Special Issue:

Systematic Reviews of Research on Online Learning

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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

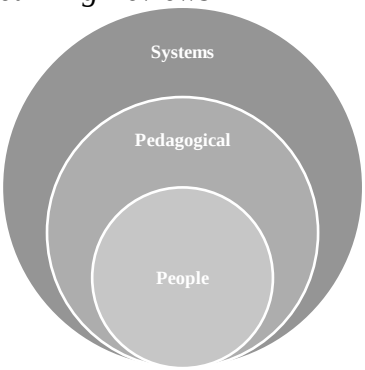

Table 1 provides the author names and titles of the articles in this special issue.

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

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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.

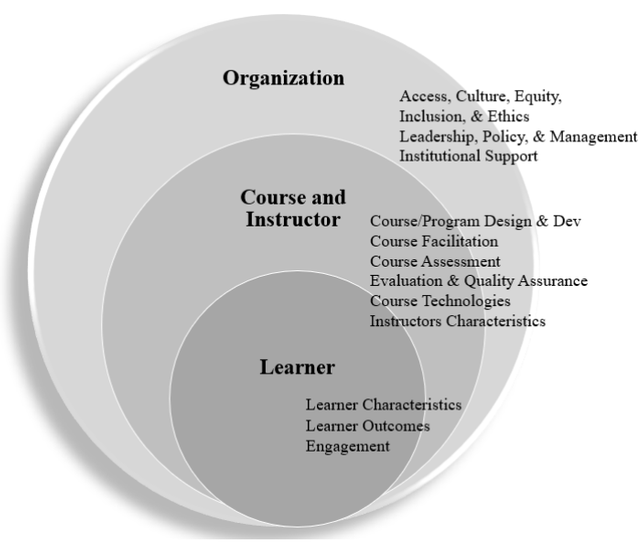
Mishra and his colleagues uncovered a few trends in their recent study. For instance, they discovered that the most productive country in terms of conducting online learning research was the United States (25.1%), which substantially outperformed the second-most and the third-most productive countries (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

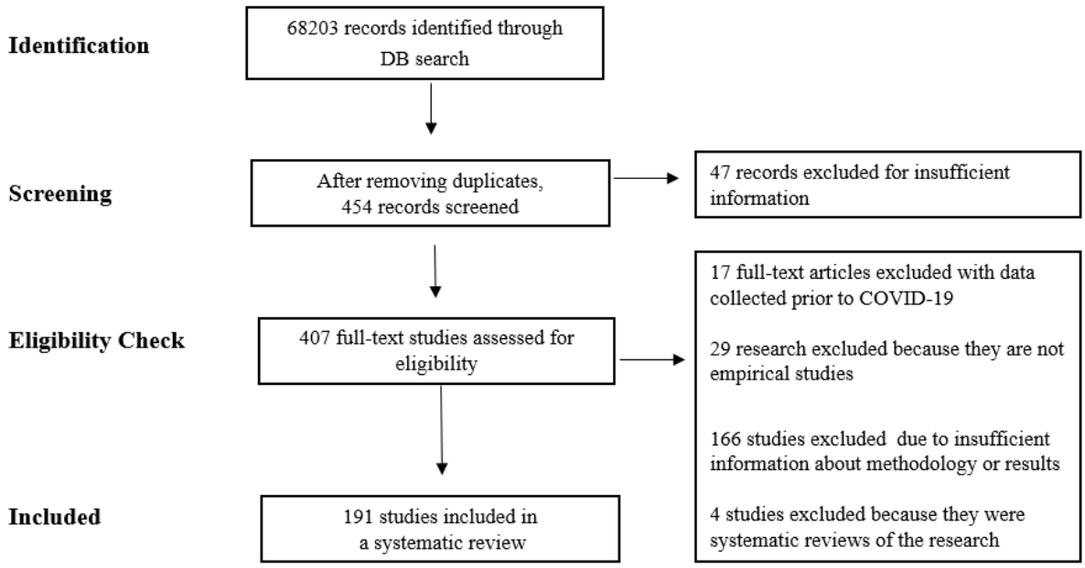
To investigate our three key research questions, we set four key inclusion criteria for the literature search to identify eligible online learning studies published during the COVID-19 pandemic; namely, the studies included in our scope were: (1) confined to online learning environments; (2) empirical 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.

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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

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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*

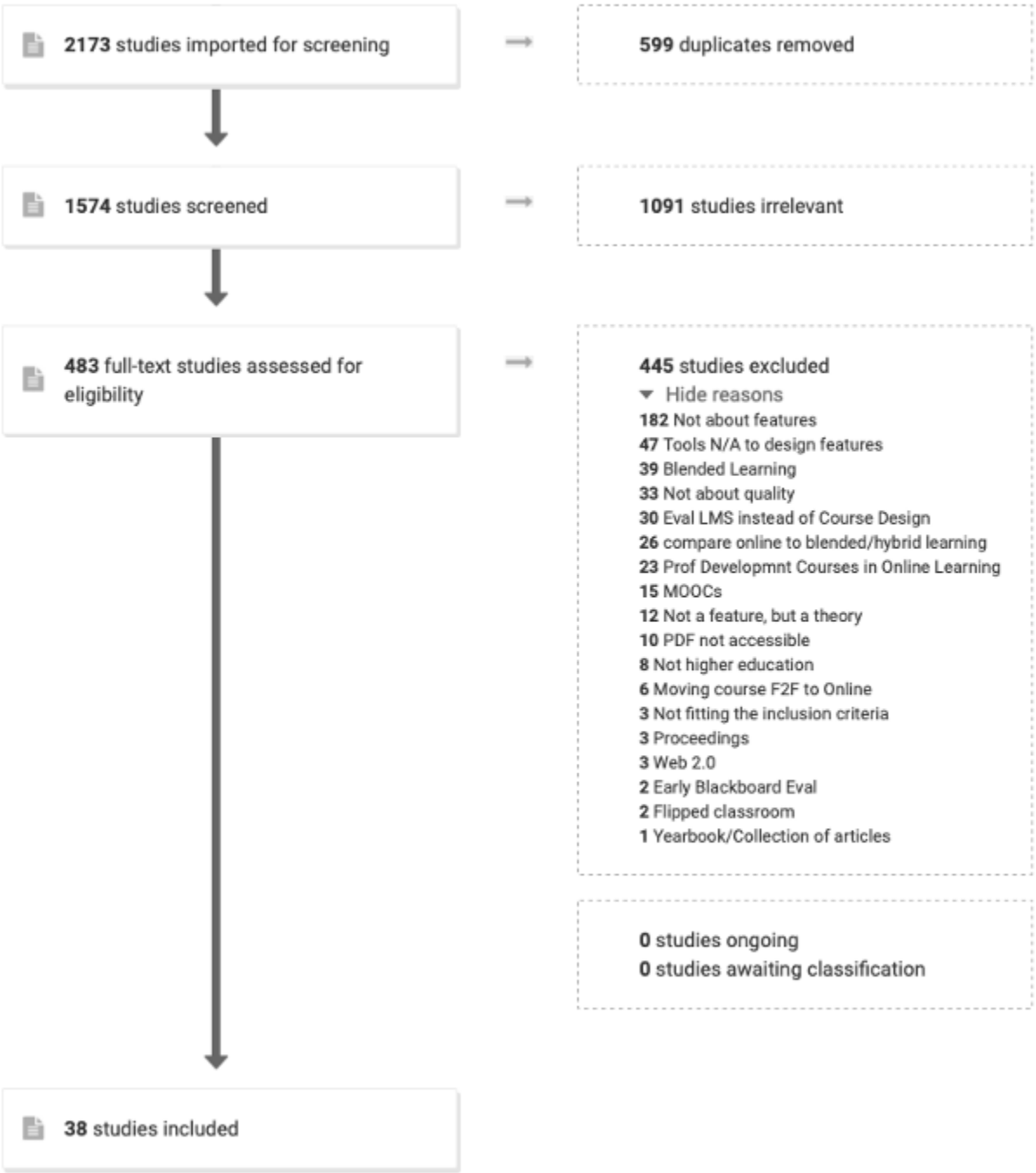
to determine the overall quality of the studies included in this review. The appraisal focused on congruence between the research questions, methods, analysis, interpretation, and representation of data, as well as ethical considerations such as the influence of the researchers on the study, the representation 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



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
	Use of ICTs	• Private messaging features • 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

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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.

