

I. Online and Blended Learning in the Age of Generative AI

The Untold Story of Training Students with Generative AI: Are We Preparing Students for True Learning or Just Personalization?

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Abstract: This special issue joins the recent but growing effort to expand understanding of integrating generative AI. While generative AI tools like ChatGPT offer great opportunities for personalized learning, it is important to think critically about what type of learning we are reinforcing through the convenience and customization offered by AI. The reliance on AI for scaffolding and personalized prompts can risk undermining students' independent thinking and problem-solving abilities. Additionally, the emphasis on personalized learning could deter the development of collaboration skills. As we continue to integrate AI into educational practices, we need to work towards balancing the benefits of personalization with the goal of fostering self-reliant, critical thinkers who can collaborate and evaluate AI generated content.

Keywords: generative AI, AI in education (AIEd), personalized learning, collaborative learning, scaffolding

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Growing up with the GenAI Baby

Generative artificial intelligence (GenAI) is actually a newborn technology that is still in its infancy. This technology will eventually start to walk, and then run, following the crawling stage (Bozkurt, 2024; Bozkurt & Bae, 2024). Unlike other technologies, it can learn, unlearn and relearn. This ability of GenAI actually points out that there are untapped areas waiting to be explored in human-machine interaction in general and human-AI interaction in particular (Akban et al., 2024; Bozkurt, 2023; Bozkurt & Sharma, 2024). One of these areas to explore is learning and teaching in the educational landscape (Tlili et al., 2023). To proactively prepare for the future, we must explore the world of GenAI and dig in deeper to use this technology responsibly, effectively, and efficiently.

Digging in Deeper: Generative AI Technology in the Educational Landscape

GenAI holds great promise for transforming how we teach and learn, praised for its ability to adapt to individual learning needs (Swindell et al., 2024). It provides an unprecedented and unique opportunity to introduce educators and learners to AI technology and its capabilities, offering personalized scaffolding and tailored teaching and learning experiences. By continuously analyzing user data, AI algorithms personalize learning paths, ensuring that each student receives content and assessments aligned with their strengths and weaknesses (Hodges & Kirschner, 2024). Another significant capability is the augmentation of feedback and assessment processes. GenAI enables automated and immediate feedback mechanisms to provide learners with quicker results related to their academic performance on assignments (Kadaruddin, 2023; Su & Yang, 2023).

These affordances collectively position GenAI as a time-saving powerful tool in shaping a more personalized, efficient, and engaging instructional experience (Bozkurt et al., 2023; Lin et al., 2024; Ruiz-Rojas et al., 2023). The goal of individualized learning is to create an environment that adapts to learners' needs through personalized feedback and contextually and competently relevant tasks. This adaptability may help to ensure that learners receive content and assessments at an appropriate difficulty level, fostering a more engaging and effective learning experience (Chan & Hu, 2023). As a result, instructional designers can leverage GenAI to build tailored learning pathways that respond to the evolving needs and progress of each learner. Moreover, GenAI can aid in assessing and refining instructional design outcomes, making the design process more iterative and responsive. This allows instructional designers to expedite decision-making and transition from design to implementation more swiftly (Salinas-Navarro et al., 2024).

However, what are we trying to achieve in student learning through the convenience and customization offered by GenAI tools? As we embrace these advancements, it is crucial to critically examine *what type of learning students are being trained with Generative AI*, considering the broader and unintended implications for their cognitive and social development.

One critical concern we argue is whether students are becoming overly reliant on these tools for deep thinking and meaningful problem-solving, which requires student-led specific and

intentional pedagogies in the classroom (Glazewski & Hmelo-Silver, 2019). It is well accepted that deep meaning-making and learner agency are crucial for effective learning and knowledge building (Hawkins, 1997). For example, problem-solving represents a student driven pedagogical approach in which students learn through solving authentic and complex problems and reflecting on their experiences (Hmelo-Silver & Barrows, 2008). It involves scaffolded inquiry where students collaboratively engage in meaningful problem-solving tasks while taking responsibility for their own learning (Bae et al., 2021). Students are expected to take an active role, engaging their agency in the pursuit of learning goals through seeking information and evaluating and negotiating decisions (Bridges et al., 2012). In this context, the personalized prompts and adaptive scaffolding provided by GenAI can potentially inhibit students' ability to think on their own and initiate and develop critical-thinking skills. When students are accustomed to AI-generated assistance at every thinking step, they might struggle to navigate problems without such support, raising the question of whether they are truly learning or merely following guided steps.

Moreover, the focus on personalized learning facilitated by GenAI tends to overshadow the importance of collaborative learning. A shift towards individual learning might hinder the development of collaborative meaning making and communication skills. During problem-solving, students often work on problems in small groups, allowing them to acquire both content knowledge and collaboration skills through joint cognitive engagement in inquiry activities, where they communicate their ideas with peers (Hmelo-Silver et al., 2007). This collaborative process is typically seen as a dialogic activity aimed at enhancing team understanding (Bereiter, 2002). Such dialogic engagement occurs when all participants are actively involved and take responsibility for their own and others' learning under the guidance of a highly skilled facilitator (Hmelo-Silver & Barrows, 2008). The facilitator guides through coaching, modeling, and offering support as needed without directly giving the correct answers (Hmelo-Silver et al., 2007). They also model the types of questions students should be asking themselves and their peers, creating a cognitive apprenticeship (Hmelo-Silver & Barrows, 2006). In this context, GenAI can be a great asset to scaffold the collaborative inquiry process if designed to support and enhance these collaborative learning experiences. By integrating GenAI tools that promote collaborative learning, critical thinking, and effective group communication, educators can ensure that students benefit from personalized learning while also acquiring essential social and cognitive skills necessary for success in both academic and professional settings. Therefore, it is critical to design GenAI tools that facilitate collaborative learning experiences and cater to individual learning progress, without isolating students or depriving them of opportunities to engage with their peers.

As a final remark, it should be noted that while GenAI can provide immediate and personalized feedback, educators and students need to critically evaluate the output of these tools, ensuring that the support provided enhances learning rather than reinforcing shallow understanding or biased perspectives that AI generated. The credibility and the quality and depth of the feedback are contingent on the data and algorithms that drive these systems. AI tools can perpetuate existing biases present in their training data and might offer superficial rather than substantive feedback (Almeida et al., 2022).

Insights and Reflections from GenAI Special Issue

The papers in this special issue offer a critical understanding of how various stakeholders (e.g., students, educators, administrators, and instructional designers) use and perceive GenAI in their own context. The issue features one systematic review, two conceptual articles, and six empirical articles. A common theme across these nine studies includes the ethical concerns and cautious approach taken by educators and instructional designers in using and introducing GenAI along with potential opportunities and challenges in teaching and learning.

In their systematic review study, Lee & Moore synthesized ten studies from 2019 to 2023 on the use of GenAI for automated feedback in higher education, highlighting how these systems reduced instructor workload, enhanced communication, provided cognitive and emotional support, and improved accessibility. Conceptual articles featured in the special issue offer both critical and crucial perspectives. For instance, Cacho proposed balanced and flexible guidelines for incorporating GenAI into university teaching and learning. The guidelines offered faculty and students a reference for integrating AI into coursework. In their article, Stefaniak & Moore proposed a conceptual framework to help instructional designers leverage GenAI tools for inclusivity, emphasizing the need to address ethical considerations and engage in iterative design practices.

In the empirical studies, Johnson et al. revealed that most participants expected AI to significantly impact their institutions within the next five years, but many felt their institutions were unprepared for this change. Their findings highlighted concerns about academic integrity, skepticism about AI being overhyped, and feelings of uncertainty. Cheng explored the potential of ChatGPT to improve university students' English writing skills, surfacing that while students found these tools convenient, teachers were concerned about the feedback AI provides. Kemal et al. also showed the benefits of ChatGPT for language learning, particularly for writing assignments. However, they also demonstrated the challenges, such as inaccuracy, lack of critical thinking, plagiarism, and technical difficulties. Li et al. revealed that language learners in the U.S. were motivated to use ChatGPT for its flexibility and personalization. The study highlighted that learners' self-monitoring skills enhanced their efficient use of AI, offering insights for designing AI-integrated learning to support diverse needs and expand opportunities. Bae et al. found that online class discussions significantly increased pre-service teachers' awareness and foundational knowledge regarding ChatGPT while reducing their anxiety about AI. However, despite this exposure, few expressed intentions to adopt AI tools in their teaching. Kumar et al. examined the roles of instructional designers in higher education regarding the integration of GenAI into their institutions and their professional practices. The study highlighted the instructional designers' cautious and ethical approach to GenAI integration.

The articles featured in this special issue call attention to the potential benefits as well as the complexities and challenges inherent in integrating AI into educational settings. These articles may provide valuable insights into the early perceptions of GenAI integration, helping us understand how educators and researchers initially approached and adapted to these emerging technologies. By facilitating dialogue on these issues, we aim to encourage a more critical and careful understanding of how AI generally and generative AI specifically can be meaningfully integrated into teaching and learning, and to stimulate discourse on future directions that foster critical and ethical use of AI with robust pedagogical principles. In other words, we must ensure that AI serves as a learning tool or

companion that enhances collaborative problem solving and knowledge building in the learning process rather than a training tool that reinforces scaffolded behavior depending on right or wrong answers.

Competing Interests

The authors have no competing interests to declare.

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The Untold Story of Training Students with Generative AI: Are We Preparing Students for True Learning or Just Personalization?

The Anticipated Impact of Artificial Intelligence on Higher Education

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Abstract

Since the rise of generative artificial intelligence (GenAI) in late 2022, many scholars and thought leaders have wondered about its impact on higher education. This study used a survey methodology (three multiple choice questions and one open-ended question) to explore the perspectives of a nationally representative sample of 1,327 U.S. administrators and faculty, asking questions to understand how much change they anticipate as a result of advancements in artificial intelligence (AI) technology, how prepared their institution is for such change, and what aspects of higher education they expect to change. The researchers used Kranzberg's Laws of Technology as a lens to interpret the findings and guide the subsequent discussion about how AI might impact higher education. The findings showed that the vast majority of participants expect that AI will change their institution over the next five years and that the majority of participants do not feel that their institution is ready for change. The comments left in response to the open-ended questions fell into one of four themes: concerns about academic integrity and rigor, issues related to AI integration (e.g., anticipated benefits, practices in teaching and learning, issues related to preparedness, and the expected scope of change), the feeling that the current AI discourse is merely hype, and feelings of uncertainty. Ultimately, AI has the potential to be both advantageous and disadvantageous to teaching and learning, with the benefits and challenges of its use varying by context.

Keywords: artificial intelligence, generative artificial intelligence, higher education, AIED, institutional change, AI integration

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“Technology is neither good nor bad; nor is it neutral.”

~Kranzberg’s First Law

Since the launch of ChatGPT in late 2022, conversations about the impact of artificial intelligence (AI) on higher education have gained prominence. Mollick (2024) recently wrote that “we are at an inflection point where AI will reshape how we teach and learn,” adding that “they [AI] will destroy the way we teach before they improve it” (p. 160). He goes on to elaborate on the tensions that exist within education surrounding AI use: namely, AI can be used by students to cheat and it offers substantial promise in providing individual-level support to students.

The role of AI in our systems of education and society, in general, is a cross-disciplinary issue encompassing many aspects (e.g., applications, benefits, drawbacks, policy, innovation, funding, adoption), more than are possible to address in detail in a single paper. In this paper, we focus on macro-level observations of the anticipated impact of AI situated within the U.S. while acknowledging that there are nuances and context-specific phenomena that may not be captured in our discussion. When presenting a high-level view of a complex and pervasive technology, one risks missing the forest for the trees. To avoid becoming overly focused on the minutiae of how AI is being implemented and the many potential applications and challenges, we used Kranzberg’s laws of technology (Kranzberg, 1986) as a theoretical framework to synthesize our findings and shape our discussion about the broader implications.

Our study builds upon previous work done by Bay View Analytics related to how higher education might change in the years to come (e.g., Johnson et al., in press; Veletsianos et al., 2021). In spring 2023, Bay View Analytics surveyed faculty about anticipated change at their institution and higher education more broadly over the next five years (Johnson et al., in press). One of the topics that emerged in the open-ended responses was AI, which led the research team to wonder about participant expectations and feelings about the future specific to AI. Our present study focuses explicitly on the adoption and impact of AI technologies on higher education in the U.S.

We also recognize that the term AI is somewhat ambiguous and includes a variety of technologies that have been used over decades, such as machine learning, intelligent tutoring, and (more recently) generative AI (GenAI). Although the questions asked of participants in our study used the term “AI” rather than asking about a specific type of AI technology, our findings show that participants tended to focus on GenAI in their responses. Thus, this paper focuses primarily on the anticipated impact of GenAI on higher education.

The purpose of this study is to investigate the anticipated impact of AI, particularly GenAI, on higher education institutions among faculty and administrators. The following research questions guided our work:

- How much change might AI bring to institutions over the next five years?

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- Are institutions prepared for such change?
- What aspects of higher education are expected to change due to AI technologies, particularly GenAI?

Review of the Relevant Literature

Scholarly reviews of literature related to AI use in education (also referred to as AIED) point out that this is not a new topic: AI has been used over time to support learning through various applications that help with assessment, provide individualized student support, and assist with administrative tasks (e.g., Chiu et al., 2023; Crompton & Burke, 2023; Zawacki-Richter et al., 2019). While past research showing how AI has been used is helpful for understanding its potential applications, the purpose of this study is to investigate the anticipated impact of AI going forward. Our review of the literature first focuses on publications that are relevant to three key elements of our study: anticipated change over the next five years, preparedness for such change, and aspects that are expected to change. We conclude the section with a description of the theoretical framework used to guide our interpretation of the findings and discussion.

Extent of Anticipated Change

Scholarly discourse and anecdotal discussions within academia indicate that AI used within higher education is growing. Within the U.S., reports from well-respected sources in the higher education sector have highlighted the increasing prominence of AIED and provided insights on the state of the landscape and recommendations for AI strategy development (e.g., Fink, 2024; Gunder, 2024; Pelletier et al., 2024; Schroeder, 2024). There is an overarching sentiment within these reports that increased AI use brings both opportunities, such as improving support for students with disabilities, and challenges like academic integrity and algorithmic biases that may disadvantage some students (Fink, 2024).

At the same time, Staudt Willet and Na (2024) cautioned against overestimating the use (and growth) of AI in higher education. Their study examining 25 education-related subreddits (on the Reddit platform) revealed that the volume of conversations related to ChatGPT was low; however, when it was discussed, the engagement was high. These subreddit conversations mostly centered on students and topics like academic integrity and the effect of ChatGPT on teaching practices. The growth of AI use in education is a generally accepted notion; how much change will result from this growth tends to be the topic of debate.

Preparedness for Change

When questioning whether institutions are prepared for change, one needs to consider faculty, students, and administration. Salhab (2024) argued that efforts to improve AI literacy among faculty and students are needed to “bridge the gap between market needs and the skills and competencies delivered by university programs” (p. 17). At the administrative level, Gunder (2024), in her framework for AI integration in higher education, recommended that decision-makers view AI as a tool that extends across multiple contexts within an institution and impacts various interest groups. The framework emphasizes the importance of garnering support and collaboration from administrators, faculty, and students to understand how AI impacts factors like strategic planning, governance, ethics, infrastructure, instruction, assessment, accessibility, and

personalized support. Despite these calls for improved AI-literacy and strategic planning for AI-related change, there is an overall lack of research that explores the prevalence of feelings of preparedness and unpreparedness at institutions and what would help address feelings of unpreparedness for AI-use in education.

Aspects of Higher Education Expected to Change

The 2024 Horizon Report (Pelletier et al., 2024), an annual report on higher education trends, dedicated a special section that discussed plausible societal impacts related to AI (e.g., AI will impact how some jobs are performed, which may impact workforce needs). They added that “AI tools have the potential to reshape pedagogy and student experiences” as “more and more uses for AI in the classroom are emerging” (p. 19). As noted by Sahab (2024), market needs may drive curriculum change as students need AI-specific skills to succeed in the workforce.

Studies using speculative methods (Ross, 2017) to forecast possible scenarios that may occur because of advancements in AIED technology also provide insight into the aspects of higher education that might change. Bozkurt et al. (2023) compiled diverse viewpoints from a global group of expert scholars into a collective reflection on GenAI. These scholars expressed concerns about academic integrity and a “fear of the unknown and concerns about its [AI’s] power” (p. 58). Another study using speculative methods by Veletsianos et al. (2024) asked respondents to imagine AI’s future role in education from a relational perspective. Some of the respondents in Veletsianos et al.’s study anticipated that AI would be used primarily as a tool that would be programmed to perform specified tasks. Others imagined AI to be more of a collaborator that would work in a relationship with humans to achieve a goal together. They argued that rethinking the epistemology of our engagement with AI is important for challenging Western biases and worldviews that might otherwise be programmed into AI as normative standards. The speculative research reiterates the key sentiments expressed in other reports: there is a tension between a desire to take advantage of potential benefits while remaining keenly aware of the potential harms of a rapidly evolving technology.

Conflicting opinions about the extent to which AI will impact education, and the aspects of teaching and learning that will be impacted are present throughout the broader AIED literature and scholarly discourse. According to UNESCO (2024), AI presents “innovative opportunities to enrich and transform educational experiences” (para. 12). Conversely, AI may also widen the digital divide, exacerbate global inequities, and perpetuate biases. One key recommendation put forth by UNESCO is that AI should be used “to complement, rather than replace, the human elements of teaching” (para. 17).

Bozkurt and Bae (2024) discussed the “dual nature of generative AI in educational contexts” (p. 1): the power it offers to humanity and the power it could potentially wield over us, if we do not learn from our past experiences with so-called disruptive technologies. For example, Popenici and Kerr’s (2017) discussion on the implications of AI use in education brings up several important points that are worth acknowledging. Written prior to the launch of GenAI, they shared the same potential uses for AI as identified in the literature reviews. In discussing the potential challenges, they use Massive Open Online Courses (MOOCs) as an example of a highly lauded

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technological solution that was believed by some to be a major disruptor through its potential to deliver free education at a mass scale. As Popenici and Kerr (2017) noted, MOOCs were much like AI in that they offered a novel solution with little empirical evidence to support decision-making (amidst pressure to make decisions fast). They stated that the takeaway lesson from MOOCs, that should be applied to any pressure to adopt AI, was “that a limited focus on one technology solution without evidence-based arguments can become a distraction for education and a perilous pathway for the financial stability of these institutions” (p. 9).

The key overarching narrative within the literature, whether from scholarly discourse, speculative perspectives, or studies on AI use in practice, is that AI use in higher education holds the potential to be beneficial. There is also an acknowledgement that critical challenges must be overcome for AI to be advantageous. At the same time, the empirical literature, especially studies focused on the perspectives of educators, is limited. One of the key aims of our study is to link theoretical and speculative discussions about AIED, especially its benefits and challenges, with empirical findings that show how AIED practices are unfolding in actuality from an educational perspective.

Theoretical Framework

Kranzberg’s Laws provide theoretical focal points for inferring what might come to pass due to technological innovation: they are not laws in the sense that they can be tested like in math or physics, but serve as maxims that can guide how we think about technology integration (Kranzberg, 1986; Pitt et al., 2023). Table 1 lists Kranzberg’s Laws and briefly explains each one (Kranzberg, 1986). Pitt et al. (2023) used Kranzberg’s Laws as a conceptual lens for understanding the implications of AI use in marketing. We follow a similar process, using Kranzberg’s Laws to explore the discourse (amongst scholars and within our findings) surrounding AI use in higher education.

