Subject (Many publications have more than one subject category)

Subject area	No. of documents	%
Educational Sciences	157	51%
Environmental Sciences	55	18%
Medicine and Health Science	39	13%
Social Sciences	27	9%
Other	10	3%
Biological, Physics & Chemical Science	8	3%
Engineering	8	3%
Computer	3	1%
Math	2	1%

Distribution of Publications by Country

The top ten countries that have made significant contributions to studies on ERT are presented in Table 2. It has been found out that studies on this subject have been carried out in 67 countries across the world, with the USA accounting for the highest number of publications and citations (25% of total publications, 28% of total citations). In terms of the number of publications, the USA is followed by Spain (7%) with 17 publications, England (7%) with 16

publications, People's Republic of China (5%) with 12 publications, and South Africa (5%) with 11 publications, respectively. In terms of the number of citations, the USA (350 citations) was followed by Cyprus with 128 citations, Canada with 86 citations, Spain with 64 citations and Oman with 58 citations, respectively. RCI value denotes a country's share of total citations worldwide and is obtained by dividing a country's total citation percentage by the total publication percentage (Sahoo & Pandey, 2020). RCI value has been used as one of the parameters to show country productivity (Mishra et al., 2021). When the RCI is above 1, it means that the relevant country's citation rate is higher than the world citation rate. Table 2 shows that in the top ten countries with the highest citation rate, only the US and Canada have higher citation rates than the world citation rate.

Table 2

Distribution of Publications and Citations by Country

Country	No. of documents	%TP	TC	%TC	TC/P	TLS	RCI
US	59	25%	350	28%	5,9	3599	1,11
Spain	17	7%	64	5%	3,8	1948	0,70
England	16	7%	30	2%	1,9	2667	0,35
Peoples R China	12	5%	24	2%	2,0	1607	0,37
South Africa	11	5%	4	0%	0,4	709	0,07
Canada	9	4%	86	7%	9,6	1064	1,79
Mexico	9	4%	19	1%	2,1	1071	0,40
Turkey	9	4%	14	1%	1,6	1626	0,29
Germany	7	3%	35	3%	5,0	1206	0,94
Japan	7	3%	14	1%	2,0	901	0,37

TP: Total Publications, TC: Total Citations, TLS: Total Link Strength, TC/P= citations per paper, RCI: Relative Citation Impact

Journals with Highest Levels of Productivity and Citation Count

Journals with publications regarding ERT are listed according to productivity and citation count; Journal Impact Factors (JIF), JCI and JCI Q values of the journals are also included, along with the total number of publications and citations, the number of citations per article, and the total link strength. JIF, one of the metrics provided by Journal Citation Reports (JCR) that presents publisher-independent data and statistics, is a value that measures the journal-level metrics calculated based on WoS indexed data and is used to measure the scientific impact of journals. Table 3 demonstrates that the journals with the highest number of papers in this field are Education and Information Technologies, the official journal of the IFIP Technical Committee on Education, and *Education Sciences* and *Sustainability* journals, which are among the open access journals published by MDPI. A review of the subject areas of the top 10 journals with the highest productivity demonstrates that the subject areas of the journals mostly include educational sciences, in line with the information in Table 1, and there are also journals in fields of environmental sciences, medicine and health sciences.

Table 3
Most Productive Journals

Journals	No. of documents	%TP	TC	%TC	TC/P	TLS	JIF (5 Year)	JCI	JCI Q
Education and Information Technologies	17	7%	23	2%	1,4	1674	2.953	1.82	Q1
Education Sciences	17	7%	62	6%	3,6	1528	N/A	1.03	Q2
Sustainability	17	7%	53	5%	3,1	1635	3.473	0.56	Q3
Online Learning	10	4%	101	10%	10,1	617	N/A	1.32	Q1
Frontiers in Education	9	4%	12	1%	1,3	602	N/A	N/A	N/A
Frontiers in Psychology	9	4%	8	1%	0,9	937	3.618	0.93	Q2
British Journal of Educational Technology	5	2%	14	1%	2,8	570	5.030	3.16	Q1
Information and Learning Sciences	5	2%	9	1%	1,8	67	N/A	0.4	Q3
International Journal of Educational Technology in Higher Education	5	2%	7	1%	1,4	646	5.361	2.7	Q1
ETR&D: Educational Technology Research and Development	4	2%	10	1%	2,5	125	4.500	2.31	Q1