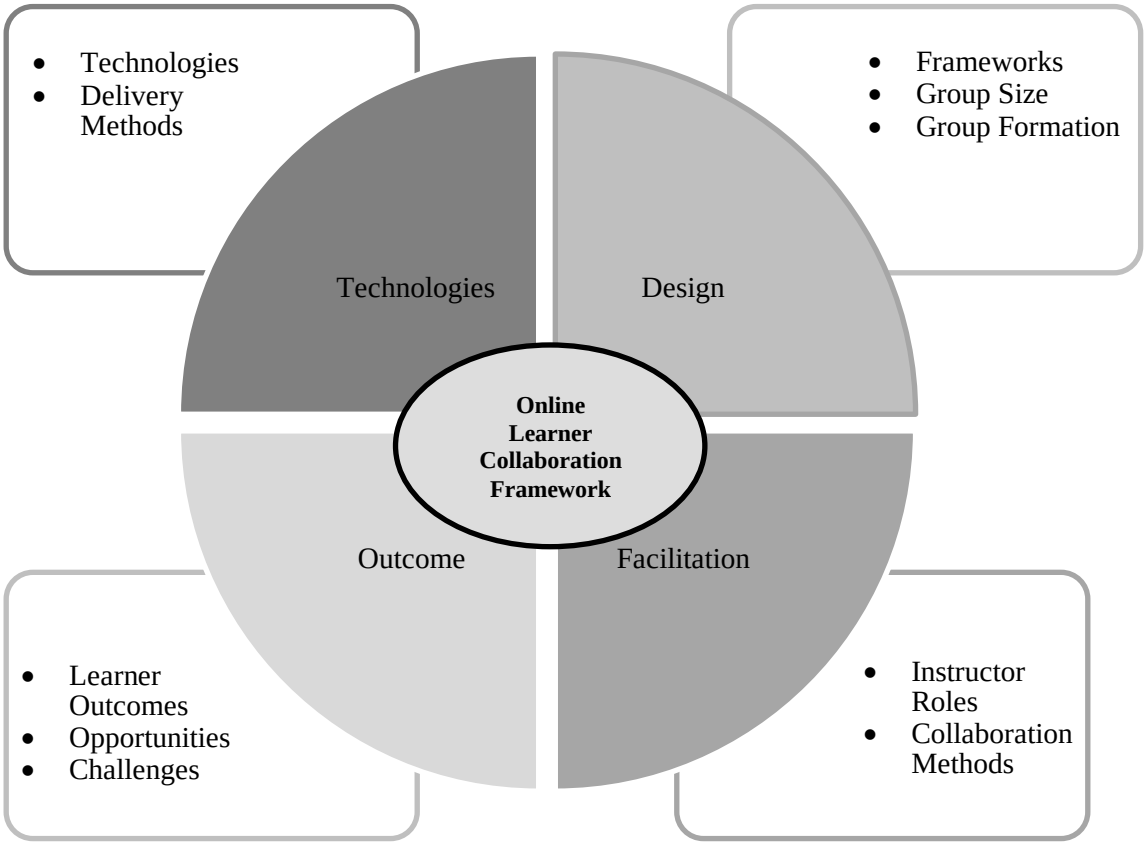
Collaboration Design. Collaboration design refers to how instructors foster collaboration through the design of online learning activities. The design of the activities includes frameworks used, group size, and group formation strategies. The design of online collaborative activities has also been explored 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



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

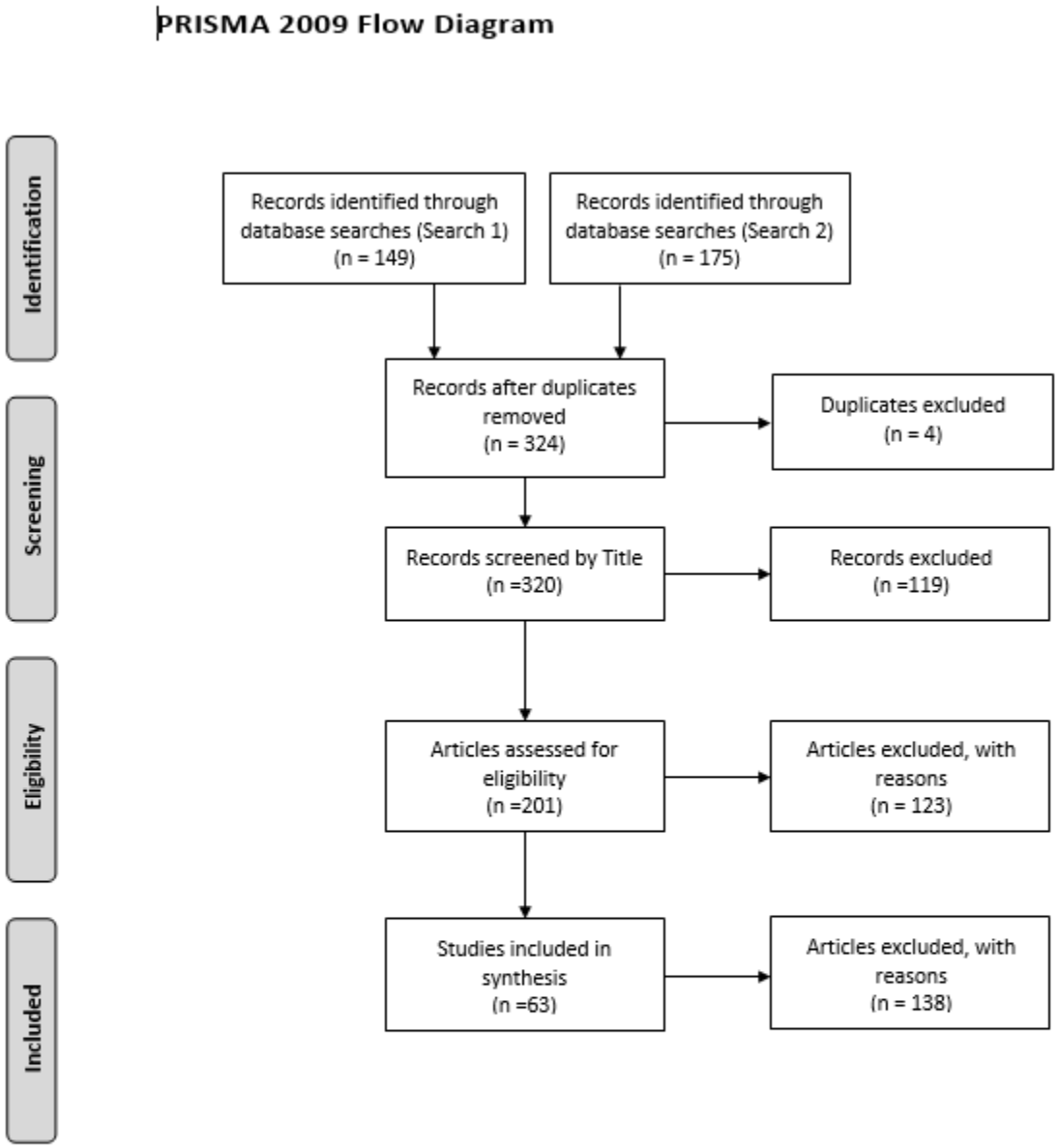
Criteria	Inclusion	Exclusion
Publication Date	Publication years 2012 to 2021	Prior to 2012 and after 2021
Publication Type	Scholarly articles of original research from peer-reviewed journals.	Book chapters, technical reports, dissertations, or proceedings
Focus of the Article	Articles focused primarily 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



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.