Table 1

Kranzberg’s Laws

Law	Summary
<i>“Technology is neither good nor bad; nor is it neutral.” (p. 545)</i>	The impact of technology may extend far beyond its purpose into the social, environmental, and political milieu. The advantages/disadvantages of a technology may manifest differently given the context and circumstances into which it is introduced. The gravity of the consequences (intended and unintended) depend on the scale of implementation and notions about the beneficial or problematic nature of a technology must be viewed in the short term and over the long term. Hopes about the

	technology must be compared with the actuality of its use.
<i>“Invention is the mother of necessity.” (p. 548)</i>	Technological innovations demand further inventions and innovations for the full potential of the technology to be realized.
<i>“Technology comes in packages, big and small.” (p. 549)</i>	Comprehensive technologies are the sum of interacting components and systems. “And because entire systems interact with other systems, a system cannot be studied in isolation any more than its component parts; hence, one must also look at the interaction of these systems with the entire social, political, economic, and cultural environment” (p. 550).
<i>“Although technology might be a prime element in many public issues, non-technical factors take precedence in technology-policy decisions.” (p. 550)</i>	Technological innovations must overcome socio-political forces for successful adoption. Contending with differing socio-political views, including possible environmental impacts, is an important part of examining the possible positive and negative consequences of implementation.
<i>“All history is relevant, but the history of technology is most relevant.” (p. 553)</i>	Knowing how our technological age came to be and the historical patterns of use, challenges, and innovations in our disciplinary fields are critical for understanding and finding appropriate, relevant solutions.
<i>“Technology is a very human activity—and so is the history of technology.” (p. 557)</i>	Technological innovation, at present and historically, has been driven by human needs and exists for human use. Technology must be designed in such a way that humans understand its use and purpose, and even then, we must understand that a lesser- or non-technological approach may be preferred in some contexts.

Kranzberg emphasized the importance of recognizing the possible implications and impacts of technology through a historical lens. Further, his laws are underpinned by the understanding that technology adoption, use, and (dis)advantage vary by context and human needs and preferences within that context.

Methods

The study used a survey research design. Bay View Analytics conducted the survey in partnership with Cengage, the Association of Community College Trustees (ACCT), the United

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States Distance Learning Association (USDLA), and the Association of College and University Educators (ACUE).

Participants

This study targeted higher education administrators, faculty, and trustees in the U.S. There were 1,327 survey participants in total, including 451 administrators, 675 faculty, and 201 trustees. The survey did not ask trustees all of the questions, including the open-ended question, which provided context for the quantitative questions. Therefore, our analysis focuses only on the 1,126 responses from administrators and faculty. Participants were invited by announcements in newsletters and communications of the partner organizations, as well as by direct email outreach. Data collection was conducted between September and November of 2023. The faculty and administrative samples were designed to be nationally representative of all degree-granting higher education institutions in the U.S. The resulting sample was compared to the distribution of higher education institutions in the National Center for Education Statistics' (NCES) Integrated Postsecondary Education Data System (IPEDS) to ensure representativeness. Trustee survey responses were invited by direct outreach of the ACCT to their members.

Materials

The survey instrument was designed to be short in length to reduce the survey burden and maximize the number of responses. The survey consisted of three multiple-choice questions and an opportunity to leave an open-ended comment (see Table 2). Administrators and faculty were asked the full set of questions, whereas trustees were only asked to answer the questions on the anticipated impact of AI over the next five years and whether they felt their institution was prepared for AI-related changes.

Table 2

Survey Instrument

Survey Questions	Participants
How much will artificial intelligence (AI) tools change your institution over the next five years?	Administrators, faculty, and trustees
Do you think your institution is prepared for AI-related changes?	Administrators, faculty, and trustees
What areas of your institution do you expect AI to change?	Administrators and faculty

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We welcome any comments you may have on how you believe AI will impact your teaching or the future of your institution. Administrators and faculty

Procedures

The survey was open from September 22 to November 27, 2023. It was distributed through a combination of outreach from partner organizations to their members and direct email invitations using leased mailing lists representative of all degree-granting higher education institutions.

Quantitative Procedures

All data were checked for completeness and inconsistent responses and to ensure that no duplicate responses were included. There were no mandatory survey questions; respondents were free to skip any if they so decided. Very few respondents ignored the short-answer questions; incomplete rates were under 2% for all questions, typically just under 1%. The survey labeled all long-form open-ended questions as "Optional." The specific wording for the primary question used for this analysis was "[Optional] We welcome any comments you may have on how you believe AI will impact your teaching or the future of your institution."

Qualitative Procedures

The final survey question (a prompt to elicit an open-ended response) provided the qualitative data for this study. Of the total number of participants, 322 administrators and faculty provided an open-ended comment. One comment was removed from the analysis for irrelevancy, leaving 321 comments included in the qualitative analysis.

A constant comparative approach was used to analyze the data and identify prominent themes related to the anticipated impact of AI on higher education. One researcher performed an initial analysis to code the data and organize the codes into themes. The other two researchers reviewed the qualitative analysis to ensure consensus among all team members. All 321 comments are represented in the themes; however, any comments included in this report are only from participants who provided consent to be quoted.

Validity and Reliability Measures

The survey questions used for this study used a structure and question-ordering employed and tested on multiple prior studies. The specific wording for the current research used team-modified survey questions that had been validated for past studies exploring administrator and faculty feelings about the future more broadly (Johnson et al., in press). The modifications were made to elicit responses specific to feelings about AI use in higher education while retaining the same structure and question order as the previous work. The primary open-ended question used for soliciting respondents' thoughts on AI use in higher education used slightly modified wording from similar questions in past studies.

Limitations and Delimitations

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Several limitations should be noted when considering the findings of this study. As is true for all survey research studies, the results are subject to sampling errors. The 95% confidence interval for administrative and faculty responses is $\pm 4.7\%$. Given the exploratory nature of this study, the research team placed an emphasis on identifying broad trends. Our participants represent an array of diverse contexts, and our study does not capture the contextual nuances that may be drivers of differences in responses. More research is needed to examine the extent of contextual variance that occurs when administrators and faculty from varying fields and institutional types are asked to anticipate the impact of AI on higher education.

Results

In presenting the findings, we briefly discuss the quantitative results as an anchoring point for a deeper discussion of the qualitative data, which is the focal point of this report. The themes identified through the findings will then inform our discussion of the anticipated impact of AI on higher education as we consider how the themes within the data relate to Kranzberg's Laws.

Quantitative Findings

The first two quantitative survey questions asked about the extent to which participants anticipated AI tools would change their institution over the next five years and whether they felt their institution was prepared for AI-related changes. The responses from administrators and faculty were similar, with most participants from these two groups expecting a small to moderate amount of change (Figure 1) while stating that their institution was unprepared (Figure 2).

Figure 1

Administrator and Faculty: Extent of Anticipated Change

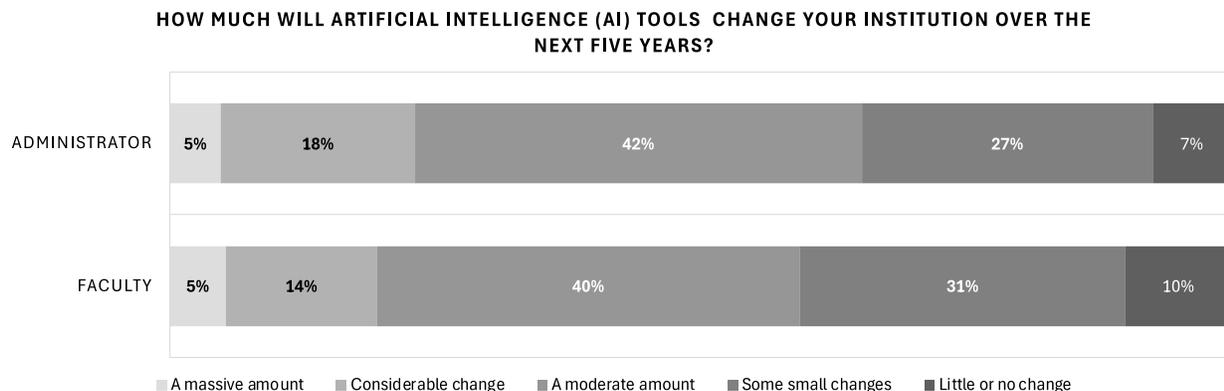


Figure 2

Administrators and Faculty: Perceptions of Institutional Preparedness

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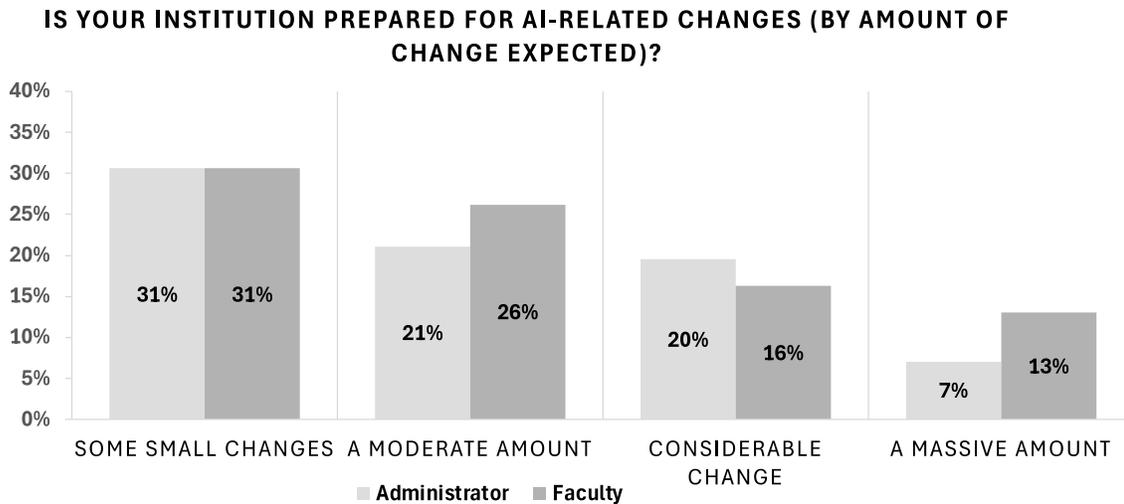
DO YOU THINK THAT YOUR INSTITUTION IS PREPARED FOR AI-RELATED CHANGES?



Over three-quarters of administrators and faculty do not feel their institution is prepared for AI-related change, which is noteworthy considering that the majority do not expect any drastic change. At the same time, the data analysis also revealed that perceptions of institutional preparedness are inversely related to the extent of anticipated change. Figure 3 shows that the administrators and faculty who expected massive change were most likely to indicate that their institution was unprepared for AI-related change.

Figure 3

Relationship Between Perceptions of Institutional Preparedness and Extent of Anticipated Change



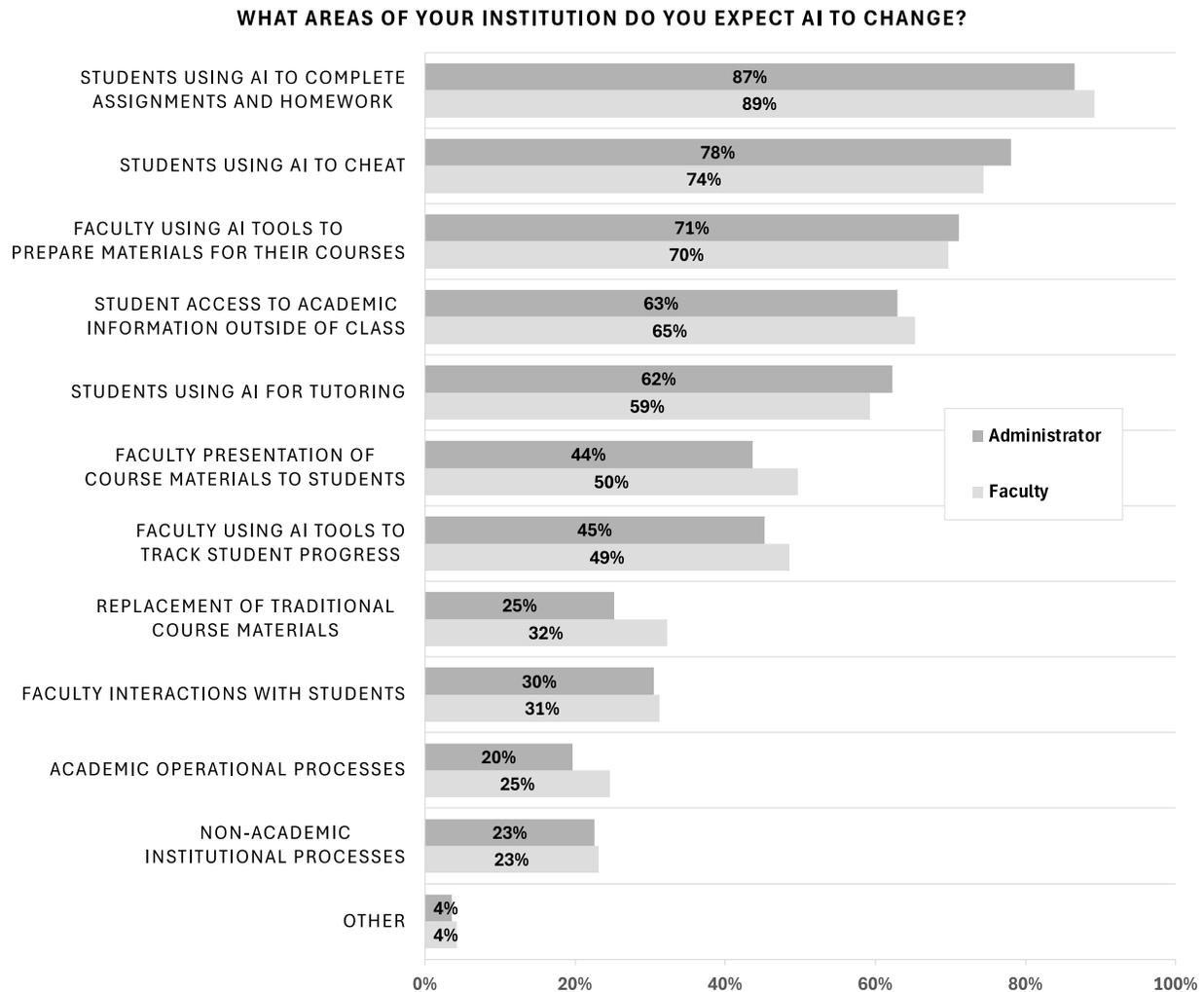
The survey also asked administrators and faculty what areas of their institution they expected AI to change. Most participants (87% of administrators and 89% of faculty) expected that students would use AI to complete homework and assignments, and roughly three-quarters of faculty and administrators expected that students would use AI to cheat. The third-most common response was that faculty would use AI tools to prepare course materials. Additionally, more than

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half of administrators and faculty expected that AI would change student access to academic information outside of class and that students would use AI for tutoring.

Figure 4

Areas of Anticipated Change



Qualitative Findings

The qualitative results are from open-ended responses to the final question posed to administrators and faculty: “We welcome any comments you may have on how you believe AI will impact your teaching or the future of your institution.” The prompt’s open nature generated many comments through which participants shared predictions, concerns, opinions, and feelings about AI.

Before performing a constant comparative analysis to identify common themes, the comments were sorted by each participant’s response to the first question about the extent of expected change. The distribution of comments by the extent of expected change is listed in Table

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3. There were 23 survey participants who did not answer the question related to the extent of anticipated change yet chose to leave a comment. The 298 participants who chose to leave a comment were slightly more likely to anticipate a greater change when compared to responses from the total group of participants (see Figure 1). In other words, those who expected small changes or little to no change were less likely to leave a comment. Despite fewer comments from the groups expecting less change, a sufficient number of responses represent these perspectives.

Table 3

Distribution of Comments by Extent of Expected Change

Extent of Expected Change	n
A massive amount of change	38
Considerable change	84
A moderate amount of change	110
Some small changes	47
Little or no change	19
Did not answer the extent question	23

Four major themes emerged from the 321 open-ended responses (117 administrators and 204 faculty): academic integrity and rigor, AI integration, hype, and uncertainty. Table 2 describes each theme and the number of comments it includes. The themes overlap, and 21 comments address more than one theme.

Table 4

Themes Related to the Perceived Impact of AI

Theme	Description	n
Academic integrity and rigor	The impact of AI on academic integrity and the quality of student work.	113

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AI integration	Observations about how AI is (or could be) integrated into higher education, implications of AI integration (benefits and concerns), barriers to integration, and preparing for AI integration.	143
Hype	The sentiment that the discourse surrounding AI is exaggerated and/or that concerns about AI are overblown.	19
Uncertainty	Expressions of uncertainty about the impact AI might have.	36

Additionally, 29 participants wrote comments that did not fit within the major themes and were coded as “vague statements” by the research team. These comments did not provide information about the participant’s opinion or expectations for the future. For example, one participant wrote, “AI will definitely have an impact on my teaching and the future of my institution and other colleges and universities all over the world.” That participant did not provide any further insights as to how they thought AI would impact their teaching or institutions worldwide. Another example of a vague statement comes from a participant who wrote, “Higher education is going to have to use AI or it will be over,” without providing any context as to “what” might “be over.”

Academic Integrity and Rigor

Many participants (n = 113) commented on the impact of AI on academic integrity and rigor. The comments within this theme were overwhelmingly negative, with participants expressing concerns that students were using (or would use) GenAI to cheat or as a crutch that would reduce students’ capabilities to “understand complex issues” and “stunt creativity.” One participant wrote, “AI is a crutch students currently rely upon and don’t learn from the use, just find a way to shortcut the learning process. The attitude of getting the grade is more important than learning.” A second participant shared a similar sense of despondency about the long-term impact of GenAI, saying, “It will be a race to the bottom where everyone gives up on real learning so we can more easily award credentials that are increasingly meaningless.”

Some participants remarked that they had become hypervigilant about implementing measures to verify that the student had completed any work submitted entirely on their own. These participants mentioned reverting to “blue book assignments” and making “students write short papers in pen or pencil” to prevent cheating. One participant who had previously redesigned their assignments to prevent cheating in response to the rise of various internet technologies added, “I suspect that soon, some idiot will create AI tools that will simply read them [course materials] for the students and answer the questions, and at that point, we have to return students to hard lockdown in the class, or else, what is the point?”

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A handful of participants also spoke of a need for a changed approach to assessment, and their comments carried a more positive tone as they suggested an improvement in the instructional design of learning experiences rather than restricting the use of technology. One person posited that “well-designed assignments won’t have to worry about AI being used to cheat,” and another wrote, “Students will cheat—but only if the assignments are poorly designed and not meaningful.” Within the conversation about academic integrity and rigor, a few comments asserted that teaching practices and assessment changes were necessary to effectively prepare students for the workforce. One participant noted, “Our course content will change as the marketplace adopts AI tools, forcing us to teach and prepare students to use AI tools in their vocations.”

Whether participants chose to permit AI use or restrict technology use, the comments suggested that the widespread availability of GenAI tools to students would impact faculty workload. Below, we contrast two participant responses related to academic integrity and workload. The first participant puts an onus on faculty to figure out how to effectively incorporate AI into coursework to create a positive benefit for students, while the second participant essentially is choosing to reject AI to reduce their workload (while noting that restricting technology also brings about extra work). Highlighting such differences in participant responses and their feelings toward AI is important for understanding the underlying tensions that may affect how AI impacts higher education over the long-term.

It’s a new technology, and as people are aware of its benefits, I hope that we can see some positives here, like using for tutoring, time management, creation of rubrics, meeting agendas, little things that take a lot of time. For students, yes, there will be cheating (there is always cheating), but I think that places the workload on faculty to create more interactive lessons, and incorporate AI in some facet.

I’ve had to switch from term papers students do at home to in-class handwritten exams. This stinks and makes things worse for both me and my students. However, I will not make any more effort to use AI tools for more creative teaching or whatever because my aim is to make things as easy as I can for myself and minimize the time and effort I devote to teaching. I’m a professor, not a teacher.

AI Integration

AI integration into higher education was the largest theme, and nearly half of the participants who left an open-ended comment (45%) made remarks that fit within the theme. Comments related to AI integration focused on whether or how AI could be integrated into higher education. Within the overarching theme of AI integration, four overlapping sub-themes emerged: benefits, practices, preparedness, and scope of change. Table 5 provides a description for each subtheme along with the associated number of comments.