TP: Total Publications, TC: Total Citations, TC/P= citations per paper, TLS: Total Link Strength.
[JIF: Journal Impact Factor, JCI: Journal Citation Indicator, JCI Q: JCI Quartile (Source: Journal Citation Reports ™ 2020, Date: 17.05.2022)]

Table 4 shows the most cited journals. *Interactive Learning Environments* was the most cited journal with an article, which is followed by *Online Learning* and *Education Sciences*. It has been observed that there are only 3 journals in common (*Online Learning*, *Education Sciences* and *Sustainability*) in the list of both the most productive and most cited journals.

Table 4
Top 10 Journals with the Highest Number of Citations

Journals	No. of documents	%TP	TC	%TC	TC/P	TLS	JIF (5Year)	JCI	JCI Q
Interactive Learning Environments	1	0%	126	12%	126,0	115	3.868	2.05	Q1
Online Learning	10	4%	101	10%	10,1	617	N/A	1.32	Q1
Education Sciences	17	7%	62	6%	3,6	1528	N/A	1.03	Q2
Journal of Business Research	1	0%	60	6%	60,0	48	8.488	1.87	Q1
Sustainability	17	7%	53	5%	3,1	1635	3.473	0.56	Q3
Children and Youth Services Review	3	1%	40	4%	13,3	570	2.944	1.14	Q1
Societies	1	0%	39	4%	39,0	77	N/A	0.63	Q3

Innovative Infrastructure Solutions	1	0%	38	4%	38,0	63	N/A	0.42	Q3
American Journal of Pharmaceutical Education	2	1%	37	4%	18,5	7	2.789	0.62	Q2
Journal of Education for Teaching	2	1%	34	3%	17,0	6	2.528	1.29	Q1

TP: Total Publications, TC: Total Citations, TC/P= citations per paper, TLS: Total Link Strength
[JIF: Journal Impact Factor, JCI: Journal Citation Indicator, JCI Q: JCI Quartile (Source: Journal Citation Reports ™ 2020, Date: 17.05.2022)]

Authorship Patterns and Collaboration
　　When we examine the analyzed records within the scope of authorship patterns and collaboration, we see that 37 documents (15%) were published by single authors, while the remaining 201 documents (85%) were published by multiple authors. Table 5 demonstrates that multi-authoring prevails in this subject area, and collaborative research is common.

Table 5
Authorship Pattern

Type of authorship	No. of publications	%
Single author	37	15
Two authors	56	23
Three authors	46	19
Four authors	32	13
Five authors	29	12
More than 5 authors	38	15

　　Subramanyam's (1983) formula was used to identify the degree of collaboration between the authors. For this purpose, the ratio of the number of multi-authored articles published in a discipline to the total number of articles published within a certain period was calculated. The formula is:

Degree of collaboration = Number of studies by multiple authors / (Number of studies by multiple authors + Number of studies by single author)

The degree of collaboration was found to be 0.84 based on this formula. The degree of collaboration between the authors between the years 2013 and 2017 was 0.93 according to the bibliometric study on e-learning by Fatima and Abu (2019), and 0.81 according to Mishra et al. (2021). Consequently, we observe that this research finding is in harmony with the results of other bibliometric studies in which multi-authoring predominates.

Thematic Clustering Analysis Based on Keywords
　　Thematic clustering analysis based on keywords was conducted to explore the key concepts in the publications analyzed. To generate a cluster map, VOSviewer (Van Eck & Waltman, 2014) was used and a minimum occurrence threshold of 3 was determined. 34 out of 640 keywords met the occurrence threshold. As given in Figure 4, those keywords were divided into clusters based on their co-occurrence with other keywords and their total link strength.