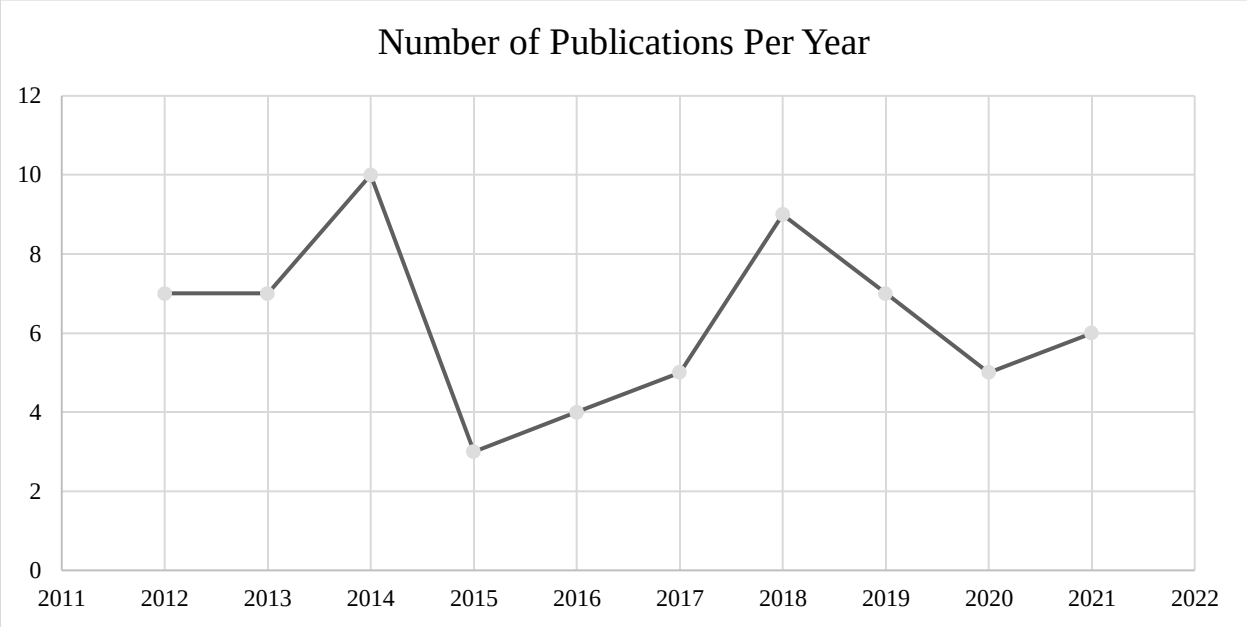
Results

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

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.

Keywords: adaptive help-seeking, online learning settings, formal & informal help-seeking

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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:

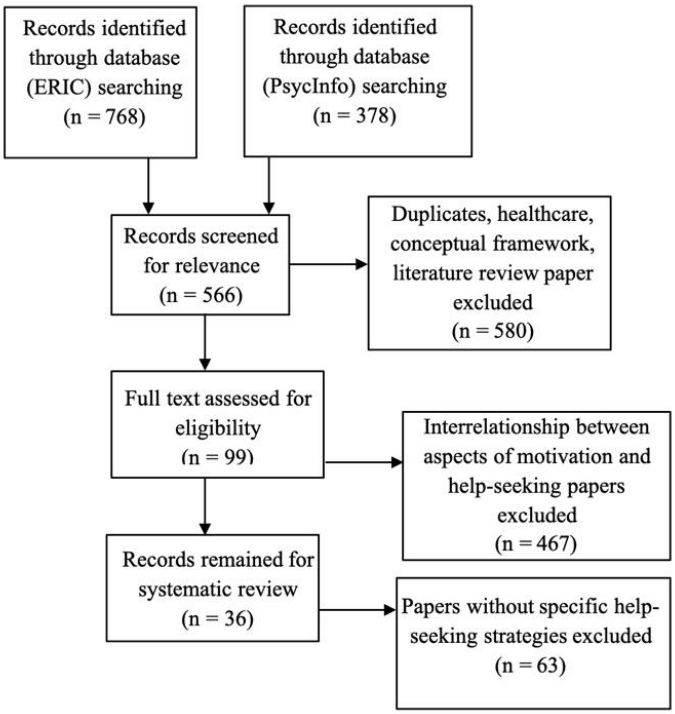
1. Studies included in this review must have been published in peer-reviewed journals. Papers published in non-peer-reviewed journals, book chapters, technical reports, dissertations, or conference proceedings were excluded.
2. Papers included in this review must have been written in English. Non-English 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

The authors declare no Conflicts of Interest
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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

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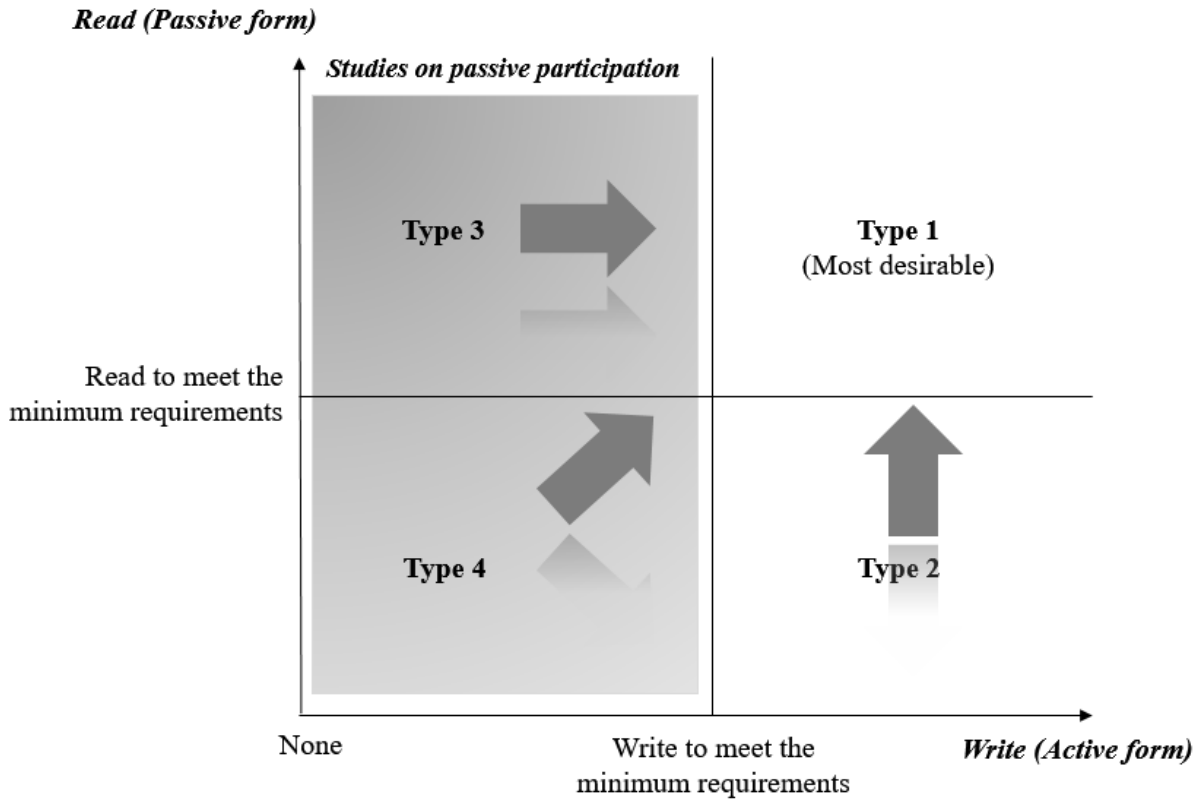
Learning is both individual and social. In online learning space, students can learn individually by reading course materials or observing others' responses in online chat box or online discussion boards. This individual learning is called student-content interaction and is understood as a passive form 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.