Table 5

Sub-themes Related to AI Integration

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Theme	Description	n
Benefits	The perceived benefits of AI adoption.	20
Practices	How are participants using AI, planning to use AI, hoping to see AI used, and/or observing others using AI?	51
Preparedness	Comments relating to experiences with professional development with AI, a desire for training to understand better how to use AI, and/or observations about their institution's preparedness for managing AI use.	39
Scope of change	How change (or lack of change) resulting from AI use may manifest itself and/or opinions and expectations about the extent of change that may come to pass.	43

Benefits. Comments related to AI integration within the sub-theme of benefits centered upon the positives that could result from implementing AI applications in teaching and learning. A primary benefit mentioned was the potential for AI to make teaching “more efficient,” with participants stating that AI would “make my workflow easier” and “save time for me by taking over rote administrative tasks.” One participant commented, “I do not intend to use AI very often, but I am continually more and more aware that the option can save time and energy when I feel under-resourced in these areas.”

Other participants anticipated that AI should be viewed as a gift that offers “an opportunity to engage students.” “We've focused almost entirely on the threat of AI and only to a very small degree on opportunities,” remarked one participant. In contrast to the concerns expressed by the comments on academic integrity, participants who mentioned the benefits of AI integration tended to view AI positively as a “tool to help us improve the quality of our programs.” Several participants expressed hope that AI would “change the focus of education,” shifting the emphasis to creativity and deeper, more critical thinking about concepts. One participant wrote, “I just think that AI will force changes in how assignments are put together. Hopefully, it will lead to more thoughtful learning outcomes and assignments.”

Practices. Comments that focused on the practical ways that AI was being, or could be, integrated into higher education were grouped into the sub-theme relating to practices. Some participants described how they had begun or intended to use AI going forward. These participants made remarks indicating that they were learning how to “use it [GenAI] effectively, efficiently, and ethically” alongside students so they could help students leverage AI as a learning tool and set

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them up for success in the workforce. One participant acknowledged the role that AI could play when students graduate and begin their careers, saying, “I realize that AI tools will be used in the workplace, and I embrace students' use of AI tools to jump-start project plans and generate ideas. I am working at modeling the instructional flow to how one would approach problems in the workplace.”

Some comments relating to practices mentioned simple ways that AI could help their institution, suggesting AI could perhaps write a user manual for the LMS, enrich or create course materials, and help students become better writers (e.g., “students use AI to create an essay or policy or homework and then critique AI's skill or lack of skill”). Participants also noted that AI could provide individualized student support, assist in research, and help with enrollment processes. It could also be used by students and faculty alike to generate new ideas. One participant noted that they had “started to explore its use to refine assignments or come up with new class examples where I already know what I want them to learn, but need slightly new or updated material.”

Similar to the discussion about academic integrity, some participants noted that they had changed their teaching practices to reduce the likelihood of cheating while permitting students to use GenAI. “AI has forced me to move away from answer-based teaching to experiential learning because I allow students to use AI,” said a participant. Another said, “I have already completely redesigned my courses with AI in mind. As AI constantly changes, I will follow those changes with reorganized courses. I'm concerned that my fellow [faculty] members have not put in the time and effort to completely re-organize their courses.”

Lastly, a small group of participants noted that their intended practice with AI technology would be to opt out of using it. For instance, one person said, “I, for one, plan to opt out. I don't have any desire to talk to robots nor let them speak for me.” Two other participants similarly commented that they would be retiring soon and had no interest in changing their approach or “learning how to deal with AI.”

Ultimately, participants whose comments focused on practices for AI integration appeared to hold the underlying belief that AI technologies would persist over time and that the onus was on institutions to adapt. As one participant aptly stated:

AI is here to stay, so our institution is already exploring how best to incorporate it sensibly into coursework. It can be a useful tool for both students and faculty (and, I assume, administrators). Like all tools, it can be misused, and that will have to be guarded against, but AI will not be the end of the world as we know it. (🎶 And I feel fine. 🎶)

Preparedness. The participants who commented on preparedness concerning AI integration focused mainly on sharing that they felt ill-prepared for AI or that their institution was not ready. Several participants used the term “behind the curve” to describe how their institution addressed AI. Despite an overwhelming feeling of not being ready, the comments within this subtheme carried the sense that AI technologies would continue to be a persistent force and that action was needed to overcome a perceived lack of preparedness. Multiple participants within this group mentioned a need for training or professional development, either for themselves or for faculty, in

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general, at their institution. One participant wrote, “I’m nervous and excited to learn about AI and know that I will need extensive training to keep up with the technology.” Another echoed that statement: “My perception is that most of the faculty at my institution, including myself, feel unprepared to use AI tools effectively.”

Others described actions such as a “cross-institutional task force studying the issues” and called for more “policies and procedures on how to correctly guide students on how they might use these tools to enhance their educational experience.” The notion of preparedness included ensuring that faculty and students were equipped and institutional policies were put in place to “use the changes that occur in technology for the good they can do, and educate (our actual calling) our students in understanding the ethics and morality of that technology.” Several participants noted frustration with their institution (or higher education more generally) for showing “zero interest in learning about AI or in even creating policies for best practices when using AI.” In the words of one participant:

My institution has no comprehensive plans to address AI to benefit student learning or the operations of the college. The posting of a draft statement on a library website does not constitute preparation for incorporation of AI in the academic enterprise.

Ultimately, there was an overarching sentiment that it is incumbent upon institutions to ready themselves to integrate AI technologies and undertake the “responsibility to prepare students for an AI future.” Rather than discussing concerns about cheating, participants who spoke about preparedness tended to emphasize a need to “guide students on how they might use these tools to enhance their educational experience,” and “think ahead and incorporate AI into class, homework, and assignments.”

Scope of Change. Within the scope of change subtheme, the comments (n = 43) focused on the extent to which participants anticipated AI would be integrated into higher education. Similar to the subtheme of preparedness, participants held an underlying expectation that AI use will persist into the future. Some of the participants who mentioned the scope of change positioned AI as an initial disruptor that will eventually become a useful and inevitable part of our daily lives. They compared the widespread use to other technologies that have emerged over time, such as books, the calculator, the internet, spellchecking and grammar-checking software, and laptop computers. Within these comparisons to other technologies was the sense that AI is, at its essence, a tool and “over time, we will get a grip on it, but it will be very disruptive in the next few years.”

Other participants linked the scope of change to the workforce. They discussed how AI use in certain professions would impact academic disciplines, with some fields of study being impacted more than others. Comments like, “our course content will change as the marketplace adopts AI tools,” and “AI will change medical care, engineering, computer science, research . . .” suggest that the scope of change within higher education may be driven in part by the extent to which AI impacts the workforce. It is important to note that these comments appear to refer to AI more generally, rather than GenAI.

The notion that AI “will become deeply embedded in our work lives” extended beyond speculation about the impact on student career paths into academia. “AI will take over most jobs,

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including mine as a lecturer, and result in a degraded educational experience,” one participant lamented. Several others also brought up concerns, saying, “only the best in-person teachers will be retained,” “they could replace me with a bot,” and “the need for me as a teacher, and the desire I’ll have for a teacher, will both decrease.” Another participant added, “each of us will be required to consistently demonstrate the intrinsic and explicit value we provide to the community.” In other words, these participants anticipated that AI would reduce the need for their personal role in higher education and that it could potentially replace them.

Hype. The smallest theme that emerged in the comments was hype (n = 19); however, it was notable that it mostly presented amongst the participants who expected minimal change. The participants who mentioned hype described the narrative that AI would largely impact higher education as being “overblown.” These participants argued that AI was “not a major problem” and that “we are all freaking out too early.” One participant likened AI to “the “crisis” of calculators in the early 1980s,” and another said, “AI is just Wikipedia on steroids.”

Uncertainty. Participants whose comments fell under the theme of uncertainty (n = 36) mainly expressed that they did not know what would happen. They used phrases like “I don’t know,” “no idea,” and “not sure” in their responses. Several illustrative comments related to feelings of uncertainty are listed below:

AI is changing so fast it is hard to even imagine the impact on our institution.

I think that AI has already had a huge impact, and we really don't know how big the change will be—but it is major.

It is too soon to know the real impact of these technologies.

Honestly, I think the impact of AI is very hard to predict. The selections I made above are nothing more than "gut feelings".

Anyone who says they know how AI will impact academia is delusional.

We don't know what we don't know.

Summary

Overall, the findings show a range of perspectives, including some competing perspectives, about what the future may hold. The thematic analysis showed the prevalence of different narratives about the potential impact of AI and provided some explanatory insights as to why people may have widely differing views. Together, the quantitative and qualitative analyses demonstrate that while there are different opinions about how AI use will manifest itself and impact higher education, there is a general consensus about two things: (1) AI is here to stay, and (2) higher education is not ready for the changes it will bring.

Discussion and Implications

To achieve our objective of connecting theory to day-to-day manifestations of AIED, this section will focus on revisiting our research questions, discussing the themes that emerged in the qualitative findings (academic integrity and rigor, issues related to AI integration, hype, and

uncertainty) in relation to Kranzberg's Laws, and presenting recommendations for research and practice going forward.

Extent of Anticipated Change and Preparedness

Our study answered our first research question, asking about the perceived extent of change to institutions over the next five years in a relatively straightforward way. Nearly all administrators and faculty surveyed expected that AI would impact higher education to some extent over the next five years; however, most anticipated moderate to small amounts of change. This finding aligns with research done by Staudt Willet and Na (2024) investigating reactions to ChatGPT by analyzing conversations within education subreddits. They found that conversations about ChatGPT on these subreddits were relatively minimal and did not show indication that mass disruption was expected amongst most posters.

The answer to our second research question was also clear: most administrators and faculty do not believe that their institution is prepared for AI-related change. Within the open-ended comments, the overall sense that AI is here to stay appeared to drive a desire for professional development and guidance from institutional leaders on how to effectively manage and integrate AI at the course level. Both Salhab (2024) and Bozkurt and Bae (2024) reiterate the importance of developing AI literacy as a critical skill.

What Aspects of Higher Education Are Expected to Change?

Our third research question was more complex: we asked what aspects of higher education are expected to change due to AI technologies, particularly GenAI. Overall, participant comments are well-aligned with the various sentiments observed in the literature, especially concerning the tensions surrounding AI use in teaching and learning. Although it is true (both in our findings and the literature) that some people think AI will be beneficial and others believe it will be detrimental, acknowledging this fact does not help us draw conclusions about the anticipated impact of AI on higher education. In reality, there are multiple potential futures that scholars and participants envision for higher education, as suggested by the literature related to speculative futures (Bozkurt et al., 2023; Veletsianos et al., 2024). In the following section, we apply Kranzberg's Laws to add shape and structure to these varying perspectives that exist in the literature and are echoed in our findings, about what might come to pass.

Interpreting the Findings and Their Implications Using Kranzberg's Laws

Will Change be Good or Bad?

Before addressing what might change, it is important to acknowledge such conversations tend to quickly bypass the "what" and jump into determining whether anticipated changes will be good or bad. There are overarching expressions of concern by some that AI will have a negative influence on teaching and learning (e.g., students cheating, reduction of critical thinking, increased faculty workload). At the same time, some academics (e.g., Mollick, 2024) and participants in our study have expressed hope that AI will improve the higher education system by creating opportunities to better support and engage students. According to Kranzberg's first law, "Technology is neither good nor bad; nor is it neutral" (p. 545). Elaborating on this statement,

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Kranzberg (1986) argued that technology may be used differently in different contexts. Depending on how a technology is used in relation to other contextual factors, it may be either beneficial or harmful (or neither or both) in the short or long term (or both). In other words, it is entirely feasible for technological innovation, such as AI, to hold the potential for both positive and negative impacts (e.g., Bozkurt et al., 2023; Popenici et al., 2017; Zawacki-Richter et al., 2019).

When applying Kranzberg's first law as a lens to examine participants' tendency toward a binary way of thinking (e.g., AI will be either good or bad for higher education), it becomes clear that attempting to judge the impact of AI as good or bad is an unproductive exercise. Rather, Kranzberg urges us to examine how AI will impact different academic contexts differently. Both the participant who said AI would "stunt creativity" and the participant who said AI would "improve the quality of our programs" make points that may be fully valid and true (even though they are in opposition) because it is the context that affects whether technological innovation will have a positive or negative impact more than the technology itself. Similarly, participants who remarked that AI would increase workload and participants who said it could reduce their workload may both be correct depending on context.

Non-Technological Factors May Influence What Aspects Will Change

The importance of context in understanding the impact of AI also ties into Kranzberg's fourth law, which highlights the importance of non-technical factors, such as sociopolitical factors, on technological decision-making. Or, as restated by Pitt et al. (2023), "the evaluation of any technology, according to Kranzberg, is largely influenced by the public's perception of risk, rather than risk itself" (p. 85). The key implication is that different institutional contexts may be impacted differently by AI, depending on institutional culture, values and leadership. For example, the findings within the subtheme of preparedness showed that the actions of institutional leaders in appointing task forces, developing policies, and supporting faculty and students in ethical AI use (or choosing not to do these things) affect whether or how AI will be implemented at an institution. Over time, there is likely to be an ever-widening rift between institutions that prepared themselves for AI use and those that did not. It is reasonable to infer that the action or inaction taken by institutions based on sociopolitical factors alone could feasibly lead to very different contextual outcomes in the future.

History Provides Insight into the Future

According to Kranzberg, understanding technological innovation in relation to history is critical. Kranzberg's fifth law, "all history is relevant, but the history of technology is most relevant" (p. 553) and sixth law, "technology is a very human activity—and so is the history of technology" (p. 557), underscore the importance of reviewing the impact of other types of disruptive technologies. Popenici and Kerr's (2017) discussion on the rise and fall of MOOCs serves as a reminder that decision-making, when based upon limited empirical research, holds considerable risk. As one participant said, "We don't know what we don't know." Educational research in an array of contexts is critical for guiding implementation choices and policy in our early stages of widespread AI use.

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Bozkurt and Bae (2024) cautioned that “the educational technology community often fails to learn from history” (p. 4) and is often swept up in the excitement of the transformative potential of technologies without taking pause to pragmatically reflect upon past innovations deemed “the next best thing that will save educators” (p. 4). Several participant comments within the theme of hype also serve as reminders that the advent of the internet and the use of calculators in mathematics were also once considered massive disruptors that have now become status quo. In a decade or two, we may come to realize that AI was, indeed, a massive disruptor or we might find that it was not (or we may see that it massively disrupted some educational contexts and left others relatively untouched).

But What Exactly Might Change?

Kranzberg’s second law, “invention is the mother of necessity,” tells us that, as AI permeates higher education, we must address the needs that will arise as a result. When identifying these needs, we gain insight as to the specific aspects of education that might change. Essentially, “every technical invention seems to require additional technical advances in order to make it fully effective” (p. 548). Kranzberg’s third law, “technology comes in packages, big and small,” adds further insight to the notion that AI integration will create new needs, reminding us that these needs will be an interconnected mix of large and small needs. As an example, concerns about students using AI to cheat have resulted in participants employing new strategies, whether that be a move away from technology use during testing altogether (e.g., reverting to the use of blue book tests), plagiarism detectors (Fink, 2024), or changing the nature of their assignments and assessments so that AI can be used in a complimentary way. Policy frameworks, like the one developed by Gunder (2024), are being used to help institutions recognize an array of needs and come up with solutions.

Finally, Kranzberg’s sixth law states that “technology is a very human activity—and so is the history of technology.” The potential benefits and challenges of AIED are reflections of our human needs. When we use AI as an efficiency tool, it reflects a human need for greater efficiency in higher education. When we use AI relationally, as a co-collaborator in our work (e.g., Veletsianos et al., 2024), it reflects our human need for technology to take on a role for us that includes a human-like way of interacting. When students use AI to cheat, it reflects our human need to avoid negative societal outcomes that may result from failure. The history of educational technology, including the integration of AI into teaching and learning in recent years (Chiu et al., 2023; Crompton & Burke, 2023; Zawacki-Richter et al., 2019), is ultimately a narrative of our desire to make our systems of education accessible, high quality, and beneficial to the lives of learners. That was the unrealized goal of MOOCs (Popenici & Kerr, 2017) and these same values are repeated in the responses of participants and scholars advocating for AI use in education (e.g., Mollick, 2023). The hoped-for impact of AI, and the reason for trialing its use, is an education system that is objectively better than the system currently in place.

Recommendations

With the understanding that AI use is likely to become a permanent fixture in education and the knowledge that it is only in its infancy (Bozkurt and Bae, 2024), how should we react? Given

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the importance of context in relation to impact, we recommend moving away from broader debates about whether AI will be good or bad and toward questions that spark context-specific discussions: How might AI integration benefit a certain subset of learners? What might be the unintended consequences of banning AI use for assignments for a specific course? How will future workers in a certain field of study be expected to use AI in the workforce?

Conclusion

To conclude, we revisit our final research question: what aspects of higher education are expected to change due to AI technologies, particularly GenAI? After conducting this investigation and examining the findings in relation to the literature, we are hesitant to make claims about the future with a bold sense of certainty. Perhaps, after reading the many differing perspectives and ascertaining through Kranzberg's Laws that different contexts may make opposing viewpoints equally valid, we find our perspectives mirroring some of the participants who expressed uncertainty. The impact of AI will likely be varied, with a yet-to-be-determined combination of context-dependent positive and negative outcomes. In the meantime, we can make the strong assertion that more research that explores the impact of AI use in practice (in multiple different contexts) is needed.

Ethics and Consent

As an independent research organization, Bay View Analytics follows strict internal ethics and privacy protocols and is not required to gain approval from an institution's ethics review board. The invitation message to all survey participants noted, "Privacy is of the utmost concern, and all respondents' data will be de-identified as the first step in the analysis. Only researchers holding current certification in human subjects research will have access to individual-level survey responses. Individual responses are not shared with the survey partners." The invitation listed the identities of the organizations conducting the research, the identity of all sponsoring organizations, who would have access to the data, and the intended research deliverables. Open-ended comments were reviewed to remove personally identifying information and only quoted if the respondent provided specific approval.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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Using AI-Generative Tools in Tertiary Education: Reflections on Their Effectiveness in Improving Tertiary Students' English Writing Abilities

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Abstract

Artificial intelligence (AI) tools have become a popular topic in the education field. Most of the schools in Hong Kong focus on how to properly use AI software to help students' learning experience. As this is still a relatively new technology, the stance for most of the schools in Hong Kong is skeptical. This study aims to find out whether AI-generative tools, such as ChatGPT, can help to improve students' English writing skills in university. Interviews were used to find out students and teachers' opinions towards using AI in writing. The results indicate that students find AI tools convenient for learning writing skills, but teachers are concerned that the feedback and examples provided by AI are too general and ambiguous. This study provides some interesting opinions from students and teachers about their experience using AI in learning and writing and helps us to understand more about how to use AI effectively in the education sector.

Keywords: artificial intelligence, shadow education, English writing, university education, computer-human interaction

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Technology has become important in the education sector as it can help to improve learning and teaching quality (Al Ghamdi et al., 2016; Kaufmann et al., 2016). In the current stage, some scholars believe that education has moved towards a new method of teaching and learning. Artificial intelligence (AI) has become something teachers and students are aware of in teaching and learning. AI can be defined as software that can communicate, reason, and function independently like humans (Du-Harpur et al., 2020). It has been developed by humans and produced products according to our needs. For example, in Kim et al. (2022), AI became a teaching assistant in the classroom to support mainstream school teaching. However, before Kim's research, Watson introduced the world's first AI teaching assistant to help students in learning in 2015 (GTPE Communications, 2016). The teaching assistant helps to answer questions from students and provides feedback on their work. From the above examples, technology has become an "agent" in the classroom (Kim et al., 2022). As a result, the effectiveness and opinions of users and educators are lacking. This has opened a space for more discussion and investigation, as it may help us to use AI more effectively.

In Hong Kong, most universities are open to using AI in their courses with some restrictions. For example, according to the Chinese University of Hong Kong (CUHK, 2023), as a general principle, tertiary students are prohibited from using any AI tools to complete their assignments, assessments, and any other works that count towards their final grade of the course or attainment of the desired learning outcomes, unless explicitly permitted. However, the university also highlights that it is important for teachers and students to learn and "become acquainted" with AI to maximize the return on education (CUHK, 2023). Other universities, such as the University of Hong Kong and Education University of Hong Kong, have similar guidelines for students and faculty members to follow. As mentioned by Kim et al. (2022), it is possible to implement AI into university curricula and help students in learning. However, the question is whether humans can trust AI. The effectiveness of using AI in the classroom and as a teacher still needs more research support. One of the things that universities and educators are worried about AI is that their information sources may not be reliable, as some of the AI tools (such as Poe) will generate nonexistent journal article citations for students. Therefore, there is a necessity to assess and find out whether AI can work as a supplement teacher for students. In the long run, they can benefit from it and improve their academic results.