Figure 4
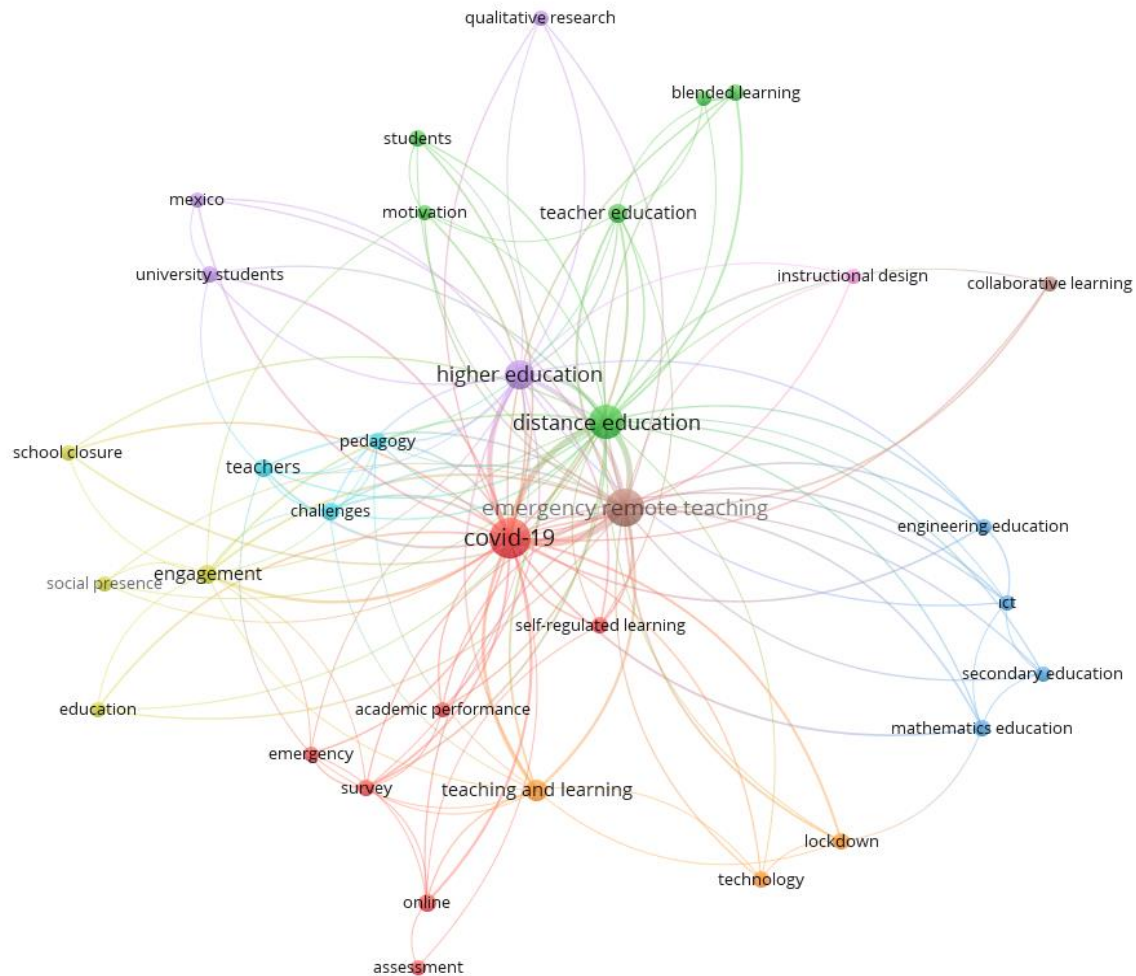*Clustering of Keywords Using VOSviewer*

Figure 4 presents 9 clusters formed. Size of the bubble indicates the strength of the keywords in terms of their frequency, association, and influence. When the keywords covered by the clusters are reviewed, they present the following themes:

Academic Process and Assessment
The red cluster consisting of 7 keywords contains the terms *Covid-19, assessment, self-regulated learning, academic performance, emergency, online,* and *survey*. We consider that mainly academic performance and assessment activities during the pandemic are examined in this cluster. The keyword *Covid-19* stands out in this cluster with a higher strength of frequency, association, and influence. It is also seen near the center of the figure, which demonstrates that this keyword is also among the concepts frequently used in other fields. Furthermore, the keyword *self-regulated learning* is close to the center in this cluster, which indicates that the

concept is commonly used and has significance in the process. It is understood that surveys are frequently used in the studies.