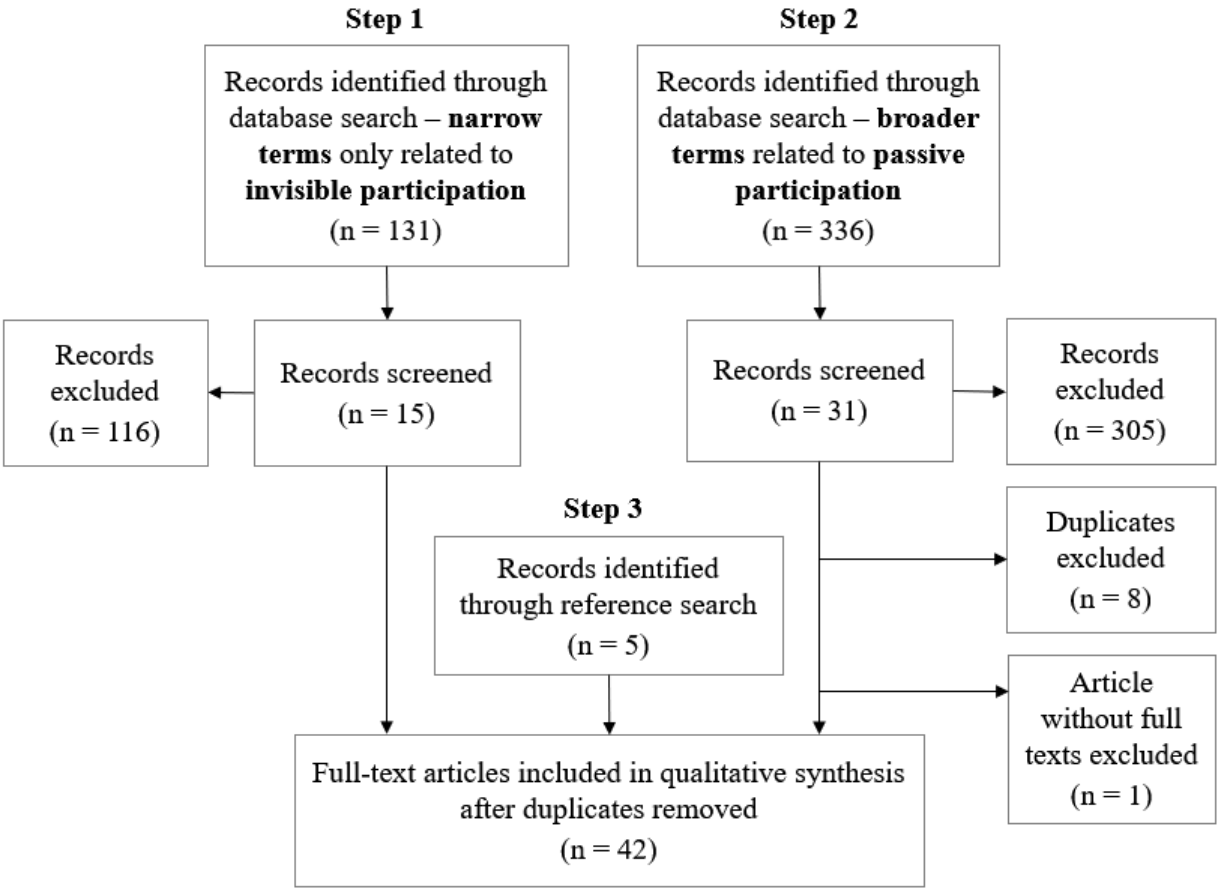
Table 2

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.

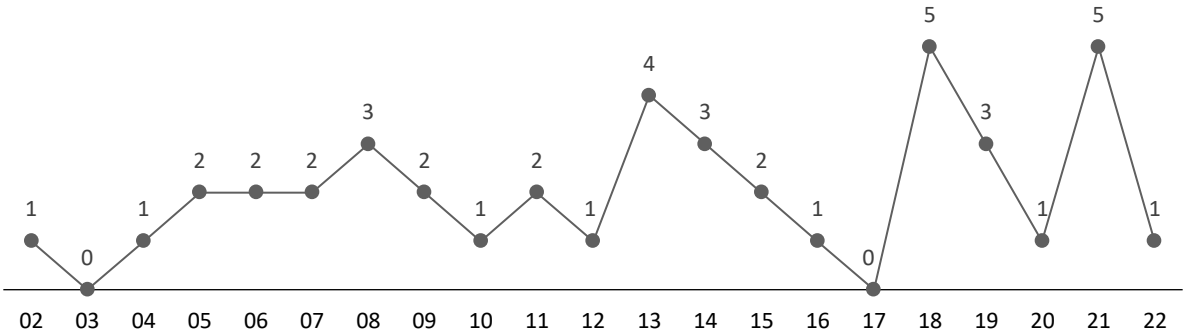
For the second search, we used the same parameters but did not limit our search to title (TI), topic (TS), or abstract (AB), expanding the search instead to full texts. The second search yielded 336 total hits after excluding six duplicates from two search platforms (322 from ERIC, 20 from Web of Science 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

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"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.

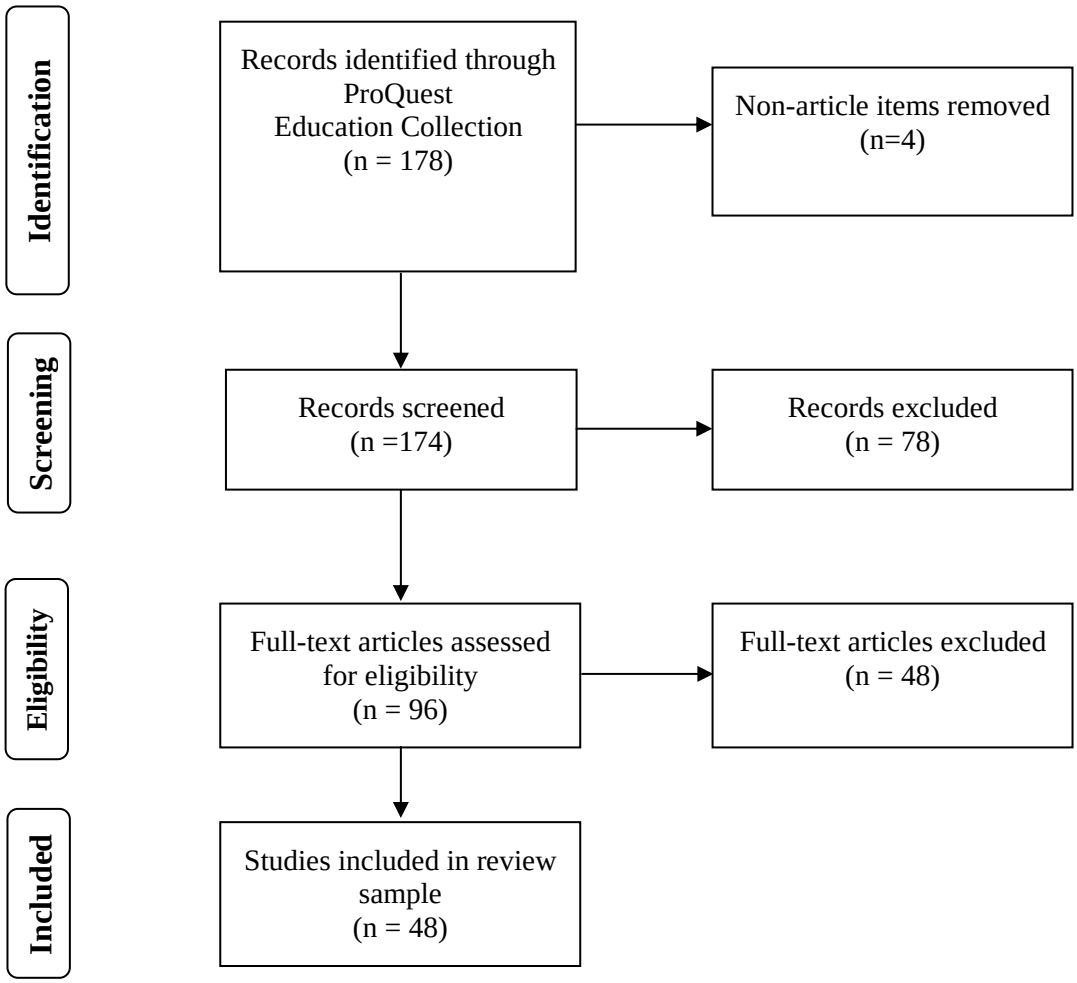
The search was not broadened to include often-related terms such as interaction, engagement, and knowledge construction because, as noted in the literature review, these are not synonymous with intersubjectivity. The terms may co-occur in a manuscript due to their relationship within the dialogic learning 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.