This study focuses on whether AI can help to improve students' Englishwriting abilities. As mentioned, AI teaching assistants have been assigned in class to help students, but there was no specific example to show educators that AI can help to improve students' academic performance. This research reveals students' opinions after using AI as a tutor role in their writing course, and they expressed their thoughts towards AI. As for teachers, they expressed their concerns about the "AI tutor" that they assigned to their students. The following section is the literature on this topic, followed by a method, results, and a discussion of the findings, implications, and contributions of the study.

The Dilemma of Using AI in the Education Sector

The advancement of technology has made teaching and learning easy and convenient (Raja & Nagasubramani, 2018), and because of the COVID situation around the world, schools have emphasized the use of electronic technology for teaching and learning (Ou et al., 2021). The sudden change has shocked the academic world, and researchers and educators are trying to find some ways to prepare for the upcoming challenges (Alawamleh, Al-Twait, & Al-Saht, 2020; Crawford et al., 2020). The development of online teaching materials or platforms has flourished because of COVID-19. Recently, there has been a trend in using AI in writing essays at schools. Those new AI language generators can generate different genres of essays with very good accuracy in language usage (Lee et al., 2022). Some scholars even proposed using the technology to help EFL writers in their writing, since it can help them to learn complex sentence structures and words (Gayed et al., 2022). However, this raises another question related to academic honesty. Using AI to help students write may be considered “cheating” (Hart-Davidson, 2018) and would be unfair to other students. In Hong Kong, several universities have already suspended the use of AI in students' assignments. According to the Student Plagiarism Policy at the University of Hong Kong (2023), the university banned the use of ChatGPT or any other AI-based software for all assignments. For any suspected case, “plagiarism” would be used to define such an act for students, since it is related to directly copying or borrowing materials without giving any credit to the source (University of Hong Kong, 2023).

AI-writing Assistant in Schools

In other parts of the world, “technology” plays a vital role in education. Some educators introduced AI writing assistants in class, such as Grammarly. Fitria (2021) claims that students feel Grammarly is useful since it can provide instant feedback for them to improve their assignments. Dizon and Gayed (2021) also use Grammarly as a supporting tool for university students. Their results showed that Grammarly is a way to help EFL writing since it can help students reduce grammatical mistakes (Dizon and Gayed, 2021). As in Kim et al.'s research (2020), they explored whether AI teaching assistants in online education can help undergraduate students in their learning. They found that students reacted positively to AI teaching assistants in the classroom (Kim et al., 2020). As this indicated, AI may be useful in helping students in learning. Chui et al. (2022) show that students were motivated in AI-supported classes as they had the autonomy to choose what information they could learn and how AI could support them. They further conclude that this method of learning can help students feel in control and flexible; this helps enhance their performance in class (Chui et al., 2022).

Chatbots are another way that educators implement AI in class. Chatbots are common in AI-setting classrooms since they can provide immediate responses to students (Chui et al., 2023). Because chatbots can answer students' questions accurately and sound like a conversation, students

feel more comfortable and supportive in their answers (Yin et al., 2021). Students found it interesting to play with Chatbots and were willing to ask questions through this media (Fryer et al., 2019; Hill et al., 2015; Yin et al., 2021). Hamouma and Menezla (2019) indicate that there is a positive relationship between having good digital literacy and students' English writing abilities. This shows that AI-writing assistants can help students improve their writing skills.

However, there were still improvements that needed to be made, such as language errors and vague responses difficult for students to understand (Smutny & Schreiberova, 2020). Gayed et al. (2021) further elaborate it is important for educators to teach their students to correctly use AI first. This can help students to minimize the risk of plagiarism and be able to receive accurate and useful feedback from the system (Moore et al., 2016; Gayed et al., 2021). Other researchers also mentioned that further research is needed for implementing AI tools in real classroom settings.

Furthermore, AI's lack of creativity has also been raised by researchers. Salhab (2024) mentioned AI is programmed by humans; its weaknesses are creativity and critical thinking, as it cannot develop ideas yet. Therefore, humans still play an important role in guiding students, especially in solving problems and creative thinking. Muslimin et al. (2024) further explain AI is still developing and it has very obvious weaknesses for students. It is important for educators to teach students the way to use AI correctly in assignments. This has opened a gap for this research.

AI in a Hong Kong Tertiary Classroom

As academic results are very important in Hong Kong, parents and students care about public exam results. Bray (2013) indicated a "no loser" principle is hidden among parents and students in Hong Kong. They categorize people who fail the public exam as "losers" and may need to work harder than others who get good grades in public exams (Bray, 2013; Yung, 2019; Cheng, 2021). Most of the students and parents in Hong Kong are aware of the importance of the public exam since it can make their lives easier. As a result, most of the students care about their academic performance in Hong Kong (Cheng, 2021). Traditional methods, such as drilling and one-way lecturing, are deemed to be a safe choice for most of the teachers in Hong Kong (Cheng, 2024). However, the Hong Kong government encourages schools to provide a balanced and diverse environment for students to learn (Education Bureau, 2023). This applies to universities as well. As the Hong Kong government would like to promote the idea of "internationalization" and "diversification" (Education Bureau, 2020), tertiary education needs to implement new learning and teaching methods to achieve these objectives.

An AI education method has been proposed and implemented in secondary education. As Chiu et al. (2022) mentioned, an AI for the future (AI4future) is used to create teaching and learning resources for secondary 1 to secondary 3 students in Hong Kong. There are three goals for secondary students to use AI: "preparing young students for life with AI," "cultivating AI talents by fostering a deeper understanding of AI," and "training future professionals across different fields to integrate AI in their jobs ethically and safely" (Chiu et al., 2022). This can help to enhance students' competitiveness in society as well as achieve the government's goals for education in Hong Kong. However, there is not enough data in AI research about the impact it has on education. This paper investigates whether the use of AI tools can help improve students' writing abilities.

Using technology in the classroom needs to combine both teacher-centered and student-centered models. As mentioned by different scholars, using technological assistance in the classroom would require teachers to teach the basic concepts of the technology, whereas students would use their creativity and critical thinking to complete the tasks (Chen et al., 2021; Hsieh & Tsai, 2017). Chen et al. (2021) found that AI can help students write effectively and raise their examination performance. Yau et al. (2023) further concluded that AI can help to contribute to the education field as well as assist the teacher in the classroom. Therefore, scholars and educators need to understand how to use AI properly in real classroom settings.

This article aims to help the public understand whether AI can help students in tertiary classrooms. As other research has indicated, studies related to AI in the classroom are not enough. The paper hopes to fill the gap between AI and tertiary education and provide some insight into using AI in tertiary education. The research questions to be answered in this study are:

- (1) What impression do students have on the concept of AI teaching assistants?
- (2) What impact does using AI in class have on students?

Method

A qualitative approach was used in this study, as it aims to understand students' and teachers' opinions towards using AI in the classroom. This research hopes to evaluate whether AI can assist students in writing, so it aims at an evaluative approach to investigate this learning model. Creswell (2004) mentioned that this kind of research is useful for practitioners to understand the impact of the education model. As a result, this is an experimental study. It is also suitable for this topic since it allows researchers to gather in-depth data from subjects (Punch & Oancea, 2014), and it can help to reveal how social actors make sense of the world around them and make participants' opinions visible to the audience (Denzin & Lincoln, 2000). Furthermore, the flexibility of qualitative studies can highlight how the world is changing and how people are responding to social change (Bryman & Bell, 2011). It can lead the public to understand how a particular process, such as social change or cultural change, happens in a specific setting (Onwuegbuzie & Leech, 2004). Ten students were studying in a university writing course for first-year students, compulsory for all students in this university. The course has implemented the use of generative AI software in the program to provide feedback on students' written tasks. The software is Poe Feedback. Students were advised to consult with AI during the lesson and while they were doing their assignments at home. After three months, they were invited to attend an individual interview to express their thoughts about using AI in their study.

As for teachers, four teachers were invited to provide their thoughts about using AI as a teaching assistant in their classroom. All of them are teaching the same writing course at that university and they have more than five years of English teaching experience at the tertiary level. The reason for asking for teachers' opinions is to complete the picture of AI teaching in real classrooms, as their opinions can show whether this is an effective tool. Table 1 is a summary of the participants' background.

Table 1

Teachers' Backgrounds

Name (Pseudonym)	Gender	Years of teaching
Simon	Male	6
Kevin	Male	6
Mary	Male	10
Susan	Female	7

Student Participants

Name (Pseudonym)	Gender
Peter	Male
Mary	Female
Sally	Female
Paul	Male
John	Male
Apple	Female
Kelly	Female
Isaac	Male
Lester	Male
Kate	Female

Research Procedure

The students and teachers who participated in this study had finished their course with the use of AI in the classroom. Poe Feedback was introduced during the 2023–24 academic year and only some of the courses used AI inside their lessons. The school's stance on using AI depends on the tutor's decision since there are four different approaches to using AI in the classroom (HKAC, 2024). Students were asked to consult with AI during the course for feedback and to improve their writing in the course. Their essays were uploaded to Poe Feedback and the software generated comments. There were four essays in total for students to submit within 15 weeks (i.e., three months), and teachers asked students to submit the comments from AI as a separate document for teachers to keep as a reference.

Snowball sampling was used in this research, as this has been applied in many education research studies for in-depth data (Bray, 2013; Yung, 2019). The first participant was a student in the author's class. Since he is a member of the student union, he can introduce many participants to this study. As a result, he was the first person approached. He agreed to help the research, and therefore, the sampling chain was able to form (Parker et al., 2019).

The interview procedures were conducted after the semester. Semi-structured interviews were used, and students and teachers were invited to share their opinions about having AI in a real classroom. As the ethics procedures have been approved by the institution review committee, participants were aware of their rights and risks in this research. Consent forms were signed and collected before the interview, and audio recording was used with prior notification. Using interviews allows researchers to collect in-depth data and be able to investigate the impression of AI in real classrooms (Savin-Baden et al., 2010).

The language used in the interviews was mainly Cantonese. According to Andreenkova (2018), mistakes in choosing the wrong language may affect the quality of the interview data. This may cause measurement bias, respondents refusing to cooperate, and an increase in data errors (Andreenkova, 2018). In some research, participants expressed their concern about using an unfamiliar language, since they may not be able to express themselves freely (Marcos et al., 2006). In this study, as all of the participants are native Cantonese speakers, Cantonese became the main medium during the interview; there was no language barrier problem.

The interview data was analyzed according to Braun and Clarke's thematic analysis framework. It allows researchers to review the data and maintain the quality and accuracy of the themes and codes in the dataset (Clarke and Braun, 2017). The following chart is a summary of the model used in analyzing the data for this study.

Table 2

Thematic Analysis Model (Braun and Clarke, 2006)

Thematic stage	What themes emerged
Step 1: Familiarizing Yourself with the Data	Data was transcribed and read through to identify themes inside the data
Step 2: Generating Initial	Codified the data and organized them for analysis

Codes	
Step 3: Searching for Themes	Look for potential themes inside the coded and collected data
Step 4: Reviewing Themes	Review the themes whether it is appropriate and whether the coded data is in the correct theme
Step 5: Defining and Naming Themes	Check whether there are overlapping themes
Step 6: Producing the Report/Manuscript	Write out the final analysis and description of the findings

Thematic analysis allows more flexibility in analyzing data, as it can provide more opportunities for researchers to revisit the themes and codes. In steps 3 and 4, the codes and themes were reviewed and adjusted again (see Table 2). This allows new themes and ideas to be generated and maintains the accuracy of the dataset.

Findings and Discussion

In this section, participants' responses were presented and analyzed. By using thematic analysis, themes, and codes were able to be compared and contrasted. Opinions about using AI as a teaching assistant in the classroom were more comprehensive through this analysis.

For students, the use of AI as a teaching assistant was largely viewed in a positive light. Students appreciated the immediate feedback and second opinion that the AI system provided, especially during English writing assignments. Many students reported that the AI-generated comments helped them improve the quality of their work, by suggesting edits to vocabulary, sentence structure, and overall organization. This real-time feedback allowed them to make revisions and polish their writing more efficiently than they could have on their own. This is somewhat similar to Lee et al. (2022) and Fitria's (2021) research, as they mentioned AI writing assistants can help students to improve their work.

Beyond the academic benefits, some students also expressed a sense of comfort and reassurance in having the AI "assistant" available to support them. They described feeling less anxiety about their writing, knowing that they could rely on the AI to help identify and fix issues. In this way, students seemed to see the AI system as a kind of tutor or secondary teacher in the classroom. They valued the AI's input and were willing to act on its suggestions, treating it as an authoritative and helpful resource. As mentioned in other papers, both educators and students were able to benefit from AI under correct guidance (Muslimin et al., 2024).

However, the analysis also revealed that students may be at risk of over-relying on the AI, potentially stunting the development of their independent writing skills. There is a need to ensure that students maintain agency and ownership over their work, rather than becoming overly dependent on the AI's guidance. It will be important to find ways to harness the benefits of AI-powered feedback while also promoting students' self-editing abilities and critical thinking. Striking this balance will be key to ensuring that the integration of AI in the classroom truly enhances, rather than replaces, student learning.

For teachers, while they acknowledged the potential benefits of using AI as a teaching assistant, many expressed concerns about students becoming overly reliant on technology. Some teachers felt that overdependence on AI feedback could undermine the development of students' own critical thinking and writing skills.

Teachers noted that while AI can provide quick feedback on things like grammar and vocabulary, it lacks the nuanced, contextual understanding that human teachers can offer. There were worries that students may start to outsource their learning to the AI assistant, rather than engaging deeply with the material and putting in the effort to improve their abilities. According to Gayed et al. (2021), it is important for teachers to guide their students on how to use AI, which can help them use AI more effectively in writing and learning. Furthermore, teachers need to oversee the process of using AI. This can help to compensate for the limitations of AI assistants in writing.

However, teachers also recognized that AI could be a useful supplementary tool when used judiciously. Suggestions included incorporating AI feedback strategically, using it to identify areas for targeted instruction and encouraging students to view the AI input as one of many resources, rather than the final authority. In the following section, students' and teachers' opinions were categorized according to their themes.

Intelligent Tutoring and Support

AI-powered tutoring systems can provide real-time feedback and guidance to students during their learning process (Kim et al., 2022); this can help students improve their writing skills. It can identify misconceptions, offer explanations, and suggest additional practice exercises suited to each student's level of understanding. In this study, intelligent tutoring systems can lead to improved learning outcomes, increased engagement, and better retention of material compared to traditional classroom instruction alone. The constant monitoring and tailored support offered by these AI tutors can free up instructors to focus on higher-level facilitation and nurturing critical thinking while ensuring that each student receives the individualized attention they need to succeed. For example, the AI system pointed out a sentence that needs to be more formal and provided suggested sentences to inspire students. Below is a feedback extract from Poe:

To improve the essay, the writer could consider: Providing more specific examples and evidence to support their arguments. Exploring the counterarguments in more depth and providing a stronger rebuttal. Using more sophisticated vocabulary and sentence structures to enhance the overall quality of the writing.

As a result, students were able to be inspired and rewrite the sentence by following examples from AI suggestions. However, at the same time, it can be seen that some of the feedback were still a bit too vague for students, especially those who are not very good at English. For instance, "more sophisticated vocabulary and sentence structures" were very abstract; students may need to ask follow-up questions to clarify this comment. This is somewhat similar to Smutny and Schreiberova's study in 2020, which is about when AI feedback is unclear for students (Smutny & Schreiberova, 2020).

This can be solved through proper prompting. For the above example: although general feedback was produced, students can ask more specific questions to make the comments clearer. Here is a follow-up question from students after receiving the feedback and Poe's responses:

Can you suggest some sophisticated vocabulary and sentence structures to enhance the overall quality of the writing?

Certainly! Here are some suggestions for enhancing the vocabulary and sentence structures in the essay:

Vocabulary:

Instead of "more fearless," consider using "increasingly bold" or "growing in courage."

Instead of "satsiked," consider using "fulfilled" or "satisfied."

Instead of "knancial needs," consider using "financial requirements" or "monetary obligations."

Instead of "conkdent," consider using "self-assured" or "confident."

Sentence Structures:

Instead of "Women are getting more fearless in speaking up and only doing what they want," consider "Women are becoming increasingly assertive in voicing their opinions and pursuing their own desires."

Instead of "The traditional view of marriage as a means of social validation is no longer relevant," consider "The conventional notion of marriage as a source of social approval has become obsolete."

Instead of "Moreover, there are more opportunities now that cater to most women compared to before," consider "Furthermore, the current landscape offers a plethora of opportunities tailored to women, surpassing those available in the past."

Instead of "Some argue that marriage provides a lot of benekts such as deep emotional connection, companionship, etc.," consider "Advocates of marriage posit various advantages, including profound emotional bonds and companionship."

Poe was able to provide a more specific type of feedback and examples to students. This is more helpful in terms of improving students' writing abilities as well as introducing different writing techniques for them to suit different purposes. As a result, AI can help students in their writing, but they need to be more specific in communicating with AI tools.

As for the implementation of AI-powered intelligent tutoring systems, it holds significant promise for enhancing the learning experience for students. By providing real-time, personalized feedback and guidance, these systems can help identify and address individual knowledge gaps or misconceptions. The ability to adapt the instructional approach to each student's level of understanding allows for more targeted and effective intervention, enabling learners to progress at

their own pace. In this study, students expressed they have gained benefits from using AI in the classroom. As students mentioned, they care about the feedback from AI and they can make changes to improve their grades. This is similar to real-life shadow education. As to other studies about shadow education, it provides a second chance for students to modify their work or recap the concepts (Bray, 2013; Yung; 2019; Cheng, 2024). AI, on the other hand, can provide something very similar to students. However, AI is still a machine. Students were unable to interact freely with it. As a result, some of the students said it is still ineffective in helping them improve their work.

Moreover, some students in this study expressed that AI language assistants can help them practice and improve their language skills. They can offer vocabulary suggestions, and even simulate real-life scenarios for language practice. The application of AI language assistants can also be particularly beneficial for students seeking to develop their foreign language skills. These AI-driven platforms can provide valuable opportunities for conversational practice, vocabulary building, and pronunciation feedback—elements that are often difficult to consistently incorporate into traditional language courses. Many of the students said AI was able to provide a second opinion for them, help them to review, revise, and even inspire them in writing. They further elaborate that in traditional writing class, they can only study the rubrics, but they do not know how to interpret those areas. With the help of AI, they were able to learn directly what areas do they need to improve. For example, AI may point out the sentences were informal, and with proper prompting, AI can even point to which sentences need extra work. This allows students to improve sentences and ultimately their grades. Therefore, most of them feel that AI can be used as a supportive tool in writing.

As for teachers' concerns, the integration of intelligent tutoring systems also raises important considerations about the role of the human teacher. While these technologies can enhance the teaching and learning process, they should not be viewed as a complete replacement for educators. Teachers bring invaluable expertise, empathy, and dynamic interactions for students in the classroom (Chiu et al., 2023); AI can only provide systemic feedback without considering the real-life context—AI was unable to include emotions in the feedback. Most of the teachers understand the benefits and convenience that AI brings to the classroom, but some of the participants prefer the method of human-led instruction supported by AI in a classroom setting. Many researchers claim it is too early to assign AI as a full-time teacher in the classroom since it still has its limitations in sentimental and emotional issues in dealing with students (Kim et al., 2022; Gayed et al., 2022). Nevertheless, it is important to recognize that while AI language assistants can supplement and enhance language learning, they cannot fully replicate the nuanced understanding, cultural awareness, and interactive dynamics that human instructors bring to the table. Maintaining a blended approach that balances AI-powered practice with instructor-led lessons and feedback will be essential for developing well-rounded language proficiency.

Assessment and Grading

The integration of AI-powered grading and assessment tools can significantly enhance efficiency and reduce the workload for teachers. By automating the analysis and evaluation of

assignments, essays, and tests, these systems can provide faster feedback to students while reducing the time and effort required by instructors.