Teaching and Technology

The keywords *quarantine, teaching and learning,* and *technology* are found together in the orange cluster. As concluded from this cluster, studies addressing the relationship between technology and teaching & learning activities during the lockdown period are intense. The keyword *teaching and learning'* is close to the red cluster, which indicates that the words in the red cluster are often studied together.

Disciplines

The blue cluster contains the words *engineering education, information technologies, (ICT), mathematics education,* and *secondary education*. We think that this cluster generally represents the disciplines in the ERT process. It can be concluded that the fields of engineering and mathematics education and information technologies are closely related in the ERT process, and that studies on secondary education are related to mathematics education and information technologies.

Higher Education

The purple cluster contains the keywords *higher education, university students, qualitative research,* and *Mexico*, Particularly the keyword *higher education* is seen to have a higher frequency, association, and influence and a position close to the center of the map, which demonstrates that studies on higher education are predominant, and this concept is often studied together with other keywords. Moreover, we acknowledge that qualitative research methods are commonly preferred in the studies.

Collaborative Learning

The brown cluster contains the keywords *emergency remote teaching'* and *'collaborative learning.* These two keywords are within the same cluster, which is worthy of note in the sense that it underlines the importance of collaborative learning in ERT practices and points out to the communities of inquiry in online learning used in online education. The keyword *emergency remote teaching* in the brown cluster is observed to have a higher frequency, association, and influence than the others, and this keyword is centrally positioned which demonstrates associations with this keyword are common in other studies.

Instructional Design

The fact that the keyword *instructional design* in the pink cluster is among the keywords repeated in the studies on ERT process points out to the importance of this concept in the process.

Distance Education and Professional Development

We see that there are 6 keywords in the green cluster: *blended learning, distance education, motivation, professional development, teacher education,* and *students* and the keyword *distance education* has higher frequency, association, and influence than the others. Particularly the keywords *teacher education* and *professional development* are included in this cluster, which demonstrates the significance of distance education studies in lifelong learning activities. It is further acknowledged that motivation is a crucial component frequently addressed

as a topic of study in distance education activities, and blended learning is also among the areas of focus in the studies.

Socialization

The yellow cluster contains the keywords *education, engagement, school closure,* and *social presence*. We can conclude from this cluster that there are studies with emphasis on the impacts of the education process, which was experienced after the closure of schools in the pandemic period, on social presence and participation; and the studies also address socialization.

Challenges

There are 3 keywords in the turquoise cluster: *challenges, pedagogy,* and *teachers*. In view of the relationship of these keywords with each other as well as with other clusters, it can be concluded that the challenges faced by teachers and pedagogical problems experienced during the pandemic are examined in this cluster. The fact that the engagement status and challenges experienced in terms of ERT during the pandemic have been frequently examined highlights the need for development of the process in those aspects.

Thematic Clustering Analysis of Abstracts

With the aim to explore the frequently repeated words in the abstracts of the analyzed publications, clustering analysis based on text data was performed in VOSViewer software and a cluster map was generated. Abstract tags and copyright notices (if any) structured in the abstract areas were ignored, and the minimum number of occurrences was determined as 20. 95 out of 5147 terms met the occurrence threshold of 20; 60% of the most relevant terms were clustered and selected in VOSviewer according to the relevance score calculated for each of the 95 terms. Figure 5 shows the 4 clusters formed upon the analysis and covering 57 terms. The size of the bubble indicates the strength of the words in terms of their frequency, association, and influence.)

Figure 5
Clustering of Abstracts and Titles Using VOSviewer

The themes associated with the clusters are as follows:

Key Elements and Practices of Distance Education

The red cluster consisting of 19 items contains terms such as *teacher, school, resource, technology, support*, which are the key elements of distance education, as well as *process, approach, practice, need, recommendation, opportunity, closure*, which reflect the implementation process. The word *teacher* has the highest frequency, association and influence and is close to the other clusters, which demonstrates the high prevalence of the studies on teachers and the significance of teachers' role in the ERT process.