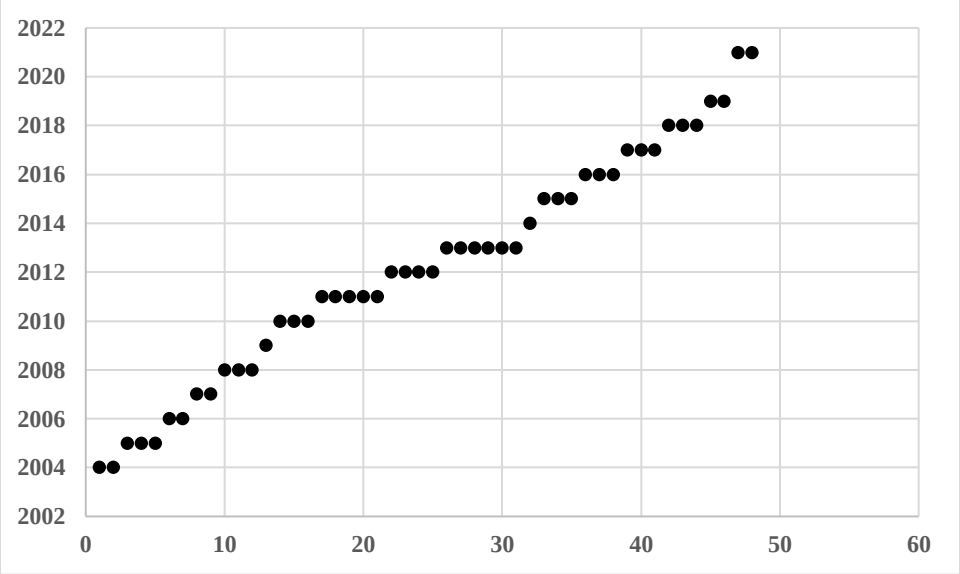
Findings

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.

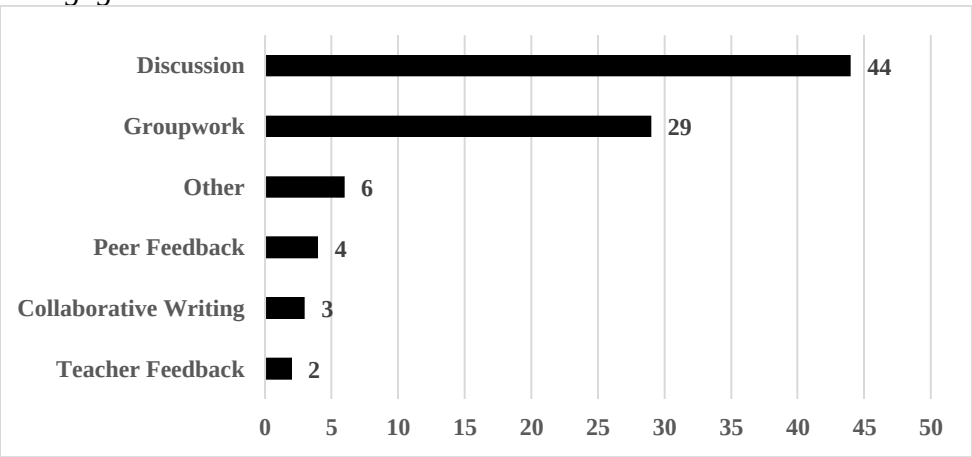
Table 1
Journals With More Than One Intersubjectivity Article

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

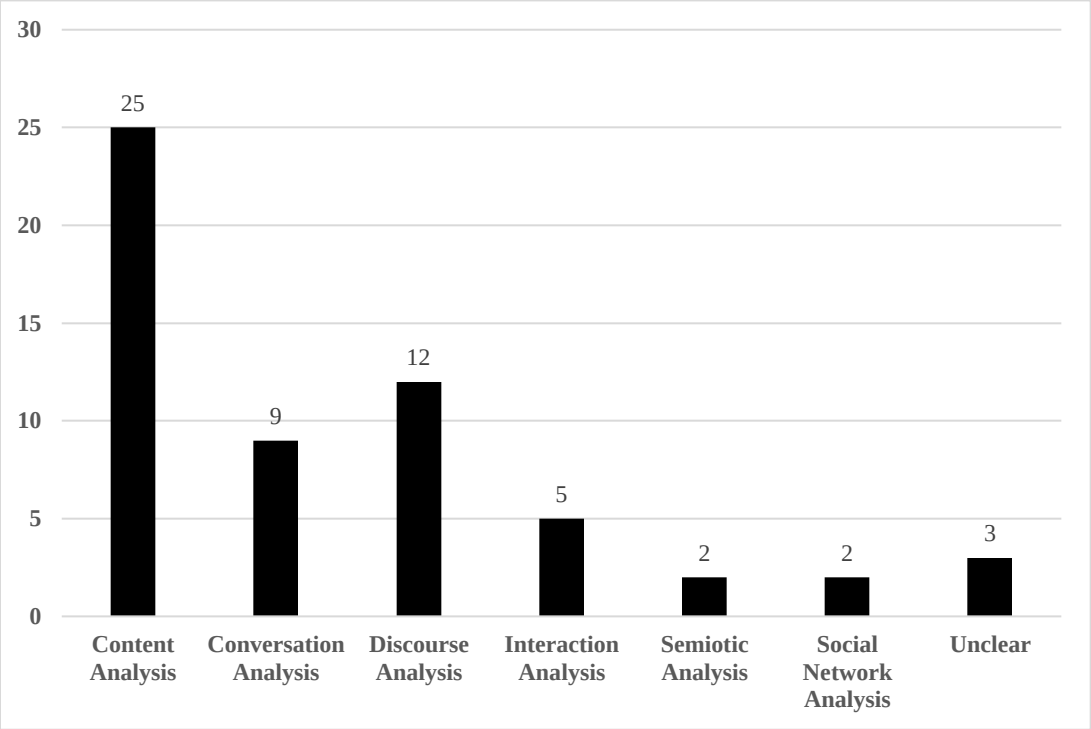
To explore types of analysis, this review focuses solely on the approaches researchers used to analyze participant-generated discourse artifacts. In other words, approaches used to analyze interview, survey, and grade data were not examined. In many instances, the researchers clearly named the analytic 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).

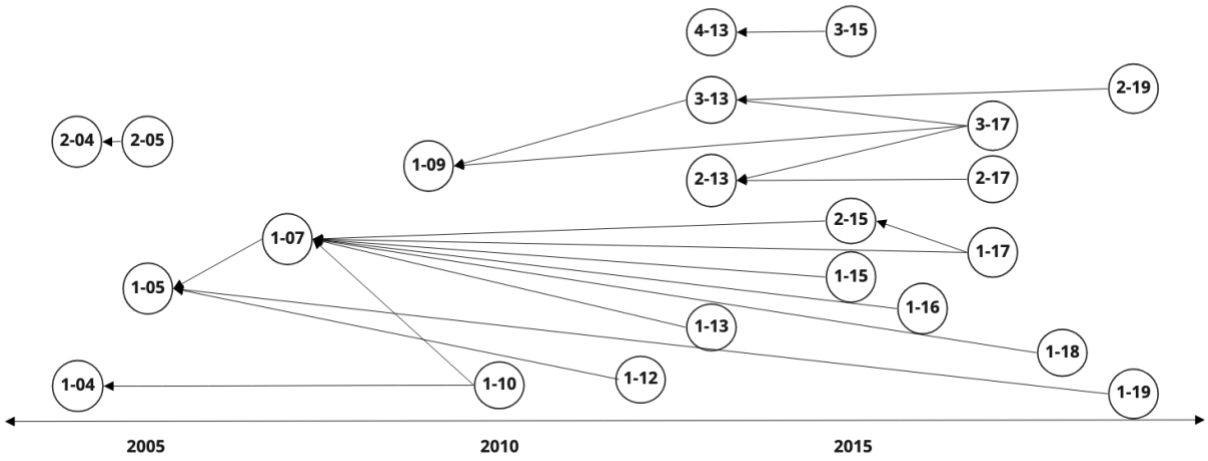
Language Contexts. As noted above, about one-third of the overall sample focused specifically on the discipline of language and linguistics. All thirteen articles in this subset had participants who were language learners. Ten (77%) of these articles examined synchronous learning interactions, and five (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).