In this study, students expressed that AI-assisted grading can provide consistent and constructive feedback to them. This can be particularly beneficial for large-scale assignments or high-stakes exams, where impartiality and consistency are important. The real-time feedback enabled by AI-powered assessment can help students identify areas for improvement and receive personalized guidance more promptly. This timely intervention can foster a more engaging learning process and encourage students to take a more active role in their academic progress. Students expressed that they would immediately improve their essays according to AI feedback. As this is a similar finding as Fitria's research (2021), students were able to receive feedback and adjust according to the software selection. This is something that students can improve on their writing abilities (Fitria, 2021). There is an example of Poe grading and feedback in class (Appendix C); students eventually used this to improve their essays. However, at the same time, some teachers expressed that Poe is too optimistic and lenient in grading. Using AI grading for real courses may still need more time to develop and, at this point, it can only be used as a second opinion.

Moreover, AI feedback can help students to "save face." "Save face" is an important aspect in Chinese culture since it can prevent embarrassment (Nair, 2019). Students were more willing to communicate with a machine than with a real-life person; this had similar results to Yung and Yuan's study (2020). In Yung and Yuan's study, students were able to express themselves more through Zoom lectures since they did not need to have any physical connection with the tutors (Yung and Yuan, 2020). As a result, they feel more comfortable and not were not embarrassed. In this study, students also were more willing to accept their mistakes and change their writing style. This indicates AI can help students recognize their limitations without making them feel uncomfortable.

From teachers' perspectives, the use of AI in accessibility support can help teachers provide feedback and grade students' assignments. This helps to lessen the workload of teachers, as some of them expressed AI can provide some valid ideas to students' assignments such as "topic sentence is needed." Students were able to follow the instructions and modify their essays. As for grading, the AI software that was used in this study was able to adopt the school's rubric and provide a second opinion for teachers. This can help to align with the teacher's first-hand marking. Compared to other similar studies, this research found that AI can provide a positive in the classroom as some of the scholars indicate it can provide a more pleasant learning environment for students (Kolchenko, 2018; Alam, 2021).

However, it is crucial to ensure that the use of AI in grading and assessment does not entirely replace the critical role of human judgment and feedback. While AI systems can efficiently handle the more routine or quantifiable aspects of evaluation, instructors should maintain oversight and the ability to provide nuanced, qualitative assessments that capture the depth and complexity of student learning (Kolchenko, 2018). Although in this study most of the impressions were positive towards using AI in real classroom settings, this is still an immature method. Teachers

need to oversee and check the final marking to ensure quality and consistency. In future research, it is crucial to investigate whether users can maintain a balance between the capabilities of these assistive technologies and the guidance and support of human educators. While AI-powered accessibility features can greatly enhance inclusivity, they should complement, rather than replace, the personalized attention and expertise that teachers can offer to students with diverse needs.

Collaboration and Communication

As for the final aspect of this study, the use of an AI-powered platform can help students in collaborative learning. It allows students to foster greater engagement, idea exchange, and collective problem-solving among students. When students received feedback from AI, some of them were able to ask follow-up questions through the chatbot. For example, "What do you mean by my word choice could be improved? Could you give me some examples?" AI-driven tools enable students to engage in real-time discussions, co-create content, and receive peer feedback that can be particularly beneficial in cultivating these essential skills (Akintayo et al., 2024). As a result, the use of AI in classrooms can encourage and teach students collaborative learning and to solve problems by themselves.

However, it is important to acknowledge the potential issues associated with the implementation of AI tools in the classroom. Although the issues were not obvious in this study, teachers and students need to be careful. For example, students may rely on AI feedback and distance themselves from their teachers. In shadow education, there is a theory called "positive and negative backwash" (Yung and Yuan, 2020). This refers to students paying more attention to private tutors' lessons rather than mainstream teachers' lessons because they feel those lessons are more practical. In this study, although this kind of opinions were not found, teachers need to remind their students of the importance of face-to-face communication at the tertiary level. Second, teachers need to educate students in how to provide effective prompts to AI. In this study, students were unable to receive very specific feedback at the beginning since it is a relatively new skill for them. Through experience and lectures, they were able to produce effective prompts that can help them to receive more specific and useful feedback. Teachers need to provide some key guidelines and examples to help students understand how to use AI accurately (Mollick and Mollick, 2023). Without clear guidance and examples, students may only receive inadequate responses from AI and not truly benefit from the software.

Conclusion

This study provides insights into the use of AI-generative tools in improving tertiary students' English writing abilities in Hong Kong. The findings suggest that while students found these tools convenient and helpful in learning writing skills, teachers expressed concerns about the generalized and ambiguous nature of the feedback and examples provided by the AI tools.

There are different perspectives on the use of AI in the classroom. Some scholars argue that AI is the future of education and educators should embrace it (Chui et al., 2022). Others suggest that educators should find ways to integrate AI and teach students to use it appropriately (Fryer et

al., 2019; Hill et al., 2015; Yin et al., 2021). However, the consensus is that AI in education has significant potential but should be supervised by humans (Smutny & Schreiberova, 2020).

The dilemma of using AI in education, particularly regarding academic integrity and the potential for "cheating" is a significant challenge that universities in Hong Kong are grappling with (CUHK, 2023). As the integration of AI in education continues to evolve, both students and teachers must be cautious and well-informed about the appropriate and ethical use of these technologies.

The study also highlights the potential for AI teaching assistants to support student learning, as indicated by research in other contexts. However, the effectiveness of these AI-based interventions in improving academic performance remains an area that requires further investigation. For example, some of the AI feedback was too general for students and students may need to use more specific prompting (Mollick and Mollick, 2023). Teachers may also need to check the quality of the feedback provided by the AI tools.

Overall, this study contributes to the ongoing discussion and research on the use of AI-generative tools in tertiary education, particularly in the context of English writing instruction. The findings provide valuable insights for educators, policymakers, and researchers to consider when exploring the integration of AI technologies in the education sector. It can be seen that AI-writing assistants can help to improve students' writing abilities, but it is necessary for teachers to provide correct techniques, such as how to prompt for students. As Gayed et al. (2021) point out, it is important for educators to educate students how to correctly use AI first before implementing it in class. Future research may focus on whether AI could provide valid and accurate feedback to students, as AI-machine teachers are still developing (Kim et al., 2021). However, the positive signs shown in this study suggest that educators should consider implementing AI with human-supervised guidelines to support its usage.

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Appendix A Interview Questions for Students

Student's version

Background information

1. Which course are you currently studying at?
2. According to your observation, how many students used AI in your class?
3. Why do they use them?
4. What subject(s) do you like?
5. Is it your strongest subject?
6. What kind of AI assisting software are you using? Why?
7. Can AI help you in your study?

Impression of AI in writing course

1. Can you describe Hong Kong tertiary education system?
2. Do you feel AI is necessary in Hong Kong?
3. Can you tell me about your current experience in using AI?
4. Do you think it is useful for you? Why?
5. Do you feel that AI writing courses are more useful than traditional writing courses?
6. Do you use AI in your assignments? Why or why not?
7. What are some of the advantages of using AI?
8. Do you feel better?

Students' prediction about AI role

1. What roles do you think AI has in Hong Kong tertiary education?
2. Do you think the role(s) will change in the coming future?
3. Do your school teachers know that you are using AI?
4. How do they feel about AI?
5. Why do they have those impressions?
6. Anything that you would like to talk about related to your AI experience?

Appendix B Interview Questions for Students

Teacher's version

Background information

1. Your academic background.
2. Do you help your students if they have academic difficulties?
3. How do you feel about your students' academic performance?

Impression of AI in Hong Kong

1. Do you think AI is useful? Why?
2. Do you think combining AI in traditional writing courses is necessary?
3. When do you think students should apply AI in their writing or lesson? When should they stop relying on this?
4. Is it possible for students not to use AI?

Teacher's prediction

1. What roles do you think AI has in Hong Kong?
2. Do you think mainstream school teachers will eventually use AI in their lessons?
3. Do you think the role(s) of AI will change in the coming future?
4. Is there anything that AI writing courses can improve?
5. Do you think the support from the Hong Kong government is enough?
6. Anything that you want to share about AI?

Appendix C Example of Poe Feedback

Based on the content provided in your essay, here is feedback based on the assessment criteria:

Content (5/5):

Your essay effectively reflects on the valuable lessons learned from the English Reading and Writing III course. You thoroughly discuss the importance of structure, grammar, punctuation, thesis statements, arguments, use of evidence, and the revision process. You also mention your improved writing skills and readiness to tackle future writing tasks.

Communicative Achievement (5/5):

The register used in your essay is appropriate for a reflective piece on academic learning. You have effectively expressed your thoughts and the impact of the course on your writing skills in a clear and concise manner.

Organization (5/5):

Your essay is well-structured with a clear introduction, body paragraphs discussing different aspects of your learning, and a conclusion summarizing your key takeaways. The ideas flow logically from one point to another, enhancing the overall coherence.

Language (5/5):

Your language use is precise and demonstrates a good command of vocabulary and grammar. You effectively convey your ideas using a variety of sentence structures and vocabulary. There are only minor errors, if any, which do not hinder understanding.

Overall, your essay is well-crafted, insightful, and effectively addresses the task at hand. To enhance the sophistication of your writing further, consider incorporating more specific examples from your coursework to illustrate your points and deepen the reader's understanding. Additionally, you can explore how these lessons have impacted not only your academic writing but also your communication skills in other areas of your life, providing a broader perspective on your growth as a writer.

Total score: 20/20

Integrating Generative AI in University Teaching and Learning: A Model for Balanced Guidelines

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Abstract

The study proposes a balanced approach and flexible guidelines for incorporating generative artificial intelligence (AI) into university-level teaching and learning processes at both the university-departmental level and within individual academic autonomy. Building on the AI Ecological Education Policy Framework, the guidelines offer a suggestive frame of reference for faculty and students to integrate generative AI into their coursework. Furthermore, feedback from 118 students and 14 academics at a teacher education institution in the Philippines underscores the guidelines' potential benefits, concerns, usefulness, and necessity in their academic undertakings. While the policy may not cover every detail exhaustively, it seeks to provide practical and context-sensitive recommendations for ethical, honest, responsible, and fair use of AI in course development, implementation, and student engagement. Consequently, other higher education institutions in general, and academics in particular, may adopt and/or modify the guidelines to suit their positions, goals, needs, and directions.

Keywords: generative artificial intelligence, AI guidelines, ChatGPT, teaching, learning, university

Cacho, R. (2024). Integrating Generative AI in University Teaching and Learning: A Model for Balanced Guidelines, *Online Learning*, Volume 28(3), (55-82). DOI: 10.24059/olj.v28i3.4508

Recently, there has been a significant increase in scholarly works on artificial intelligence (AI) within the educational sector, emphasizing the rapid advancement and implementation of generative AI tools. These generative AI technologies not only act as catalysts for innovation, necessitating adaptation within dynamic environments for both individuals and institutions to thrive (Bozkurt & Sharma, 2022) but also underscore the importance of managing knowledge flows in higher education institutions to respond to the challenges of novel disruptions (Cacho & Ribiere, 2018). Environmental uncertainties, including technological disruptions, may increase the complexity of strategic decision-making in knowledge-intensive organizations (Cacho et al., 2023), necessitating reflective decision-making and training to enhance human capabilities in addressing the disruption caused by artificial intelligence tools (Trunk et al., 2020). Acknowledging that higher education students benefit from diverse support, flexible schedules, and adaptive teaching methods (Bajar et al., 2024), knowledge-intensive education institutions have to be more cognizant, sensitive, and ethical in their approach to integrating emerging generative AI into their programs and services for further innovation and improvement.

UNESCO (2023a) defines generative AI as “technology that automatically generates content in response to prompts written in natural language conversational... where content can appear in formats that comprise all symbolic representations of human thinking: texts written in natural language, images (including photographs to digital paintings and cartoons), videos, music, and software code” (p. 8). Some AI tools available online include but are not limited to conversational models like ChatGPT, Microsoft Copilot, Google Gemini, and others. The use of these text-generative AI tools, however, poses some concerns that academics in higher education should not overlook. One concern Sohail et al. (2023) noted is the potential use of generative AI applications by students to engage in academic dishonesty, specifically through cheating or plagiarizing their written assignments and tests. Another issue is the decline in students' academic performance. With increased dependence on automated tools for task completion among students (Chan, 2023), this may contribute to procrastination and memory loss, ultimately diminishing their learning competence (Abbas et al., 2024).

These concerns have led some universities to rethink their academic programs and processes. Although there are acknowledged risks or concerns at the onset, the use of generative AI tools, however, could potentially enhance writing evaluation and feedback by providing valuable assistance to human assessments of written outputs (Mizumoto & Eguchi, 2023; Punar Özçelik & Yangın Ekşi, 2024; Wolf & Wolf, 2023). Moreover, AI has the potential to improve student learning outcomes by offering customized, instant feedback and adjusting to each learner's unique style (Chan & Hu, 2023; Delcker et al., 2024; Lin et al., 2023; Schroeder et al., 2022). Recently, Younis (2024) found that integrating ChatGPT in online classes within peer groups can significantly enhance students' satisfaction and content delivery and increase engagement. These are on top of other benefits and uses of AI tools that most students take advantage of, including but not limited to grammar and spelling checkers, understanding concepts, planning, and summarizing. Thus, instead of outright banning these tools for students who will enter an AI-driven industry after university life (Johnston et al., 2024), it is more beneficial to prepare them for a future dominated

by AI. This approach aligns with the understanding that generative AI technologies can significantly transform teaching and learning methodologies, requiring novel approaches to thinking (Bozkurt, 2023a; Tlili et al., 2023; Walter, 2024).

Still, some academics express lingering apprehensions that the use of generative AI in educational settings may degrade the quality of education and adversely affect students' academic performance (Adeshola & Adepoju, 2023; Chan & Lee, 2023; Nam & Bai, 2023; Popenici & Kerr, 2017). Consequently, these concerns have prompted some universities to prohibit the deployment of generative AI technologies within their academic program. However, instead of imposing prohibitions or stringent directives on the use of generative AI technologies such as ChatGPT (Kostka & Toncelli, 2023), UNESCO (2023b) advises the adoption of explicit guidelines for both teachers and students on the appropriate application of generative AI, like ChatGPT. As Casal-Otero et al. (2023) also support, this approach advocates for a collaborative process in establishing these guidelines, involving both students and instructors, rather than just dictating terms for them to follow. This strategy aims to improve the technological knowledge of both students and teachers (Cacho, 2014), equipping them to effectively manage the “promises” and “perils” presented by emerging and disruptive technologies, such as generative AI tools (Mollick & Mollick, 2023). Essentially, Chan (2023) underscores the critical need for universities to craft policies on AI education that ensure teachers and students are both proficient in this technology. This urgent call requires universities to act decisively, laying the groundwork with specific guidelines that facilitate AI-related educational initiatives.

On a critical note, Nam and Bai (2023) and Salhab (2024) express grave concerns about the lack of clear ethical guidelines, ground rules, and policies in education, amidst the rapid advancement of AI and the opportunities it presents for learners. Consequently, the current paper aims to propose balanced approach guidelines articulating Chan’s (2023) AI Ecological Education Policy Framework into definitive AI integration guideposts in curricular design, implementation, and student engagement both for academics and students within the higher education environment. In doing so, involving the inputs of the stakeholders in the formulation of the guidelines is critical (Delcker et al., 2024; Salas-Pilco et al., 2022). Consequently, feedback was obtained from both academics and students to ensure that the policy document accurately represents the needs and values of the parties involved. The combination of this strategy and data collection allowed for a design thinking approach in formulating a policy that captures the essentials of relevant literature and feedback from the implementers and end-users. By doing so, the ensuing balanced approach guidelines (see Appendix A) in the integration of AI tools in the higher education context are useful, inclusive, context-sensitive, and flexible.

Literature Review and the Model Guidelines

AI Ecological Education Policy Framework

Chan (2023) crafted a policy framework for the integration of AI in higher education, guided by an examination of stakeholder attitudes towards text-generative AI and informed by UNESCO's (2021) humanistic AI in education guidelines. This policy framework is rooted in collaborative expert engagement and emphasizes ethical, inclusive AI use to benefit all learners. It outlines a comprehensive strategy for AI application in educational management, instruction, and

assessment, and includes stages for pilot testing, continuous monitoring, evaluation, and the promotion of evidence-based practices. Additionally, it encourages the cultivation of local innovations tailored to meet community-specific needs.

Chan's empirical research gathered insights from 457 students and 180 faculty and staff members from various fields within Hong Kong's higher education industry, aiming to understand their views on AI's role in academia. The study's quantitative analysis revealed both acknowledgment of AI's potential upsides—such as enhanced personalized learning, digital literacy, academic achievement, and the anonymity of support services—and concerns over possible downsides like excessive dependency on AI, reduced human interaction, and obstacles to acquiring universal skills. The findings highlight a general willingness among the higher education community to embrace generative AI technologies, coupled with an awareness of their potential impacts. The study concludes that thoughtful policymaking and institutional support are essential to leverage AI's benefits in enhancing teaching and learning experiences in universities.

Drawing on these insights, recommendations, and concerns of stakeholders, Chan (2023) formulated the AI Ecological Education Policy Framework to foster the ethical and efficient incorporation of AI technologies in higher education contexts. This framework facilitates a comprehensive appreciation of the complex ramifications of AI integration within universities, guiding stakeholders—including senior management, faculty, and staff—to assess AI adoption's extensive impacts on the teaching and learning environment. While UNESCO (2021) targets a wider audience of policymakers with its baseline recommendations, Chan's framework translates these policy recommendations into actionable strategies across three critical dimensions: Pedagogical, Ethical, and Operational.

The *Pedagogical* dimension delves into the educational implications of AI integration, highlighting areas such as revising assessment methods, enhancing students' holistic competencies, preparing them for AI-influenced workplaces, and promoting a balanced adoption of AI technologies. Meanwhile, the *Governance* dimension focuses on the administrative aspects of AI use, covering ethical dilemmas and academic integrity, governance issues like data privacy and accountability, technology attribution, and ensuring equitable access to AI resources. The *Operational* dimension, on the other hand, addresses the tangible aspects of deploying AI in academic environments, emphasizing the monitoring and evaluation of AI applications, alongside offering necessary training and support in AI literacy for all university stakeholders. These dimensions lay the groundwork for the development of balanced approach guidelines, elaborated in subsequent sections. This advances a strategic, more specific yet flexible pathway for integrating AI into higher education practices.

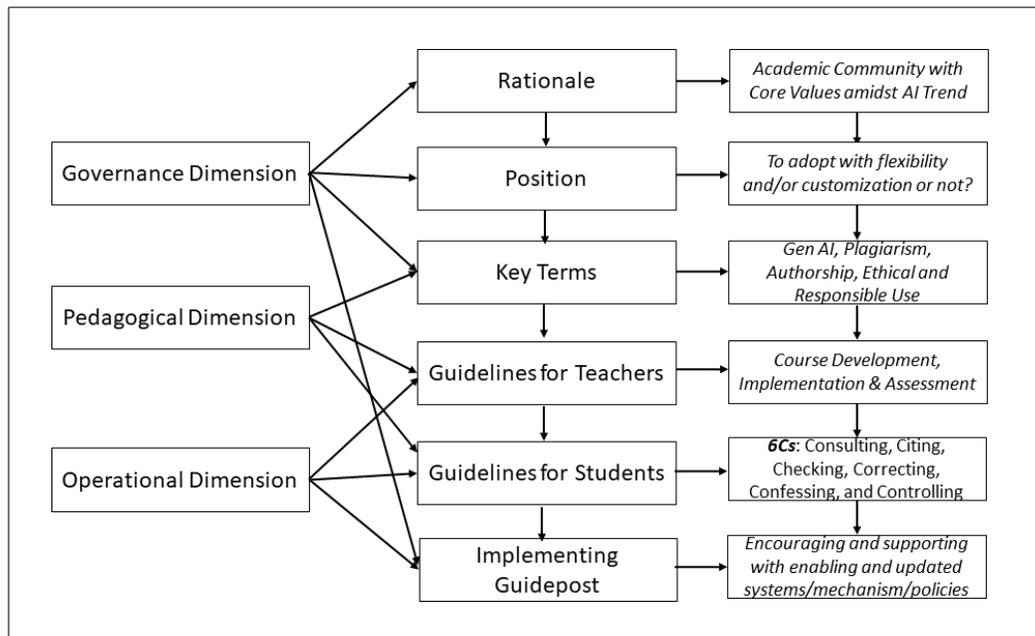
The Balanced-Approach Guidelines

Building upon the foundation of the AI Ecological Education Policy Framework previously discussed, a model of balanced approach guidelines designed for the integration of AI into higher education's teaching and learning processes is hereby crafted and endorsed. These generic and flexible guidelines are deliberately crafted to be adaptable, allowing any educational institution to customize them based on their specific context, needs, strategy, and overarching direction. This flexibility ensures that institutions and/or academics can effectively align the integration of AI technologies with their distinct educational philosophies and operational frameworks, promoting an individualized and strategic adoption of AI in academia. Appendix A showcases the policy

document that contains six sections: *rationale*, *position*, *key terms*, *guidelines for teachers*, *guidelines for students*, and *guidepost*. Figure 1 delineates the framework dimensions and guidelines sections where the policy framework and balanced approach guidelines converge.