Institutional Structure and Management of Distance Education

The green cluster consists of 14 items. The cluster contains expressions related to institutional and administrative elements such as institution, course, faculty, class, time, teacher, assessment,

difficulty, higher education, faculty member. The words *course, time, class,* and *faculty* have higher frequency, association and influence, which underscores the importance of these elements in the structure and management of distance education. Considering the presence of words emphasizing higher education in this cluster, we think that there have been more studies on higher education. Also, the prevalence of studies on assessments is worthy of note.

Psychology and Stakeholders in Distance Education

The blue cluster consists of 13 items. In addition to the keywords distance education, ERT, remote teaching, distance learning, instruction, presence of words that reflect the psychological state is remarkable in this cluster. It is understood that most of the studies involved an analysis in this direction by considering the process in terms of anxiety, satisfaction, and perception. Furthermore, learners, instructors, and parents, who are stakeholders of distance education, are included in this cluster, and the word *teacher* (56) is seen to have a higher frequency of occurrence than that of *learner* (34) and *parent* (34). This can lead us to the conclusion that more studies have been done on the *instructor*. Because the words *learner* and *instructor* are located close to other clusters, we can conclude that these concepts are frequently used in other clusters as well.

Learning-Teaching Process

The yellow cluster consists of 11 items. Words related to the teaching process such as *engagement, student engagement, participant, model, use, interview, online learning,* and *crisis* are concentrated in this cluster. The words *model, use,* and *factor* stand out in terms of frequency, association, and influence, which points out to studies that encompass the structuring of the remote teaching process. *Engagement* occurs in three different ways in the same cluster (engagement, participant, student engagement), from which we can understand the significance of engagement in the remote teaching process. We also observe that interviews are commonly used in research.

Conclusion and Discussion

This research aimed to provide a systematic literature review of studies related to the ERT process. Following the search structured in line with the PRISMA framework and performed in the WoS database, 238 publications were analyzed using the bibliometric analysis method. The results of this mapping study reveal the general trends of an intense and rapidly emerging research field. This area of research continues its growth in parallel with the ongoing pandemic.

In the view of the findings of research, the emergence of ERT-related publications for the years 2020 and 2021 and the finding that the term ERT was not used in scientific research conducted before 2020 are seen to be similar to other research findings in the literature (Bond, 2020; Bond et al., 2021; Yavuz et al., 2021). This situation can be associated with the fact that distance education activities carried out in emergency conditions have increasingly become known as "emergency remote teaching- ERT" (Hodges et al., 2020) after the Covid 19 epidemic. Furthermore, the number of publications with a focus on the ERT process, the diversity of sources and citation information not only demonstrate recognition of the idea that the dynamics of ERT and the dynamics of online education should be positioned differently, but also point to the fact that there have been efforts in place to build scientific studies based on this idea. The increase in the number of these studies in the year 2021 can be considered as a natural

consequence of the process of conducting and publishing research on teaching activities during the Covid-19 pandemic that emerged in 2019.

An analysis of the studies on ERT by publication type reveals that most of the studies are composed of journal articles, followed by review papers, editorials, and conference proceedings. This finding supports the study by Darsono (2020) which demonstrated that publications consisted of articles and review papers, respectively, in this field. There are also other studies indicating that most of the publications in the field consist of articles, and supporting the research findings (Al-Zaman, 2000; Bond 2020; Köseoğlu & Bozkurt, 2018; Mishra et al., 2021).

When the distribution of publications is analyzed by subject, most of the publications are in the field of educational sciences, which are followed by environmental sciences, and medicine and health sciences. This finding is consistent with other studies indicating that most of the publications on distance education and e-learning have been made in the field of educational sciences (Amoozegar et al., 2018; Hung, 2012). Bond et al. (2021) stated that the highest number of publications on ERT were made in the fields of health sciences and natural sciences, mathematics and statistics, and education. Although the ranking of the studies varies in the research, the top three fields have remained the same. In that regard, the findings obtained from the studies support each other. Considering that ERT studies were mostly carried out during the Covid-19 pandemic, it is predictable that research has been conducted on the natural sciences and health sciences, with which the pandemic is closely associated. The high number of studies in the field of education is that the reviews focused on research in the field of ERT.