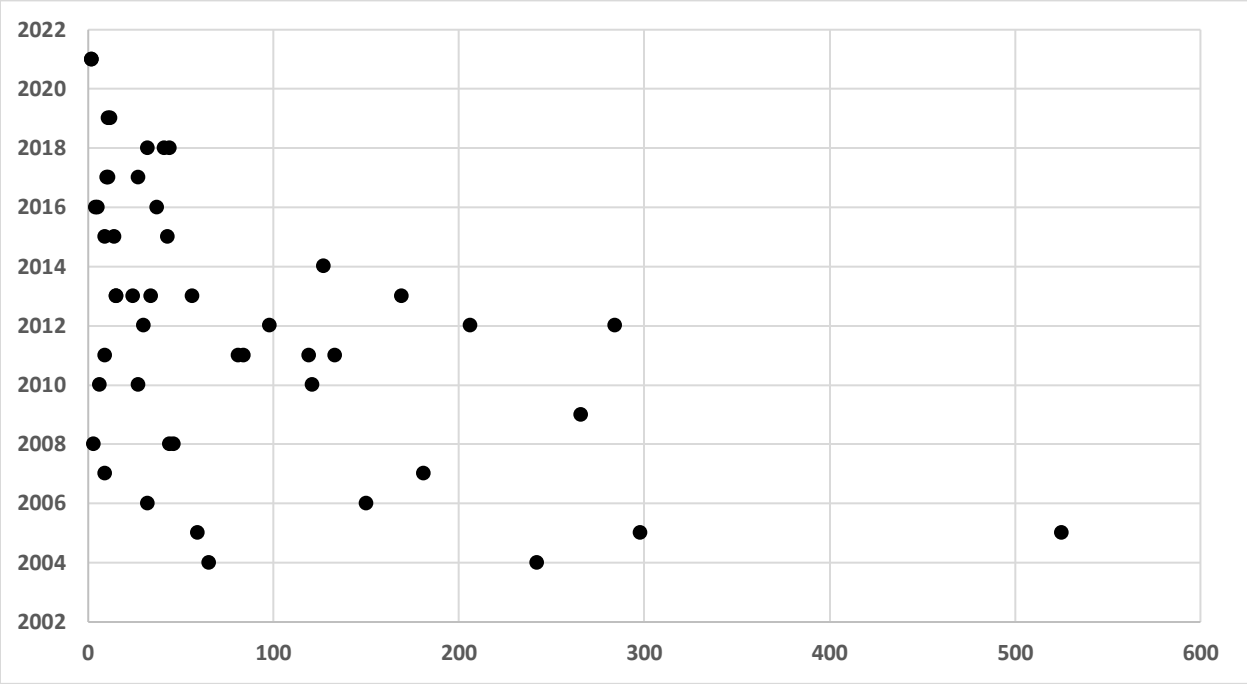
Figure 5
Citations within Articles in the Sample



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

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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,

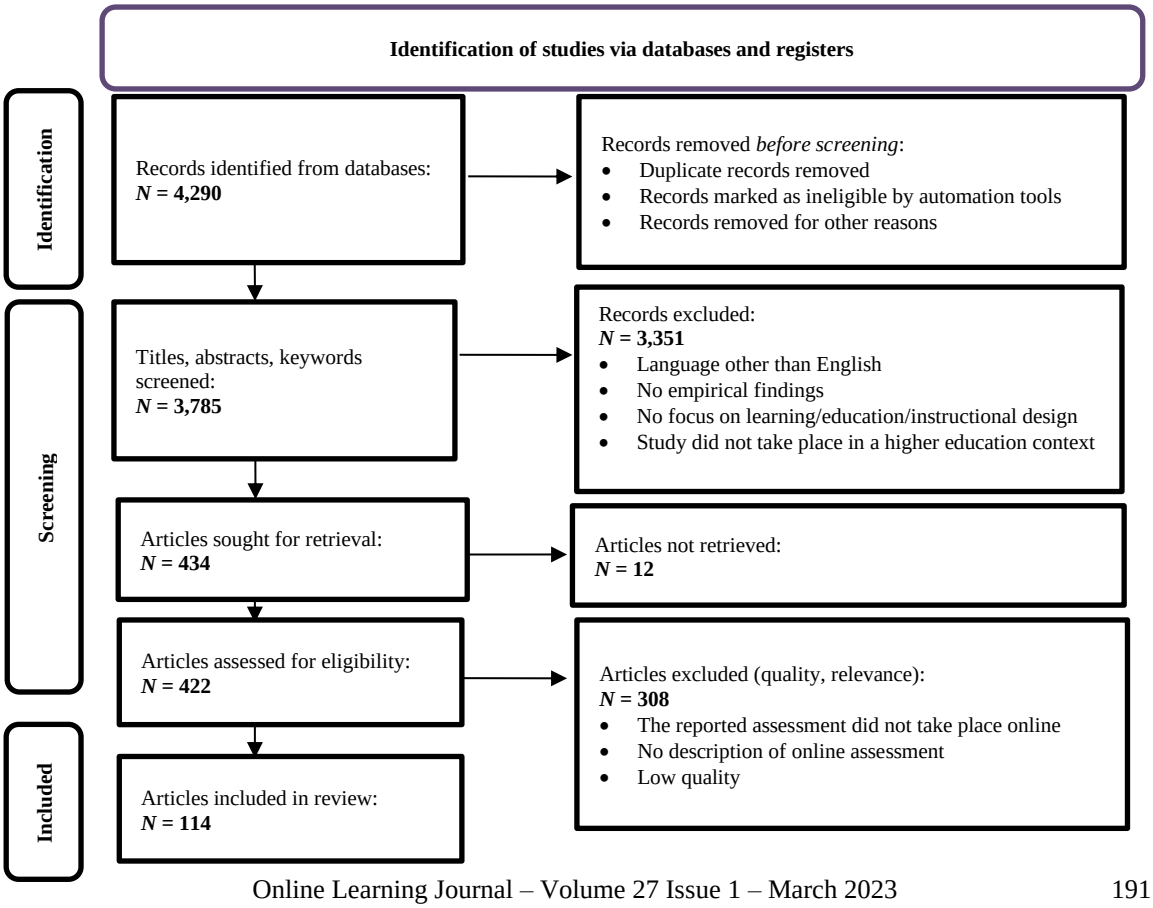
DBLP, Google Scholar, ERIC, etc. Additionally, relevant journals in the field of Learning Sciences and Educational Technology were used in the research process and are listed in the next section. The search includes articles published since January 2010 (marking the increased availability of empirical 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)

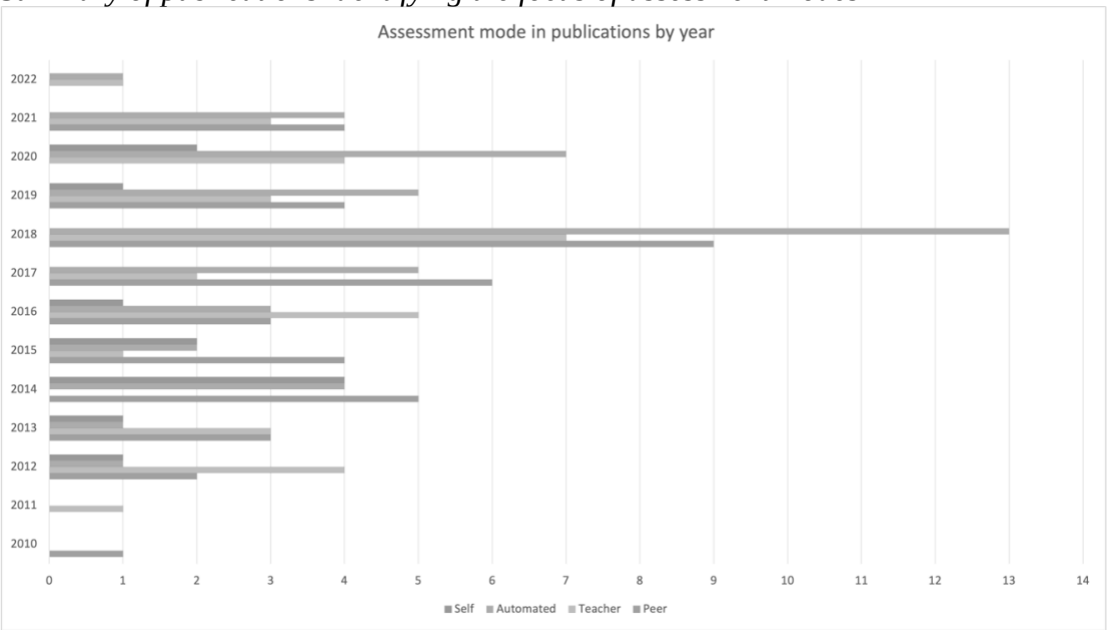
Assessment types are diverse and include a broad range of possible implementations. Additionally, many publications included multiple types. Some main categories of types could nonetheless be identified. N = 42 (37%) publications reported some type of quiz, N = 18 (16%) essays or other writing tasks, 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.