Figure 1

AI Ecological Framework and Balanced Approach Guidelines Convergence



The Rationale. The rationale section articulates the need for a specific academic institution/department/faculty to embrace generative AI within its educational framework, aligning this technological advancement with the organization's core values and commitment to academic excellence. It stresses the importance of adapting to the rapidly evolving technological landscape to sustain relevance in education. Moreover, by advocating for the exploration of generative AI's potential to enrich teaching and learning experiences, the section underscores a proactive strategy toward innovative teaching, rigorous research, and dedicated service. Furthermore, it reaffirms the institution's dedication to transparency and accountability, ensuring that the integration of AI technologies reflects the institution's mission and philosophical commitments. This proactive stance towards generative AI is presented as essential to upholding the institution's values and enhancing its educational program. In connection to the earlier policy framework and this rationale section, Chan's (2023) *governance* dimension resonates with the university's underpinning of its academic integrity, transparency, proactiveness, and accountability as the primary motivation and justification to respond to the critical stance of adopting innovations vis-à-vis the organization core values. With management support, organizations and/or academics willing to borrow such rationale section content are encouraged to customize it according to one's organizational values and philosophy.

The Organization's Position. The position statement delineates the approach of the university/college towards integrating AI in its academic ecosystem, aligning with the standards of a premier international institution (Hong Kong Polytechnic University, 2023). It emphasizes a balanced and inclusive strategy for adopting AI tools to innovate and enhance learning, teaching, and assessment methods. Thus, it explicitly drives the organization's position that not only capitalizes on the transformative potential of AI for educational advancement but also safeguards the principles of academic integrity, critical thinking, and skill development. It commits to blending traditional values with technological innovation, aiming to rationalize the ethical and responsible use of generative AI across academic practices for both faculty and students starting from a mutually agreed specific academic term/semester. This approach underscores the institution's vision to remain inclusive, adaptive, and ethical in the evolving educational landscape. In connection to the ecological framework and this position, Chan's governance dimension highlights how educational institutions can integrate AI technologies harmoniously, ensuring that these advancements align with core educational values, which other organizations of higher learning can also adopt or enhance.

Key Terms. This section offers conceptual insights including the operational definitions of critical terms as they relate to the use and ethical considerations of generative AI. Generative AI, as defined by UNESCO (2023a), encompasses technologies that create diverse content types, including texts, images, and videos in response to natural language prompts. Addressing the critical issues of plagiarism and authorship, it emphasizes the necessity of attributing AI-generated content and recognizing the creators of AI systems, aligning with copyright principles that reserve authorship for humans as per the U.S. Copyright Office (2023). Furthermore, Mhlanga (2023) outlines the ethical guidelines for AI's use, stressing transparency, privacy, accuracy, fairness, and the indispensable role of human oversight in educational applications. This section collectively underlines the importance of a responsible and informed approach to incorporating AI technologies in educational settings, ensuring that such integration honors academic integrity and the evolving landscape of copyright and ethical standards. In this section, both Chan's (2023) governance and pedagogical dimensions come into play. The *governance* dimension underscores how transparency, accountability, and human authorship are briefly discussed primarily focusing on human authors and proper attribution of AI-generated content. On one hand, the *pedagogical* dimension highlights the instructional benefits offered by AI tools, while simultaneously acknowledging the indispensable role of human oversight in their integration.

Guidelines for Teachers. This section begins by addressing the use of generative AI in the course development process, emphasizing its role in enhancing educational programs across all levels. It advocates for the strategic integration of AI to achieve learning outcomes, streamline content creation, curate relevant and context-sensitive learning materials, and support various learning preferences through technology augmentation. Moreover, its *course development* subsection underscores the potential of AI to enrich the educational experience by promoting the enhancement of essential soft and hard skills among learners, thereby fostering a more dynamic and inclusive learning environment. Concurrently, AI literacy across curriculum design (Salhab, 2024) can be integrated.

In the *course implementation* subsection, the guidelines focus on practical aspects of employing AI tools in teaching and learning contexts. Faculty members are advised on the importance of setting clear boundaries for AI use, particularly about assessments and learning assistance, and communicating these to students to maintain academic integrity. The guidelines detail the necessity of outlining the acceptable use of AI, managing authorship claims, and establishing criteria for the evaluation of AI-assisted student works. Additionally, the emphasis is placed on ethical and responsible AI usage, highlighting the procedures for validating the integrity of student submissions through multiple assessment strategies and tools. This approach ensures that AI technologies serve as a complement to traditional teaching methods, supporting educators in navigating the integration of AI into their pedagogical practices while upholding academic standards.

Within the AI Ecological Framework, the *pedagogical* and *operational* dimensions are at work in this section. The *pedagogical* dimension in this section emphasizes the strategic integration of AI in education to enhance learning experiences by promoting skill development and creating an inclusive environment while ensuring ethical use and academic integrity through clear policies and assessment strategies. On one hand, its *operational* dimension focuses on the practical implementation of AI tools in teaching and learning, including setting clear usage boundaries, managing authorship and evaluation criteria, and employing ethical practices to complement traditional teaching methods and maintain academic quality mechanisms

Guidelines for Students. This section is crafted to assist students in navigating the ethical and responsible use of AI tools in their academic work, aiming to prevent academic dishonesty. It introduces the easy-to-remember overarching **6Cs** approach:

1. Consulting: Students are advised to adhere to their teachers' instructions or seek clarification in the absence of explicit guidance, ensuring they are aligned with the provided guidelines and expectations.
2. Citing: Following McAadoo's (2024) recommendations, students must appropriately cite any AI-generated content in their work, following the American Psychological Association publication manual's seventh edition.
3. Checking: This encourages students to verify the reliability and credibility of AI-generated materials by consulting primary sources, mindful of potential restrictions on AI authorship in their work.
4. Correcting: Guided by practices from the London School of Economics and Political Science (2022), students should limit AI's use to tasks like spelling, punctuation, grammar, and structure improvements, ensuring the work adheres to the conventions of academic writing.
5. Confessing: This involves openly acknowledging any AI assistance in content generation, including a detailed acknowledgment statement and an AI use declaration with their submissions, specifying how AI tools were employed in the creation of their work.
6. Controlling: This advises students to regulate their use of AI within ethical and honest boundaries, avoiding any actions that could be deemed unacceptable or unethical.

Additionally, students are required to include an acknowledgment of any permissible assistance received and a declaration regarding their use of generative AI tools, stating which tools were used and describing their application. This section serves to instill a sense of responsibility and integrity among students in the use of AI tools, ensuring that their academic pursuits remain within the bounds of ethical standards and are aligned with the principles of academic honesty. It aims to prepare students to use AI in a manner that enhances their learning and research while maintaining the integrity of their scholarly work.

Aligned with the AI Ecological Framework, the *pedagogical* and *operational* dimensions are still manifested in this section. The pedagogical and operational dimensions are built in by promoting ethical AI use through the 6Cs approach—consulting, citing, checking, correcting, confessing, controlling—to uphold academic integrity and enrich learning while recommending a structured strategy for engaging responsibly with AI tools.

Guideposts. This section outlines strategic initiatives for integrating generative AI within the academic environments of higher education institutions (HEIs). This comprehensive approach encourages the adaptation of curricula to include AI use across a continuum from minimal to optimal opportunities, emphasizing the need to update curricular programs, syllabi, and educational materials to reflect these new guidelines. It also advocates for the formation of a multidisciplinary body, led by designated academic leaders, tasked with promoting AI integration through upskilling programs and enhancing AI literacy among internal stakeholders. This body is then responsible for revising and recommending additional guidelines and frameworks for AI integration in teaching and learning, ensuring that these initiatives are inclusive and involve consultations with both internal and external stakeholders.

Furthermore, the section underscores the importance of making AI and other digital infrastructures accessible to the entire academic community, highlighting the institution's commitment to digital inclusivity and preparedness. It points out the inevitable need for investment in soft digital AI tools and infrastructure to future-proof the university, necessitating policy updates on AI tool selection, deployment, and the establishment of preventive and corrective measures for guideline infringements. Despite the acknowledged risks associated with AI use, the institution views the integration of AI as an opportunity to model a balanced approach to leveraging generative AI tools responsibly and ethically. This forward-thinking strategy aims to innovate and safeguard the teaching and learning experience. In line with the AI Ecological Framework, this section, however, encapsulates the *governance* and *operational* dimensions. The *governance* dimension is captured through the establishment of a multidisciplinary body led by academic leaders to oversee AI integration and policy updates, ensuring inclusivity and stakeholder consultation, while the *operational* dimension is reflected in the strategic updating of curricular programs, investment in digital infrastructure, and the implementation of upskilling programs to enhance AI literacy, thereby innovatively and responsibly future-proofing the teaching and learning experience within higher education institutions.

Methodology

Primarily drawing from Chan's (2023) AI Ecological Education Policy Framework, the author formulated generic guidelines for the integration of AI into educational practices. The methodology employed design thinking principles to iterate the proposed guideline, which was

subsequently shared with both students and faculty colleagues for their critical comments. Feedback was gathered through online question-and-answer sessions, seamlessly integrated into asynchronous classes conducted via Google Classroom for undergraduates, and through the university's Learning Management System (LMS) for graduate students. An online forum facilitated an open discussion among student participants, encouraging them to provide critical feedback on the policy document as a component of their coursework. Concurrently, faculty feedback was solicited through an in-person focus group discussion, specifically organized as part of a professional development workshop aimed at enhancing faculty proficiency in using the online LMS. This dual-faceted approach to feedback gathering—engaging both student and faculty perspectives—ensured an inclusive capturing of stakeholders' awareness of AI and the guidelines' potential pedagogical and management bearing on the status quo and areas for policy refinement.

The study engaged a total of 104 undergraduate students from three different classes and 14 graduate students from a single class. All participants were supervised by the researcher. The undergraduate education students ranged in age from 18 to 22 years, while the graduate students' ages spanned from 25 to 45 years. Additionally, a focus group discussion (FGD) was conducted with 14 teachers who were colleagues of the researcher. The faculty participants, aged 26 to 55 years, specialized in various fields, including social studies, elementary education, science, mathematics, management, technology and livelihood, agriculture, and industrial education. All participants were affiliated with a small campus/college that is part of a larger system of public or state-run teacher education institutions in the Philippines. The study employed a thematic analysis approach to analyze responses to open-ended questions. These questions were designed to elicit participants' thoughts on the proposed generic guidelines and their perceptions of the impact of generative artificial intelligence on their practices. Specifically, participants were asked for their opinions on the proposed guidelines and to share their experiences with generative AI, particularly in relation to their academic work. This method facilitated a deep exploration of the participants' perceptions, enabling the identification and reflection of key themes and insights related to the guideline's refinement, its adoption or implementation, and the potential effects of AI in educational settings.

Qualitative data and thematic analysis

Participants from both the online forum and FGD were invited to share their insights on the proposed generic guidelines for integrating AI into the teaching and learning processes. They were encouraged to provide critical feedback and be open to diverse opinions, enabling the collection of a wide range of perspectives on AI, its impact on their work, and their experiences with various AI tools. The data from the online forum were analyzed through inductive thematic analysis. Generally, the inductive approach allows themes to naturally emerge from the participants' responses instead of being predetermined by the researcher.

On the other hand, the focus group discussion data were analyzed through a deductive thematic approach. Within qualitative research, deductive category application involves using predefined, theoretically derived analytical aspects and relating them to the text. The qualitative phase of analysis is characterized by systematically assigning a category to a specific text segment in a methodologically controlled manner (Mayring, 2000). By comparing the proposed guidelines with the primary stakeholders' feedback (both inductively and deductively analyzed), the researcher

refined the final draft, making necessary clarifications and adjustments to address identified gaps and areas needing improvement. This process enhanced the quality and applicability of the guidelines that may contribute valuable insights to university programs and policies relevant to the selection, use, and evaluation of generative AI tools.

Results

Students' Feedback

The qualitative data collected from both undergraduate and graduate students yielded valuable suggestions and/or comments. There are three main themes and eight subthemes that emerged from the qualitative data as presented in Table 1. From the data, the main themes serve as the key areas that are directly relevant to the refinement of the guidelines for AI use in university-level teaching and learning. These also connect with the feedback from their teachers.

Table 1

Main Themes and Subthemes of Inductively Analyzed Data

Main Themes	Subthemes
1. AI utilization and efficiency	Task simplification and assistance Personal and professional advancement
2. Cognitive and ethical implications	Intellectual laziness and dependence Threat to authentic learning Ethical considerations and integrity
3. Navigational strategies for AI use	Implementing and following guidelines Balancing AI with human effort Responsible and mindful application

AI Utilization and Efficiency. The research findings underscore the pivotal role of AI in both streamlining academic tasks and paving the way for professional opportunities, as observed in the overarching theme of AI utilization and efficiency. The insights from participants—such as one undergraduate student (UG28) who pointed out the benefits of AI in academic contexts by stating, *"AI can be very helpful for students in various ways..."*—highlight the technology's capacity to enhance efficiency in educational settings. Similarly, the anticipation and eagerness for technological engagement expressed by a graduate student (G4)—*"Looking forward to be immersed with this kind of technology..."*—reflect a broader enthusiasm among students for leveraging AI not just as a tool for immediate task assistance but also as a catalyst for professional growth. Together, these perspectives weave a narrative that not only appreciates AI's immediate benefits in educational tasks but also acknowledges its potential to influence professional advancement, illustrating the technology's dual role in students' academic journeys and future career trajectories.

Cognitive and Ethical Implications. The cognitive and ethical implications of AI use encompass focused concerns including laziness, authentic learning, and integrity, reflecting emerging challenges in intellectual engagement and ethical standards. A graduate student (G1) highlighted the potential negative cognitive impact, noting *"...it may induce mental dependence, impair critical*

thinking...", which points to concerns about the possibility of AI fostering a reliance that could diminish students' critical thinking and problem-solving skills. On a different note, the value of authentic learning was passionately articulated by a graduate student (G6), who expressed a desire for genuine emotional connection in writing, stating, *"I want my readers to feel what I have written and it will happen if I wrote it with feelings..."* This sentiment underscores the importance of maintaining personal touch and authenticity in AI-assisted educational contexts. Ethical considerations, particularly regarding academic integrity, were voiced by a graduate student (G13), who cautioned, *"...using AI... can lead to bad habits and produce output that is not entirely our idea..."* This reflects concerns about the ease with which AI can be misused, potentially undermining the originality and authenticity of academic work. Collectively, these insights bring to light the foreseen cognitive and ethical considerations that accompany the integration of AI in educational settings, indicating both the potential challenges and the intrinsic value of maintaining human elements in learning and creativity.

Navigational Strategies for AI Use. Navigational strategies for AI use are categorized into three subthemes that include following the guidelines, piloting human effort, and doing a mindful application. The clarity of the AI guidelines was affirmed by a graduate student (G12), who appreciated the non-prohibitive stance on AI, stating *"The guidelines...are clear that the utilization of AI is not prohibited..."* that underscores the openness of the educational policy towards embracing AI technologies while setting boundaries. Additionally, the importance of integrating human effort with AI tools was highlighted by another graduate student (G11), who posited that productive outcomes could be achieved if tasks are undertaken with sincerity and AI assistance: *"...if we do our task wholeheartedly with the aid of AI, I believe we will be able to turn out productive..."*. This suggests a synergy between human endeavor and technological aid as key to maximizing the benefits of AI in academic settings.

Furthermore, the significance of mindful AI application was articulated by one undergraduate student (UG23), who emphasized responsible use, guided by the established dos and don'ts, stating, *"We must use AI responsibly. We've read in these guidelines the dos and don'ts of using AI..."* This reflects a collective understanding among students about the necessity of adhering to guidelines for ethical and effective AI utilization. Together, these perspectives highlight a comprehensive approach toward navigating AI integration into academic practices.

Academic Insights

AI use extends beyond student applications, centering primarily on how teachers facilitate opportunities for AI integration within the educational realm. Therefore, it is also crucial to gather feedback directly from teachers on their perspectives regarding AI's role in education and their thoughts on the guidelines shaping their teaching and learning environment. The qualitative data collected from teachers also provided insightful and substantial suggestions enriching the study's findings. Analysis of this data revolves around 7 main themes and is expanded by 23 explanatory subthemes, as detailed in Table 2. These themes represent crucial categories pertinent to refining the generic guidelines for AI use in university teaching and learning contexts. Furthermore, the

insights from teachers complement the feedback obtained from students, collectively informing the specificity and context-sensitivity of the balanced approach guidelines.

Exposure to AI. Teachers' exposure to AI encompasses information that details its introduction and application across educational and professional landscapes, illustrating diverse pathways to engagement with the technology. One Teacher (T4) shared their initial encounter with AI, stating *"I heard and experienced it when I attended a short course in Australia,"* highlighting the role of formal education abroad as a catalyst for exposure to AI technologies. This experience contrasts with the practical application of AI tools in everyday professional activities, as described by another teacher (T2), who utilizes AI-powered applications like Grammarly, ChatGPT, and QuillBot for crafting reports and instructions, showcasing the integration of AI into their workflow for enhanced productivity and efficiency. Furthermore, the significance of social networks in fostering AI adoption is underscored by one teacher (T3), who noted, *"it was introduced to me by a colleague,"* indicating the importance of peer influence in the discovery and adoption of new technologies. Together, these insights illustrate the diverse avenues through which educators are exposed to and engage with AI technologies, from formal educational experiences to professional tool usage and peer introductions. This contributes to a broader understanding and incorporation of AI in educational and professional contexts.

AI Tools in Academia. Another research finding reveals an emerging theme centered on the utilization of AI tools in academia, encompassing subthemes such as academic integrity, teaching aid, and learning enhancement. One teacher (T1) specifically mentioned the use of tools like *"Grammarly and Turnitin"* in the context of maintaining academic integrity, indicating the crucial role these technologies play in upholding standards of originality and proper citation. In terms of teaching assistance, another teacher (T6) listed *"ChatGPT, Grammarly, SIRI"* as integral tools, highlighting the diverse applications of AI in facilitating educational processes and teacher tasks. Furthermore, the enhancement of the learning experience through AI was exemplified by one more teacher (T2), who noted the benefits of AI in *"checking my grammar and sometimes serves as my consultant,"* showcasing the personal utility of AI in improving their academic work. These findings collectively resonate with the multifaceted impact of AI tools in academia, spanning from

ensuring academic integrity to aiding in teaching and enriching the learning journey.

AI's Educational Impact. The exploration of AI's Educational Impact within the study presents a pivotal understanding of its role in a university setting, encapsulated through the acknowledgment of benefits, concerns over limitations, and considerations of its influence on employment. One teacher (T10) briefly recognizes the positive aspects of AI by stating, *"it is beneficial,"* highlighting a general appreciation for AI's contributions to the educational field. This sentiment is expanded upon by another teacher (T1), who acknowledges AI's advantages but also stresses the importance of being cognizant of its limitations and disadvantages, articulating, *"I believe it is beneficial to education but as educators, we should also be aware of its limitations and disadvantages so that we can manage them."* This perspective underscores the critical need for a balanced approach to integrating AI in educational contexts. Furthermore, a seemingly technology-literate teacher (T5) delves into the broader implications of AI beyond the classroom, noting its growing dominance in

the online world and its potential to automate tasks traditionally performed by humans, as observed in their remark, *"I think it dominates the online world already. Some companies are also already designing systems that will replace or lessen work performed by humans."* Together, these perspectives weave a complex picture of AI's educational impact. Balancing the recognition of its benefits with a mindful approach to its limitations and the evolving landscape of employment or relevant industry, however, remains critical.