The countries that have significantly contributed to studies on ERT are the United States, Spain, the UK, People's Republic of China, and South Africa, respectively. Similarly, there are studies in the literature demonstrating that Spain, the US, the UK, and China are among the top ten countries that produce many publications in this field (Ahmad et al., 2018; Al-Zaman, 2020; Bond et al., 2021; Darsono, et al., 2020; Gupta & Dhawan, 2020; Wang et al., 2017; Yavuz, et al., 2021). Despite the difference in ranking, this result substantially matches the research findings. Similarly, other bibliometric studies listing the US and the UK as the most productive countries in the literature (Ahmad et al., 2018; Fatima & Abu, 2019; Mishra et al., 2021; Sezgin, 2021), support this finding. The difference between countries and rankings of the studies can be explained by the difference in size and structure of the study data, in the databases used, and in the limitations of the studies. The large number of studies conducted in China may be attributed the fact that the virus emerged in China and there was the intention to convey the news about the situation and conditions in China to the entire world (Chahrour et al., 2020; Yavuz, et al., 2021;). It is noteworthy that many studies referred to the US and the UK as the most productive countries in terms of ERT. This situation can be interpreted as a conscious effort by developed or developing countries leading in the human development index ranking (United Nations Development Programme, 2020) according to the per capita income to manage the education processes correctly and to ensure sustainability of the education processes in the time of crisis by revealing research conducted on ERT and current trends in this subject (Sezgin, 2021). Nonetheless, when assessing the contributions of countries to studies on ERT, it is recommended that the changing national responses to COVID-19 and the measures implemented to fight against the spread of the pandemic should be considered, and that the situation should be evaluated within the specific context of the pandemic (Bond et al., 2021). The unavailability of research in the countries that are not included in the ranking may be due to research indexed in other databases that were not analyzed, and research published in the local language of the country other than English language. Another factor affecting the ranking may be that international databases mostly index journals that only accept submissions in English (Tight, 2019).

Upon a review of the list of journals with the highest number of papers in the field and the highest citation count, it has been revealed that the list of the most productive journals mostly concentrates on the field of educational sciences; and there are also journals in the fields of environmental sciences, medicine, and health sciences. *The International Journal of Educational Technology in Higher Education*, which was listed among the most productive journals in the research with the highest Journal Impact Factor (JIF), is also found to be the most productive journal on open education practices as reported in the study by Köseoğlu and Bozkurt (2018). According to the findings of the research, the journal ranked 9th in the list of most productive journals. It has been found out that *Online Learning, Education Sciences* and *Sustainability* journals were listed among the top ten journals both with the highest productivity and the highest citations. Zhang et al. (2022) also listed the journals *Sustainability* and *Education and Information Technologies* as among the most productive journals in their study where they used the bibliometric method to analyze online learning experiences during the pandemic. According to various studies that followed the e-learning trends during the pandemic, *Education Sciences* and *Sustainability* journals were seen to be leading in the ranking in terms of publication output and citation rate (Yavuz, et al., 2021). An examination of the journals by discipline noted that educational sciences and environmental sciences were again the most common fields studied on this subject. It can be suggested that the uneven distribution of the 5 Year Impact Factor (JIF 5 Year), Journal Citation Indicator (JCI), and JCI Quartile (JCI Q), which is used to measure the scientific impact of the journals in the list of journals with the highest productivity and highest citation count, may be due to the publication speed during the pandemic and the difference in the publication process in some journals (considering the effect of the peer review process affected by the pandemic).

The data obtained within the scope of authorship patterns and collaboration under this research demonstrated that most of the studies in this field were conducted by more than one author. Multi-authoring outweighs in this subject area, and collaborative research is common. As indicated by Fatima and Abu (2019), the number of articles with two or more authors displayed a steady increase in all block years between 1989 and 2017. This finding supports the result obtained from the research. There are also different studies that confirm the conclusion that most of the studies are reported in multi-authored papers (Al-Zaman, 2020; Dehghanbanadaki et al., 2020; Kaya & Erbay, 2020). Degree of collaboration for this study was found to be 0,84. The degree of collaboration between the authors between years 2013 and 2017 was found to be 0.93 according to the bibliometric study on e-learning by Fatima and Abu (2019), and 0.81 according to Mishra et al. (2021). This research finding is in harmony with the results of other bibliometric studies in which multi-authoring predominates, and collaboration is adopted to a remarkable extent.