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

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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

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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

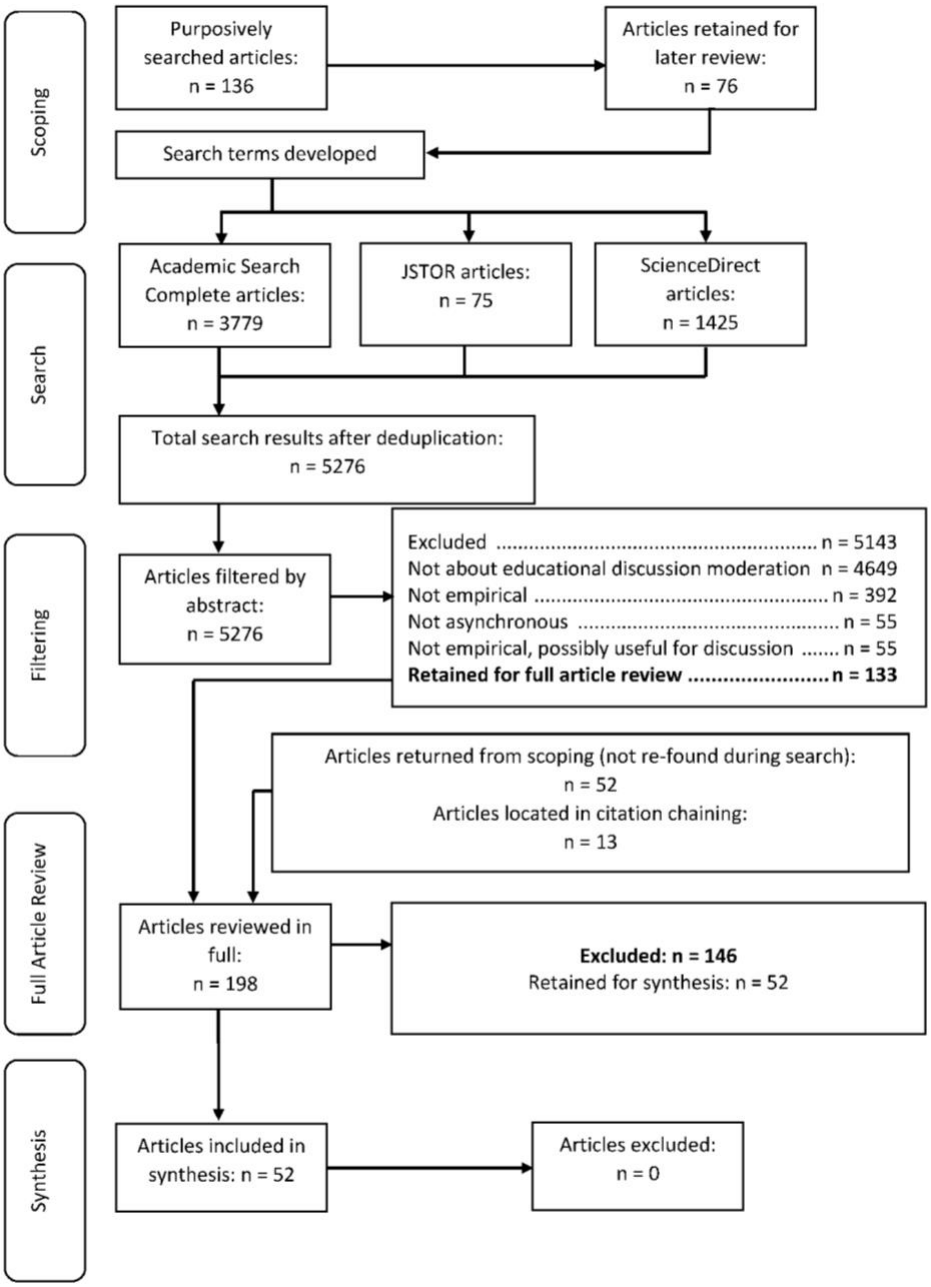
	Managerial Role Creates the agenda, sets norms for behavior and participation, shows leadership	**Monitoring Role** Recognizes contributions, reassures commenters, prompts continued participation	**Pedagogical Role** Focuses discussion, weaves threads, summarizes, supports learning, combats information 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				1				1		1	1		2		1			1	1		2	1	13
Belgium																	1		2	2	2	4									11
United Kingdom	1					1	1							1		1			1	1											7
Iran																													1	2	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	0	1	1	1	0	0	0	1	0	2	1	3	1	1	5	3	4	8	3	3	0	2	1	1	5	4	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.

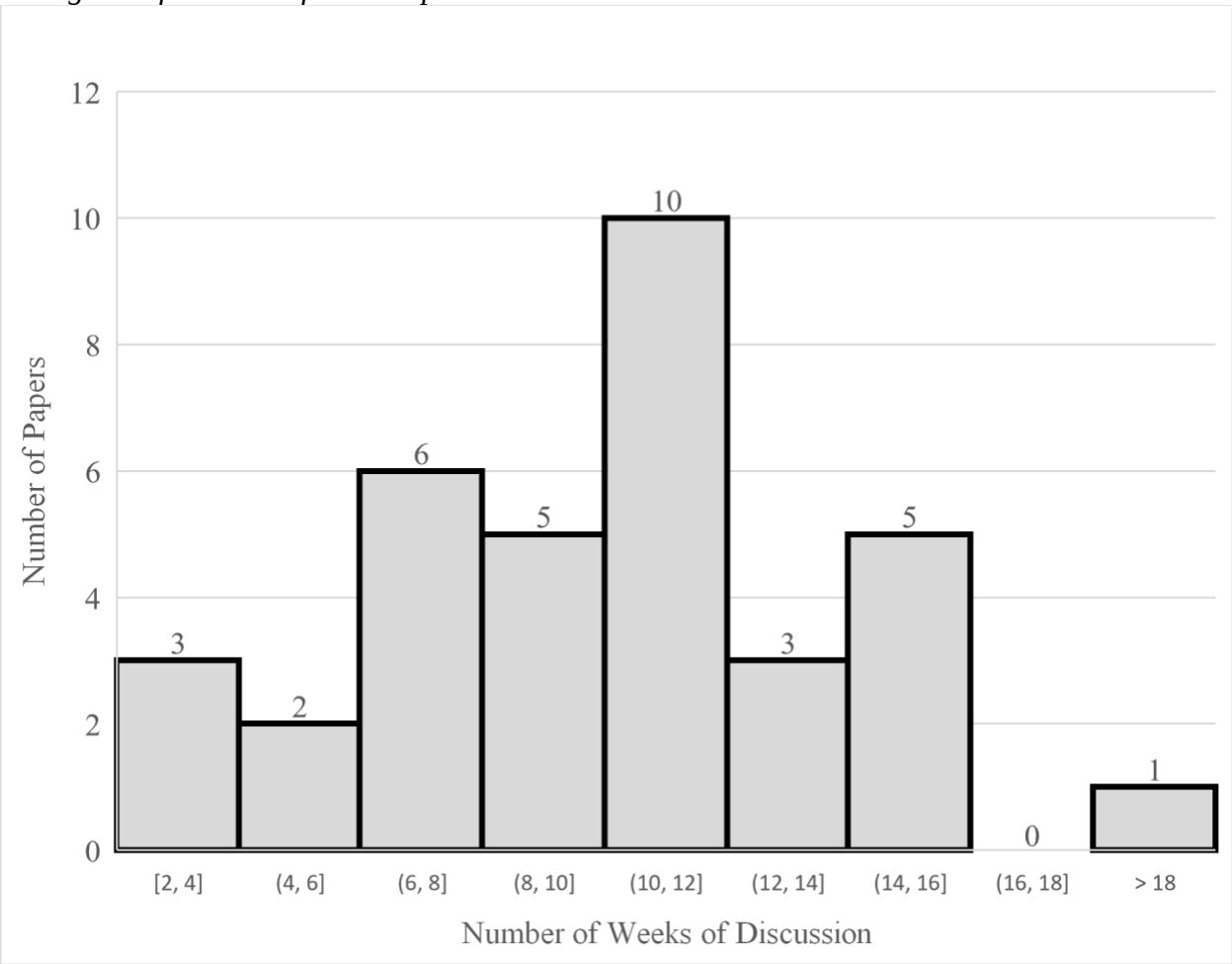
We observed some variation in the course environments being studied. The most common were fully online courses (*n* = 23, 44.2%), followed by hybrid (*n* = 20, 38.5%), and then face-to-face with supplemental asynchronous discussions (*n* = 5, 9.6%). The remaining four did not fit these categories, either 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							Total Papers
	Instructors	Peer Moderators	Untyped Moderators	Discussion Participants	Instructors + Peer Moderators	Instructors + Participants	Peer Moderators + Participants	
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		7	6	5		1	1	1	2	1
Student Outcomes	7		2	2	6	2	1			
Participation Level	6	2		3	1		1	1		
Moderator Style	5	2	3					1		1
Role Assignment		6	1					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				1			
Training of Moderators or Learning to Moderate			1		1				
Comparing Instructor Moderation to Peer Moderation		3	1						
Learning Outcomes or Knowledge Construction	1	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