Campus Readiness for AI. Campus readiness for AI was also a significant concern in the focus discussion. One teacher points out the lack of preparedness and the urgent need for relevant training. This teacher (T1) articulated *"I think as a campus, we are not yet ready. We need relevant pieces of training to be prepared,"* emphasizing the critical need for educational development to facilitate AI integration. Another teacher (T3) expanded on this by addressing the complexities surrounding infrastructure and budget constraints, indicating, *"Somehow, for challenges, I think the infrastructure, sustainability, security etc.,"* which brings to light the multifaceted challenges that extend beyond training to include the physical and financial readiness of the campus for AI adoption. These perspectives collectively illustrate an informed understanding among educators of the requirements for successfully implementing AI in educational settings that underscore the importance of both developing human capabilities and enhancing infrastructural and budgetary supports.

Teaching and AI. The focus group discussion also reveals a consensus among educators regarding AI's role and limitations in the educational sphere. One teacher (T1) clearly stated, *"AI can't replace a teacher but AI tools can support teachers in teaching,"* highlighting the belief that while AI can augment the teaching process, it cannot displace the unique contributions of human educators. Another teacher (T4) deepened this perspective by stressing the irreplaceable human elements that AI lacks, asserting, *"AI may copy how teachers teach knowledge but AI cannot copy how teachers infuse the values they need to learn. AI cannot copy the caring touch of the teachers."* This underscores the intrinsic human qualities, such as the ability to impart values and offer a caring presence, which AI cannot replicate. Furthermore, the ethical dimension of AI use in education was addressed by another teacher (T3), who remarked, *"Students can use AI provided that there is a solid Ethical Framework followed by a university."* This points to the necessity of guiding AI application within educational settings through well-defined ethical guidelines. Jointly, these insights from educators articulate a vision of AI as a supportive tool in teaching. Thus, it underscores the indispensable nature of human interaction and ethical considerations in leveraging technology for educational purposes.

Policy on AI Use. Policy on AI use discussion revolves around the academic context, revealing a layered approach to governance that spans from university-wide mandates, and departmental autonomy to individual teacher discretion. One teacher (T2) advocates for system-based cohesive governance, noting *"The PNU System, however, must have a uniform policy on this since we have ONE-PNU policy,"* emphasizing the need for a standardized policy across the university to ensure consistency in AI integration. Contrasting this perspective, a teacher (T1) suggests a blend of overarching guidelines and localized control: *"Have a university-wide policy on when they are and or are not appropriate to use and let departments/faculties decide the policy on when they are or are not appropriate to use."* This approach allows for a foundational policy that accommodates

department-specific nuances. Further individualizing policymaking, another teacher (T13) champions lecturer autonomy, proposing *"Let lecturers decide individual policies for individual assignments on when they are or are not appropriate to use."* This stance supports the idea that lecturers, being closest to the student learning experience, should tailor AI usage policies to fit specific academic objectives and tasks. Together, these viewpoints outline a multitiered approach to AI policy in education, balancing uniformity with the flexibility needed that address the diverse needs of university departments and individual teachers. Thus, this input characterizes the context-sensitivity of the balanced approach guidelines.

Guidelines Feedback. Finally, the proposed guidelines were presented to the teachers for their critical comments. The category under feedback reveals insightful perspectives on the development and reception of policies regarding AI use which are brought to light through the views of various academics coming from different disciplines in one campus. The craftsmanship of the AI usage policy received praise from a teacher (T7), who described it as *"Well-crafted,"* indicating a positive assessment of the policy's construction and clarity. Moreover, this sentiment is echoed by another teacher (T1), who considers the guidelines *"a good start."* This suggests an optimistic outlook on the initial steps toward strategically regulating AI use in educational settings. However, one more teacher (T2) emphasizes the urgency and necessity of these policies, stating *"It is not a matter of choice for the faculty. It is a must,"* highlighting the imperative nature of guidelines for academics to consider more seriously.

Furthermore, the teachers' perspectives encompass views on the broader implications and strategies for AI integration within the teaching profession. One teacher (T3) encourages a proactive stance towards AI, asserting, *"AI is something that we shouldn't be afraid of but rather, we need to embrace and adapt,"* which underscores the importance of adopting AI as a beneficial tool in education. This perspective of adaptation and acceptance is fortified by another teacher (T4), who points out that *"Students can use AI provided that there is a solid Ethical Framework followed by a university."* This draws attention to the ethical and practical considerations essential for responsible AI use. Additionally, one more teacher (T5) advocates for further guidance specifically tailored for future teachers, suggesting, *"AI can be utilized, but to build a strong foundation of knowledge as future teachers, additional guidelines must be provided."* This highlights the necessity for ongoing development of AI policies that cater not only to current educational needs but also to the preparation of future educators in navigating and leveraging AI technologies efficiently and effectively.

Discussion

To construct a coherent narrative that discusses the key points of the findings and smoothly delineates the objectives of this paper for both student and teachers' feedback on the use of generative AI and the guidelines presented to them, three subtopics are put forward: (1) revealing the obvious, (2) refining the guidelines, and (3) responding to critical needs.

Revealing the Obvious

The enthusiasm among university students for the integration of generative AI into the educational landscape highlights a forward-looking perspective toward technology's role in the university. Students (like UG28 and G4) embody this optimism, seeing AI as a tool that not only

simplifies academic tasks but also opens doors to professional development opportunities. This optimism is shared broadly among the student body, where AI is perceived as a catalyst for enhancing educational efficiency and personalizing the learning experience. There is widespread optimism among students who view AI as a key to enhancing educational efficiency and personalizing learning experiences. This positive outlook toward AI tools mirrors findings by Miyazaki et al. (2024) and Tlili et al. (2023) who observed a similar sentiment in social media among users across various industries. Seemingly, students are particularly enthusiastic about the benefits of future AI literacy training, ready to leverage AI's potential to innovate traditional educational frameworks. This is crucial for promoting their integration and improving learning outcomes. Consequently, the study's participants generally perceived the use of AI tools as beneficial to their learning environments.

Conversely, teachers' perspectives on AI integration are shaped by a rich experience that ranges from formal education settings, as one teacher's (T4) overseas experience exemplifies, to the pragmatic application of AI tools in day-to-day academic operations, as practiced by another teacher (T2). This diversity in exposure contributes to a more distinct understanding of AI's role in education among teachers, who recognize its benefits but also approach its integration with caution. Acknowledging AI's capacity to enrich teaching and learning experiences, educators underscore the critical importance of upholding academic integrity and retaining the authentic human touch. Bozkurt (2023b) contributes to this dialogue by categorizing content generation into two types: "organic (human-created)" and "synthetic (generative AI-created)" that introduces a nuanced approach to integrating AI in content co-creation. He then delves into the multifaceted roles of generative AI and promotes the necessity of open disclosure to ensure academic integrity (Bozkurt, 2024). Therefore, both educators and learners must engage with AI responsibly, in a manner that not only enhances educational success but also remains true to ethical guidelines and upholds the core principles of education.

Refining the Guidelines

The feedback from both students and teachers signals a consensus on the need for guidelines that are not only clear and comprehensive but also adaptable to the dynamic nature of AI technologies. Students, through voices like G12 and UG23, advocate for policies that outline the ethical use of AI, emphasizing its role as a supportive tool rather than a substitute for human interaction. This perspective highlights a desire for guidelines that facilitate responsible AI use, ensuring that technology serves as an enhancement rather than a hindrance to the learning experience. Echoing this sentiment, Wang et al. (2023) maintain that students who perceive their learning contexts as more supportive are notably more eager to engage in AI-enhanced learning, illustrating the positive correlation between supportive educational environments and the willingness to adopt AI for learning.

Reflecting on their varied experiences with AI, teacher participants appeal for flexible policy frameworks capable of accommodating the diverse requirements of educational environments. The call for policy development, articulated by T1 and T13, underscores the importance of creating guidelines that are broad enough to cover general principles yet adaptable to address specific educational contexts. Notably, Delcker et al. (2024) stress the vital contribution of educators and stakeholders in higher education to illustrate the impactful applications of AI tools. Thus, guidelines adopting a balanced approach that receive positive reception and feedback from participants will significantly make the guidelines more relevant and inclusive.

Participants' feedback suggests the need for guidelines that not only cover a wide range of AI-related issues but also remain sensitive to the specific contexts in which AI is used. These guidelines should empower both educators and learners to engage with AI technologies in meaningful and effective ways. Moreover, the emphasis on comprehensive yet flexible guidelines suggests a pathway toward more effective and ethical AI integration in educational settings, catering to the evolving needs of the academic community. On this note, Besley et al. (2023) recommend formulating an integrity statement, establishing explicit course policies, and steering clear of academic power misuse, course instructors could enhance the reciprocity between learning and teaching dynamics. Considering the feedback and additional points, the proposed balanced approach guidelines articulate a wide breadth in scope and profound depth in adaptability, providing more inclusive opportunities for teachers and students to communicate meaningfully and purposively. This facilitates the achievement of the competencies that a particular coursework aims to accomplish, yielding significant results.

Responding to the critical needs

The critical need for AI literacy and adequate resources emerges as a central point in the discourse on AI integration. Both students and teachers highlight the importance of strategies that enhance understanding and familiarity with generative AI tools, indicating a gap between current educational practices and the potential offered by AI technologies. The concerns raised by teachers (T1 and T3) about the readiness of campuses for AI adoption, specifically in terms of infrastructural and human capital development, align with the findings of Lin et al. (2023) regarding sustainable education. These perspectives highlight the critical role of education in building a sustainable future while also pointing out significant challenges, including inadequate infrastructure, limited resources, and a lack of awareness and engagement. These issues underscore the necessity for a holistic approach to AI integration and sustainable education, which involves not only training programs and resource allocation but also significant investments in technology and infrastructure.

Furthermore, the call for additional guidelines tailored to the unique challenges and opportunities of AI integration emphasizes the ongoing need for support mechanisms that facilitate the ethical and effective use of generative AI in education. This encompasses a broader requirement for policies that not only guide responsible AI use but also ensure educators and learners are equipped to navigate the complexities of generative AI integration. In this regard, Tlili et al. (2023) reveal that while the majority of early adopters in educational settings are optimistic about the role of ChatGPT in enhancing education, there remains a segment of the community that advises caution regarding its integration. It stresses the need for a methodical and deliberate approach to weaving AI into educational systems. This entails not only establishing explicit guidelines and examples to prevent unethical use of AI in academia but also balancing the curriculum to foster skills development. Such a curriculum should encourage critical thinking, creativity, and innovation, with or without AI support. Additionally, it should also call for an ongoing process of review and adjustment to stay aligned with the fast-paced advancements in the AI field.

At the core of the proposed guidelines is the crucial role of teachers in guiding and mentoring students toward ethical and responsible AI use. Barrett and Pack (2023) argue the importance of educators undergoing targeted professional development programs to effectively apply generative AI in educational settings, in addition to the creation of clear guidelines.

Therefore, providing academics with the necessary toolkit and training is mission critical to render the balanced approach guidelines usefulness and relevance. By upskilling human resources and filling the gaps, educational institutions can foster an environment where AI is seamlessly integrated into teaching and learning processes, enhancing the educational experience while safeguarding against potential pitfalls. This approach aligns with the collective insights advocating for a comprehensive strategy that embraces the transformative potential of AI technologies while making sure that the integration of AI into education is informed, effective, and aligned with educational goals. Another consideration is to view the educational application of AI from what Swindell et al. (2024) suggest anchoring philosophical perspectives on technology, education, and society integration, with a focus on the enduring aim of creating an education that empowers individuals to act effectively in the world.

Conclusion

The study proposes a balanced, adaptable, and context-specific guidance for embedding generative AI within the teaching and learning processes at the university level and individual levels. Grounded in the AI Ecological Education Framework, it offers a wide-ranging set of guidelines across six key sections—rationale, position, key terms, guidelines for teachers, guidelines for students, and guidepost. These guidelines are designed with flexibility in mind, empowering educational institutions or individuals to tailor such to their unique contexts, needs, strategic goals, and overarching visions. Input from both educators and students has been crucial, providing significant contributions towards the formulation and enhancement of these policies. Nevertheless, the study acknowledges its limitations, notably its primary focus on a relatively small campus, which may not reflect the broader spectrum of higher education settings in the Philippines. Additionally, the research centered on text-based generative AI tools and involved participants from classes directly taught by the researcher, as well as the immediacy with teacher colleague focus group participants, introducing potential biases inherent to insider-led research projects.

Students' feedback on integrating AI into education highlights its benefits, such as simplifying tasks and fostering advancement. However, concerns about creating intellectual dependency and ethical challenges are also prevalent. Beyond the essential need for clear guidelines on AI integration, with a focus on enhancing AI literacy, there is a consensus on the importance of balanced AI use. This calls for the establishment and/or adoption of proposed guidelines that not only ensure the responsible application of AI but also promote synergy between AI capabilities and human contributions in the learning process. Similarly, teachers' reflections on incorporating AI into the teaching and learning ecosystem reveal a nuanced understanding that spans its potential to revolutionize education and the intrinsic challenges it poses. Acknowledging AI's role as an augmentative tool rather than a replacement, teachers stress the importance of human elements in learning, the necessity for comprehensive yet context-specific guidelines, and targeted training to ensure ethical use and substantial investment in campus AI readiness. Thus, striking a balance between leveraging AI for educational benefits and mitigating concerns pivots on sustaining institutional values and promoting academic integrity, alongside establishing a sound university departmental framework that also recognizes individual teachers' autonomy.

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Declarations

The author has no competing interests to declare. The study is conducted solely by the author with the Institutional Review/Clearance to Proceed REC Code: 2024-111. The datasets used and/or analyzed in this project are available from the corresponding author upon reasonable request. The research project was completed without the benefit of internal or external financial support.

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Appendix A

A Model for a Balanced Approach to Guidelines in Integrating Generative AI in University-level Teaching and Learning

RATIONALE

The faculty members and students of _____
[University/College/Department] belong to a community of scholars, practitioners, and lifelong learners who embody the institution's core values of _____
[University's/College's core values] whether online or offline in the pursuit of academic excellence for _____ **[Fitting the Organization's key philosophy/vision or mission]**. In an era redefined by rapid technology breakthroughs, generative artificial intelligence's (AI) relevance can no longer be discounted; generative artificial intelligence has emerged as a potent tool in the educational landscape. As the academic community strives for transparency and accountability through rigorous research, innovative teaching, and dedicated institutional and community service, it is critical to adapt to the changing educational landscape and explore how generative AI may enrich and transform the teaching and learning experience.

_____ **[University/College] POSITION**

Similar to an international topnotch university¹,
 _____ **[University/College]** adopts an **inclusive and forward-thinking position** regarding the utilization of AI tools as a constructive and game-changing force in education. This includes integrating such tools into the academic works fostering innovative approaches for learning, teaching, and assessment practices. Thus, these baseline guidelines aim to navigate the dynamic terrain of AI integration in our academic coursework, forging a critical balance between harnessing the potential of AI (for) as a tool in advancing educational

transformation and the human capacity to ensure that the values of academic integrity and critical thinking are not disregarded and the development of essential skills are not compromised.

As a professional community of practitioners and lifelong learners,

_____ [University/College] shall nurture time-tested traditions while embracing innovation and future readiness to create a policy compass for the ethical, honest, responsible, and fair use of generative AI encompassing a wide array of academic works for both teachers and students. It is aimed that the utilization of relevant and appropriate generative AI will become part of the routine work among academics and students beginning the

_____ [Term/Semester Academic Year].

KEY TERMS

Generative Artificial Intelligence. UNESCO² defines generative Artificial Intelligence (AI) as “technology that automatically generates content in response to prompts written in natural language conversational... where content can appear in formats that comprise all symbolic representations of human thinking: texts written in natural language, images (including photographs to digital paintings and cartoons), videos, music, and software code.” Some AI tools available online include but are not limited to conversational models like ChatGPT, Copilot, Gemini, and others.

¹ The Hong Kong Polytechnic University "Guidelines for Students on the Use of Generative Artificial Intelligence (GenAI)," Academic Registry, accessed [December 2023], <https://www.polyu.edu.hk/ar/students-in-taught-programmes/use-of-genai/>.

² UNESCO. “*Guidance for generative AI in education and research*” accessed [November 2023], UNESCO Publishing. <https://unesdoc.unesco.org/ark:/48223/pf0000386693>

Plagiarism. It is generally defined as when the words or ideas of others are evident in one’s work (excluding common knowledge) without appropriate attribution, credit, or acknowledgment. Giving credit to the source of works of others is not limited to citing or attributing human authors. Using raw or unprocessed AI-generated content should be properly acknowledged also; failure to do so or attribute comprises plagiarism.

Authorship³. In the context of scholarly works classified as copyrightable and noncopyrightable, the term “author” is exclusive to “human-authored works”. The author is the one “to whom anything owes its origin; originator; maker; one who completes a work of science or literature” or other creative published forms of expression. Nonetheless, if “raw” AI-generated content or output is borrowed or incorporated into one’s work, it should be acknowledged properly by giving credit to the author of the algorithm or AI system.

Ethical and responsible use of AI⁴. Responsible and ethical use of AI tools revolves around the transparency of utilization (truthful disclosure about use of AI), respect for privacy (users’ data protection), accuracy of information (users’ responsibility for multiple verifications of content), fairness and non-discrimination of AI (inclusivity of training data), AI literacy (learning proper use) and irreplaceability of human teachers (human in the loop). Thus, teachers, and students will

NOT solely rely on AI tools-generated content in doing role-and-task-specific assessments and decision-making.

GUIDELINES FOR TEACHERS

Course Development. The use of generative AI in the design or development of courses for all levels (short courses, undergraduate, graduate, etc.) aims to:

- Ensure the fulfillment of program/course, learning outcomes or objectives
- Improve efficiency in the content creation and refining of course materials
- Assist in curating relevant, current, credible, and context-sensitive learning resources
- Augment other technologies to cater to a variety of learning preferences and outcomes
- Enhance the learning experience for all diverse learners by fostering higher-level soft and hard life skills

Course Implementation. Faculty members are encouraged to **explicitly** communicate to their students the following:

- The permissible usage of AI, as well as specifying instances where and when its use is restricted, including its application or not in both formative and summative assessments.
- The acceptable usage of AI in assisting learning (i.e, as an online tutor, evaluator and/or content co-creator [the level/degree/amount in percentage of the total work]) which is highly dependent on the course objectives set to attain.
- The claim and implications of authorship with works created with generative AI assistance.
- The criteria, weight, and scope of assessment tasks or rubrics for submitted outputs, if applicable.

³ U.S. Copyright Office, Library of Congress. “Copyright Registration Guidance: Works Containing Material Generated by Artificial Intelligence (88 FR 16190)”. accessed [November 2023] <https://www.federalregister.gov/documents/2023/03/16/2023-05321/copyright-registration-guidance-works-containing-material-generated-by-artificial-intelligence>

⁴ Mhlanga, D. (2023). Open AI in education, the responsible and ethical use of ChatGPT towards lifelong learning. SSRN Electronic Journal. <https://doi.org/2/10139/ssrn.4354422>

- The ethical, honest, responsible, and fair use of generative AI thereby upholding academic integrity and/or honesty in all academic course works.
- The ramifications in the event of guideline infringement on their academic standing and scholarship prospects.

As stated earlier, **academics** will NOT solely rely on AI tools-generated content in doing role-and-task-specific assessments and decision-making. They will take all necessary options to validate and/or triangulate the integrity of students’ submissions including the use of similarity detection tool(s) and multiple modes of assessments.