The thematic clustering analysis for keywords demonstrates that the most important topics that are addressed in the studies on ERT are the process of pandemic, distance education and higher education. The thematic clustering analysis for the abstracts also reveals that higher education is at the forefront. Considering that the term *higher education* is among the keywords with the highest influence, we can conclude that distance education activities concentrating on the higher education level predominate. Similar to the findings of this research, Sezgin (2021) noted in his study analyzing the publications on the ERT process that such publications were mostly in the field of higher education. There are also other studies supporting this finding (Bond et al., 2021; Mishra et al., 2021; Bozkurt & Zawacki-Richter, 2021), and noting that there are limited studies on the K-12 level (Bond, 2020; Cachón-Zagalaz et al., 2020). Nevertheless, it is reported that the pandemic has had important effects on K-12 education and that there is need for

further study in this field (UNESCO, 2020). According to the research findings, the term *secondary education* is one of the terms that is repeated in fewer number of studies and is less relevant. Therefore, it is anticipated that more research on the K-12 level will enrich the ERT literature.

The challenges experienced regarding teachers and pedagogic issues during the process, teacher education, student-related characteristics (such as self-regulated learning-motivation-academic success) and participation are located at the center of the map, which suggests that the topics are meso-level factors that are frequently repeated and are associated with other concepts. It is seen that the factors related to teachers, participation and structuring of distance education come to the fore in the thematic cluster analysis for the abstracts. Other studies support the finding of the structuring process of distance education and the high prevalence of the studies on teachers in this research (Rosenberg, 2012; Welsh et al., 2003; Sampson & Zervas, 2013). In a similar manner, there is emphasis on the importance of an integration between information and content management, learning management systems and teaching staff training for the future of e-learning. The findings of our study are also in harmony with the findings of Zawacki-Richter et al. (2009) in terms of the emphasis on participation and student characteristics. In their study aimed to determine the general trend of research on distance education between 2000-2008, Zawacki-Richter et al. (2009) similarly stated that the interaction in learning communities, learner characteristics and instructional design (Zawacki-Richter, 2009) are among the most studied subjects although they are considered important at the micro level. Similar to this research, studies that emphasize the need for teacher education in online learning (Zawacki-Richter, 2009; Bozkurt & Zawacki-Richter, 2021; Johnson et al., 2020; Sepulveda-Escobar & Morrison, 2020; Jelińska & Paradowski, 2021), mention the importance of e-learning for professional development (Cheng et al., 2014), and underline the significance of social interaction (Bozkurt & Zawacki-Richter, 2021). The challenges experienced in relation to the process, as reported in findings of this research, are also seen to be prominent in numerous ERT practices. A large number of studies available lay stress on the challenges faced due to the very first experience of distance education during the pandemic (Chatziralli et al., 2020; MacIntyre et al., 2020), and point to various mental problems such as stress, decrease in motivation, anxiety, feeling of isolation caused by additional planning and preparation stages (MacIntyre et al., 2020; Petillion & McNeil, 2020; Kapasia et al., 2020; Green et al.. , 2020), indicate technical challenges as to internet and computer access (Aboagye et al., 2020; Gillis & Krull, 2020; Jandric et al., 2020), and emphasize digital privacy and the digital divide throughout the process (Khlaif et al., 2021). Considering the dynamics of the emergence of ERT process and the speed of the pandemic in shaping the education process, it is comprehensible that the professional development of teachers who must adapt to the process, the characteristics of students who do not yet have a distance education culture, and the challenges experienced in the process are frequently addressed.

Regarding the frequency of repetition and association of keywords, the importance of concepts such as instructional design, collaborative learning, social presence, and assessment remained at a more micro level. Such concepts reappear in ERT studies, maintaining their importance as before the pandemic. Similar to the findings of this research, studies that mention the role of assessment tools in the ERT process (Bond et al., 2021), emphasize that instructional design is among the most frequently studied subjects in distance education research (Zawacki-Richter et al., 2009), and underscore the importance of social presence and collaborative learning by noting that the Community of Inquiry framework can be used to reassess, organize and manage ERT (Chiroma et al., 2021).