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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.

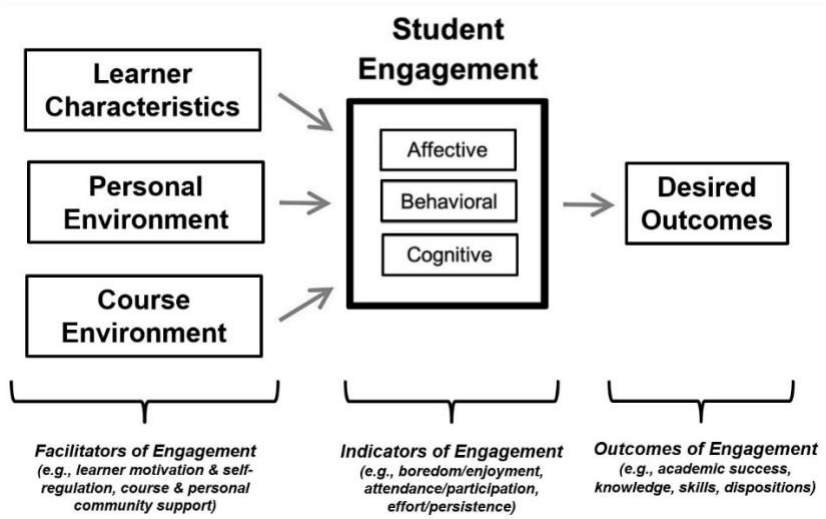
Indicators of Engagement

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 Successl, 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

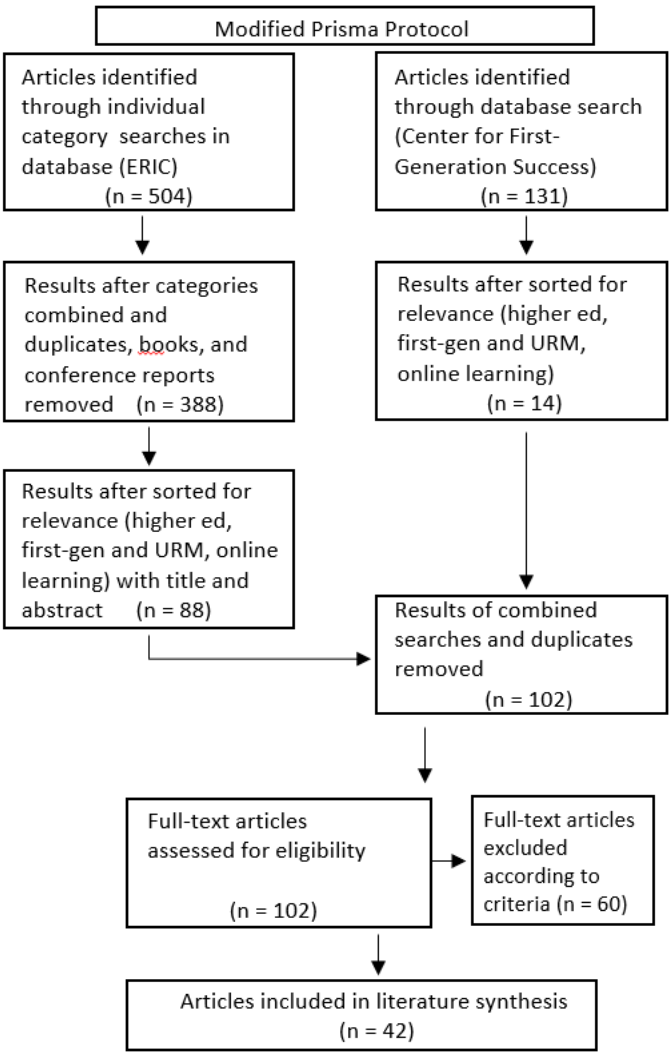
The following inclusion criteria were used:

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

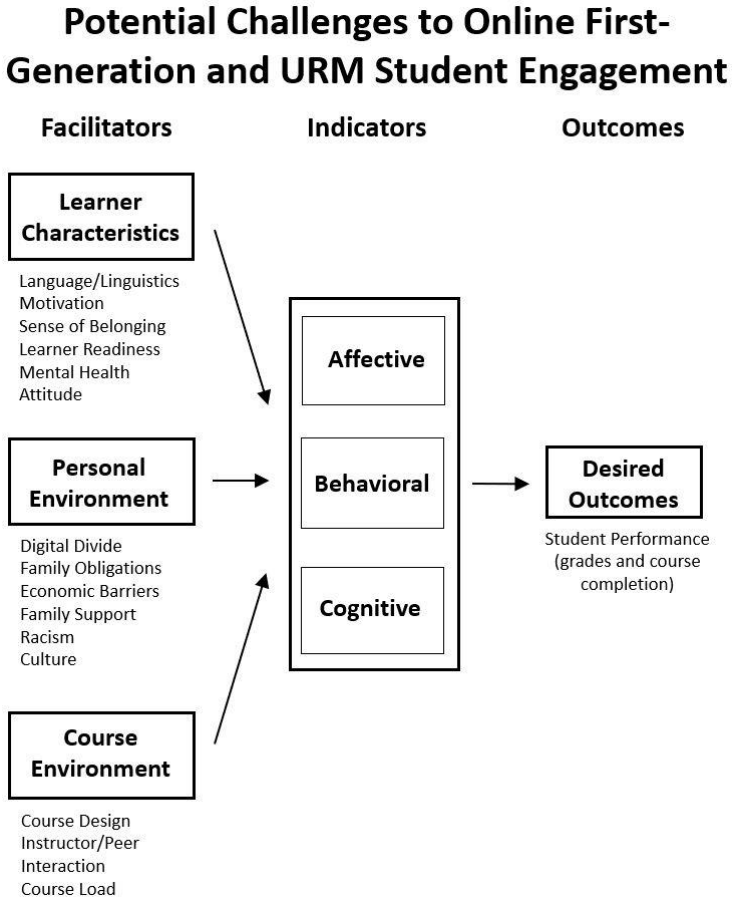
Using data of more than 45,000 students from 30 community colleges, Shea and Bidjerano (2019) conducted a research study focused on completion rates of minority students compared with nonminority students. They found that with each unit of completed online study, the likelihood of degree completion increased, 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



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 Environnent*—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