With the compulsory and widespread transition to online education during the pandemic, many stakeholders of education have experienced online learning through ERT, and such experiences and the process have been analyzed and interpreted by many studies. Trend analysis of ERT research provides us with many different findings in this process, in addition to the prominent topics related to online education in the period before the pandemic. Researchers that acknowledge the difference between ERT and online education and build their analysis upon that difference usually concentrate on the article format in the field of educational sciences. They focus on themes such as the pandemic, and higher education studies in this process, professional development, pedagogical issues, student characteristics and social interaction. It is anticipated that the implications for policy and practice based on the examination of research trends will have a significant effect on the structuring of future online learning environments, as well as the ERT designed for emergencies.

Limitations and Future Avenues of Research

As with all other studies, this study also has certain limitations. The first limitation is associated with the method employed. Although bibliometric analysis is a suitable method to analyze research productivity, monitor the growth and development direction of research and make sense of large data sets (Bornmann, 2014), there are studies that consider the method to be insufficient in revealing the social impacts, and point out to limitations of those analyses as they are largely based on the metadata of publications rather than their actual content (Mishra et al., 2021). To overcome this limitation at least partially under this study, Co-word Analysis of Keywords and Text Analysis of Abstracts were used, focusing on the analysis of the actual content of the studies. However, as there are usually many documents examined in bibliometric studies, no detailed information is provided on the results of the relevant studies.

Information is not provided in detail; furthermore, bibliometric studies usually take a long time to monitor the growth and development direction of the research. However, the unprecedented volume of publications produced on online education during the pandemic (González-Zamar et al., 2020), justifies the use of bibliometric method, which is referred to as a suitable method to make sense of large datasets and analyze efficiency (Bornmann, 2014). There are also studies that analyze online learning studies within the period limited to the pandemic using the bibliometric method (González-Zamar et al., 2020; Rodrigues et al., 2020; Yaacob & Gan, 2021; Zhang et al., 2022).

Another limitation is related to the sole use of the WOS database. The WOS database has the highest international recognition and contains thousands of academic publications and bibliographic data about authors, links, and citations with high scientific recognition in the academic world (Rodrigues et al., 2020). Yet, future research can be structured in such a way to include other databases as well. For example, ERT studies can also be scanned in the Scopus database, which can help reveal studies that were not indexed in WOS and whose content may be important and include them in classifications.

Another limitation is that due to the ongoing pandemic, there have been more and more studies on ERT, and not all these studies are searched in the WoS database. Moreover, many journals have been announcing special issues on the global impact of COVID-19, and institutional reviews are underway. Regarding the ongoing situation of the pandemic and hence the use of the term *ERT*, the search needs to be constantly updated to cover different databases. The inclusion of the results of this research, which aims to systematically identify, categorize,

and analyze ERT studies in other future analysis studies is of importance in terms of showing the development direction of the expanding ERT literature analysis.

This article covers only open access studies in English language. Gray literature was not included in the scope, either. Both exclusions limited the findings of the research. Only open access publications are included within the scope since the studies in this field are overwhelmingly composed of open access content (Bond et al., 2021), with the increase in the number of open access journals being described as "an efficient way to co-construct knowledge" (Beigel, 2014, p. 619).), and open access publication enables a more even distribution of publications to regions across the globe (Bond et al., 2021). Nevertheless, other mapping studies, including those that are not open access and are published in other languages, are expected to enrich the field.

Finally, this study provides fertile ground for many future studies. Current trends indicate that online teaching methods will be more integrated into conventional teaching processes in the post-pandemic period (Dost et al., 2020). Nevertheless, there is a need for more research on how digital transformation is supposed to improve teaching environments (García-Peñalvo, 2021). Within this context, it is recommended that the research trends in blended learning processes, other e-learning and technology-supported learning processes should be analyzed in other databases and with different methods in a similar fashion to the ERT process, and the number of studies on different levels such as k12 should be increased. In the view of effect of the pandemic on the rapid transition to online education and the general trend of ERT studies, it is anticipated that research on the design of online courses, professional development of teachers, online learning communities, the institutional structure and management of online education, the relationship of online education with psychological factors, and the positioning of post-epidemic online education activities at all educational levels will contribute to the field in the future.

Declarations
The authors declare no conflicts of interest.
The authors declare funding for this work.

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