GUIDELINES FOR STUDENTS

To avoid committing academic dishonesty in the use of AI tool(s), students must do these **6Cs**:

- **Consulting.** Be mindful of the instructions provided by their teachers and in the lack thereof or absence of explicit directions, seek clarifications from their teachers.
- **Citing.** As responsible and ethical users of AI, authors need to cite in text with appropriate inclusion in the reference list any AI-generated content in their works. See McAdoo's recommendations⁵ for updated and concise steps on how such content or output can be integrated in one's work following the 7th edition of the American Psychological Association publication manual. Apart from citing, academics may require you to include in your submission 'prompts' used in generating content. Always keep a record of the *prompts* used.
- **Checking.** Not all materials or content generated by AI are trustworthy. It is prudent to check for other reliable or credible primary sources and cite such information rather than solely rely upon AI-generated materials. Remember, academics may limit to a certain extent AI authorship on students' work.
- **Correcting.** Adapted from the London School of Economics and Political Science⁶, the use of AI for general language editing or proofreading work should be limited to:
 - spelling and punctuation;
 - ensuring the work follows the conventions of grammar and syntax in written English;
 - shortening long sentences and editing long paragraphs;
 - changing passives and impersonal usages into actives; and
 - improving grammar, spelling, and punctuation of any text
- **Confessing.** Students should explicitly acknowledge any support received including how AI is used to generate content. The succeeding **Acknowledgement Statement and AI Disclosure inclusion** should be properly and truthfully accomplished and appended to the student's major coursework or requirements submitted.

Acknowledgment: Specify here the person or organization (if applicable) if you received allowable/acceptable support or assistance like minor language editing and technical support for the videos including **IF** part or entirety of work(s) is/are submitted to other courses among others. _____

⁵ McAdoo, T. (2023, April 7). How to cite ChatGPT. <https://apastyle.apa.org/blog/how-to-cite-chatgpt>

⁶ London School of Economics and Political Science. (2022). Statement on editorial help for students' written work. <https://info.lse.ac.uk/Staff/Divisions/Academic-Registrars-Division/Teaching-Quality-Assurance-and-Review-Office/Assets/Documents/Calendar/StatementOnEditorialHelp.pdf>

AI Utilization Declaration.

I/We declare that Generative AI tools have **not** been used to produce the submitted

work. State your reason(s) for **not** using Generative AI tools. _____

I/We declare that Generative AI tools have been used to prepare the submitted work. The **Generative AI tools used** and **the way they were used** are as follows:

- **Controlling.** Regulate but not limit oneself in using AI within the acceptable, honest, and ethical bounds thereby not committing any unacceptable or unethical act.

GUIDEPOSTS

Academics are **encouraged** to design and implement coursework with minimal to optimal opportunities to accommodate the use of Generative AI. Thus, updating curricular programs, syllabi, course documents, and other relevant materials with the consideration of these guidelines is necessary.

Building on the AI Ecological Education Policy Framework⁷, the _____ **[Head of the HEI/Campus/Department]** shall constitute a multidiscipline body to advocate AI integration in teaching and learning in the _____ **[university/college/unit]**. With the leadership of the _____ **[VP of Academics/Head/Dean]**, this body shall campaign on upskilling drives, programs, and activities toward furthering internal stakeholders’ competence on “AI for education readiness” or “AI literacy”. Moreover, they shall update and recommend additional guidelines, code of conduct, and other implementing frameworks or mechanisms for AI integration in higher education with consultation with internal and external stakeholders. Consequently, AI and other digital infrastructure should be accessible to all members of the academic community.

The need to invest more in the soft digital AI tools and/or infrastructure for the university’s future readiness or “AI readiness” becomes inevitable too. In doing so, additional policy formulation and/or updates on the selection and deployment of AI tools including preventive and corrective and/or disciplinary measures for any future infringement of this initial guide warrants to be looked forward to and acted upon.

Finally, while the risks of using AI persist, the _____ **[University/College/Department]** sees this challenge as an opportunity to model how the AI tools can be incorporated into a balanced approach thereby using appropriate generative AI responsibly and ethically in innovating and future-proofing the teaching and learning experience.

⁷Chan, C.K.Y. A comprehensive AI policy education framework for university teaching and learning. *Int J Educ Technol High Educ* **20**, 38 (2023). <https://doi.org/10.1186/s41239-023-00408-3>

Harnessing Generative AI (GenAI) for Automated Feedback in Higher Education: A Systematic Review

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Abstract

In this systematic review, we synthesize ten empirical peer-reviewed articles published between 2019 and 2023 that used generative artificial intelligence (GenAI) for automated feedback in higher education. There are significant opportunities and challenges to integrate these tools effectively into learning environments as the demand for timely and personalized feedback grows. We examine the articles based on instructional contexts and system characteristics, identifying critical implementation possibilities for GenAI in automated feedback. Our findings reveal that GenAI provides diverse feedback across various contexts with multiple instructional purposes. GenAI systems can reduce instructor workload by automating routine grading and feedback tasks, allowing educators to focus on more complex teaching responsibilities with augmented capabilities. Additionally, these systems enhance communication, offer cognitive and emotional support, and improve accessibility by creating supportive, stress-free learning environments. Overall, implementing GenAI automated feedback systems improves educational outcomes and creates a more efficient and supportive learning environment for students and instructors. We conclude with future research directions to better integrate GenAI with human instruction by

reconsidering instructors' roles, especially in providing feedback to create more effective educational experiences.

Keywords: Generative AI, chatbots, artificial intelligence, higher education, automated feedback, human-AI interaction

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Recent advances in generative artificial intelligence (GenAI) have created new opportunities to explore how to integrate this technology into instructional practices. One area where GenAI has potential is through streamlining and scaling up instructor feedback. Particularly in online learning environments, providing personalized and formative feedback to learners can be challenging as course sizes increase without a comparable increase in instructors. In addition, there is a high demand from students for quality feedback (Moore et al., 2023; Mulliner & Tucker, 2017) and its utility in many aspects of learning, including increasing motivation (Koenka et al., 2021), promoting self-regulated learning (Lim et al., 2021), and enhancing students' academic achievement (Cai et al., 2023). Feedback enhances students' ability by guiding their learning process, and there are three central proposed mechanisms by which it does so (Shute, 2008). First, formative feedback signals a gap between learners' current performance and desired performance, thus reducing uncertainty about their current level. Second, formative feedback can help reduce learners' cognitive load via personalized feedback providing scaffolding. Lastly, feedback provides learners with helpful information for correction when it is specific enough to address learners' misunderstandings. Thus, a concerted effort has been made to automate feedback to increase the amount (Bälter et al., 2013) and enhance the quality and timing (Van der Kleij et al., 2015). Evidence for the effectiveness of automated feedback and high student satisfaction (Bayerlein, 2014) and the advancements of Natural Language Processing techniques has spurred interest in studying automated feedback (Deeva et al., 2021; Yan et al., 2024).

The Promises and Concerns of Using Generative AI for Feedback in Higher Education

Given the labor-intensiveness of providing quality and timely feedback, there has been consistent interest in integrating technology into instructional practices. AI has been at the forefront of the trend, with the acceleration further fueled by the impact of the COVID-19 pandemic. AI in Education (AIEd), which refers to the application of AI technologies to support and enhance educational practices, has garnered attention from educational researchers and educators around the world with unique expectations around using it to enhance learning, teaching, assessment, and administration (Chiu et al., 2023). The interest in AI was amplified with the introduction of ChatGPT in 2022, intensifying global curiosity and attention toward AI applications in education.

Generative AI uses deep learning models to produce human-like content, such as images and text, in response to complex prompts, including languages, instructions, and questions (Bozkurt & Bae, 2024; Lim et al., 2024). Examples include ChatGPT and Claude, which can create personalized and interactive learning experiences that enhance students' learning outcomes (Swindell et al., 2024). GenAI can function similarly to a personal assistant through language manipulation and generation capabilities (Bozkurt & Bae, 2024). While there are several categories of GenAI, the focus has been on text generation, especially in higher education. The term "Large Language Model" (LLM) refers to generative AI models that utilize extensive pre-trained text data to produce human-like text content (Yan et al., 2024). These systems leverage LLMs to comprehend and generate language, thereby playing a crucial role in educational settings (Bozkurt & Bae, 2024). Picciano (2024) explains that LLMs, such as ChatGPT, are trained on vast datasets to predict and generate coherent, contextually appropriate language outputs. This capability facilitates various educational tasks, including essay writing and providing personalized feedback.

GenAI harnesses Natural Language Processing (NLP) techniques to utilize large language models to understand natural language patterns and generate human-like text, facilitating automatization.

In the context of feedback, GenAI enables what could be conceptualized as AI-generated feedback (Banihashem et al., 2024; Farrokhnia et al., 2023), and it is expected to facilitate effective feedback practices (Katz et al., 2023). AI-generated feedback shares the features of timeliness and abundance with other automated feedback systems. However, using pre-trained language models such as BART and GPT-based models, AI-generated feedback is expected to provide more personalized and qualified feedback for more complex tasks (Dai et al., 2023) because it does not require specialized training to adapt to different tasks. Also, integrating AI-generated feedback creates opportunities for real-time collaboration (Yan et al., 2024) and interactive learning in online discussions (Lin et al., 2024), which often leads to increased student engagement in learning tasks (Michel-Villarreal et al., 2023; Smolansky et al., 2023). Providing feedback on essay writing (Chieu et al., 2023; Farrokhnia et al., 2023) and language learning (Barrot, 2023) has been especially prevalent.

There are naturally some concerns specific to AI-generated feedback, considering the heavy reliance on writing tasks, especially in higher education settings. Main concerns have been centered around accuracy, reliability, and plagiarism while using a GenAI tool, which could be problematic in the context of student learning and academic integrity (Michel-Villarreal et al., 2023; Moore et al., 2023; Swindell et al., 2024). Especially regarding accuracy and reliability, past research raised concerns over the possibility of students receiving inappropriate feedback, often leading to decreased tool use (Jasin et al., 2023). Also, with the accelerated adoption of AI-based feedback tools in online learning environments and decreasing human touch within the process, AI-generated feedback systems could lead to students' misuse or abuse of the system, especially when institutional guidelines are unclear. Ethical concerns about the potential reinforcement of biases and the impact on human agency and critical thinking skills have also been posed (Moore, 2019; Swindell et al., 2024).

The suspected problems embedded within the AI-generated feedback system could be more deeply understood from an AI-human interaction framework, which posits that AI could play very different roles depending on how it interacts with other components within an educational system (Xu & Ouyang, 2022). However, there is a lack of research on the roles that instructors play within classrooms interacting with GenAI. Also, our understanding of how and to what extent AI that generates text may enhance feedback practices and its capacity to improve feedback's effectiveness, timeliness, and personalization is somewhat limited.

Background

Due to the increasing emphasis on self-regulated and personalized learning coupled with the demanding nature of providing feedback, numerous initiatives have been aimed at creating automated feedback systems. As technology evolves rapidly, there have been significant advancements in how feedback is delivered and utilized within instructional settings (Conrad & Dabbagh, 2015; Elsayed & Cakir, 2023; Pishchukhina & Allen, 2021; Vittorini et al., 2021). Cavalcanti et al. (2023) synthesized 63 articles that used automated feedback systems and evaluated the systems' effectiveness in increasing students' learning outcomes and unburdening instructors' workloads. Their findings were that automatic feedback might be as effective as manual feedback provided by instructors. They also found that while utilizing an automatic

feedback approach could improve student outcomes and support instructors, there is still a limited understanding of how instructors integrate these tools into their classrooms. Also, this review is further limited in that most of the studies included were designed to provide feedback for a specific context, which is not generalizable to other contexts.

Deeva et al. (2021) presented a comprehensive classification framework for automated feedback, synthesizing 109 automated feedback systems. According to their framework, educational technologies (“architecture”), the educational settings in which they are applied (“educational context”), the properties of automated feedback they deliver (“feedback”), and the approaches for their design and evaluation (“evaluation”) form the core of the systems. Also, they asserted that more attention should be paid to the students to provide more personalized feedback. While this comprehensive review offers a valuable tool for designing and understanding automated feedback systems, it emphasizes the importance of students providing more personalized learning experiences rather than implementing the systems within real-world settings involving different stakeholders.

Banihashem et al.’s (2022) higher-education-focused study provided insights into the potential of learning analytics’ use for feedback regarding stakeholders, objectives, data used, and learning analytics methods in practice. The findings did not emphasize the automatic aspect of the learning-analytics-based feedback systems analyzed but provided insights into the underlying objectives of these automatic feedback systems in higher education settings including reflection, personalization, and expected outcomes such as enhanced academic performance, self-regulation, and motivation.

Several reviews focus on the use of Generative AI in education. Bahroun et al. (2023) comprehensively reviewed GenAI in educational settings, including its application in higher education contexts. They found that publications focused on integrating GenAI tools (Chaudhry et al., 2023) and students’ acceptance and use of GenAI (Strzelecki, 2023). Some reviews attempt to understand the potential of using GenAI or large language models in educational contexts, although they do not specifically focus on feedback. For instance, Yan et al. (2024) outlined the current usage of LLMs in supporting educational tasks. They reviewed 109 articles and found that, by using many different models of LLMs, including BERT and GPT, important educational tasks such as providing feedback, generating content, and offering recommendations were being automated. While some emphasized teachers as agents of implementing automatic systems boosted by LLMs, they were considered more passive implementers than active designers of learning experiences.

Additionally, Kasneci et al. (2023) outline opportunities for adopting LLMs in education, emphasizing the affordance of LLMs in personalizing learning for individual students. They identified two major developments that made significant advancements in NLP: the use of transformer architecture and the underlying attention mechanism, which augmented past models to understand human language better, and the use of pre-training, which broadened the scope of tasks that language models could address. However, they also raised concerns about the lack of interpretability and ethical considerations. While the authors mention the opportunities to use LLMs for assessment and evaluation by identifying students’ difficulties and providing personalized feedback, empirical evidence was limited to specific cases that adopt these approaches.

In summary, past review literature on automatic feedback systems helps us understand the core components (Deeva et al., 2021) and essential applications of automatic feedback systems (Banihashem et al., 2022), especially in higher education. Furthermore, several reviews on Generative AI or LLMs offer essential implications for augmenting past automatic feedback systems (Kasneji et al., 2023; Yan, 2024), highlighting a research gap at the intersection of these fields.

Purpose

While several prior systematic reviews have focused on automated feedback systems or GenAI, we identified gaps in these reviews. First, previous studies did not focus on feedback using generative AI (Cavalcanti et al., 2023; Deeva et al., 2021). This is important because LLM-based GenAI differs from other automated systems in terms of their affordances (Kasneji et al., 2023; Yan et al., 2024). In addition, previous research has paid limited attention to implementing automated feedback in higher education settings, particularly the role of instructors in designing and implementing automatic feedback (Cavalcanti et al., 2023; Banihashem et al., 2022). Cavalcanti et al. (2023) explored the impact of automated feedback on teachers primarily from the workload perspective. Banihashem et al. (2022) focused on different uses of LA-enabled feedback systems but were limited in understanding instructors' active roles. AI can play very different roles depending on how it interacts with other components within an educational system (Moore et al., 2023; Xu & Ouyang, 2022), signaling a need to pair the emerging interest in GenAI with the interest in implementing automated feedback systems to frame our systematic review. Our systematic review answers the following questions:

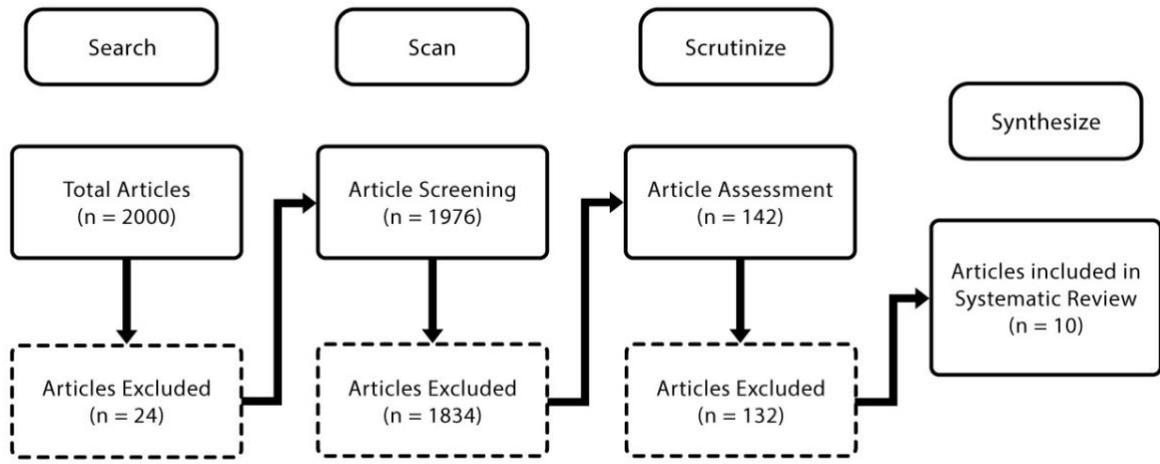
1. What are the contexts of GenAI automated feedback systems?
2. What are the characteristics (instructional purpose, format, mechanism, technology) of GenAI automated feedback systems?
3. What are the possibilities for GenAI automated feedback systems in higher education?

Methods

We conducted a systematic review to identify peer-reviewed articles that address specific research questions, following the methodology outlined by Arksey and O'Malley (2005). Our approach adhered to the PRISMA principles (Liberati et al., 2009) for systematic reviews, and the steps we followed are summarized in Figure 1.

Figure 1

Article Selection Process. (Adapted from Liberati et al. (2009))



Our search was limited to peer-reviewed articles published in English between 2019 and 2023, utilizing the Academic Search Premier and Education Source databases. These databases are commonly employed for education-focused systematic reviews (Moore et al., 2024; Moore & Miller, 2022; Powers & Moore, 2021). Our search terms were: ("conversational agent*" OR "conversational AI" OR "generative ai" OR "GenAI" OR "chatbot*" OR "generative artificial intelligence" OR "language model*" OR "LLM*" OR "pre*trained language model" OR "natural language processing" OR "NLP") AND ("student*" or "learn*" or "teach*" or "instruct*") AND "feedback" OR "assess*" OR "eval*" AND ("higher education" OR "college" OR "university" or "grad*" OR "undergrad*"). The "*" is added for wildcard searches. Initially, we retrieved 2,000 studies, which were then reduced to 1,976 after removing duplicates for further examination.

Scan

In the next stage, we conducted a detailed scan of abstracts to refine our selection of articles, focusing on using GenAI for feedback. Dissertations and conference proceedings were omitted from consideration. This screening process reduced our initial pool to 142 relevant articles.

Scrutinize

We applied the inclusion and exclusion criteria outlined in Table 1 to assess the full texts of the selected articles. Each article underwent review by both authors, with any conflicts resolved by the first author to achieve consensus. Articles were excluded if they did not meet the specified criteria, and a reason for exclusion was provided in each case. This process led to the removal of 132 articles. The most common reasons for exclusion included a non-higher-education setting (39), not focused on feedback or assessment (34), not empirical (23), and no context for implementation (12). We assessed the articles' quality by using their ranking within SciMago. This technique of using only Q1 or Q2 journals has been used in prior systematic reviews (Bano et al., 2018; Moore & Blackmon, 2022; Moore et al., 2024).

Table 1

Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Published between 2019-2023 in English	Article was a book chapter, conference proceeding, or dissertation
Peer-reviewed and empirical	Not published in a Q1 or Q2 journal*
Focused on higher education setting	No context for implementation

*Source: SCIMago Journal and Country rankings (<https://www.scimagojr.com/journalrank.php>)

Synthesize

After completing our screening process, we were left with ten articles. We synthesized the articles included around the three research questions and added additional citations where appropriate.

Results

Our search focused on empirical peer-reviewed journal articles published between 2019-2023 that analyzed the features of GenAI in providing automated feedback in higher education settings. The articles provided helpful insight into how GenAI is already being used to automate feedback and insights for future implementations.

RQ1: What are the contexts of GenAI automated feedback systems?

Our included articles focused on writing tasks in language, business, creative thinking, and STEM contexts (Table 2).

Table 2

Contexts for Included Articles

Context	Included Articles
Language learning	Escalante et al., 2023; J. Li et al., 2023
Writing	X. Li et al., 2023; Wambsganss et al., 2022
Creative thinking	Hu et al., 2023; Neo, 2022
STEM	Hobert & Berens, 2023; Jasin et al., 2023; Lee et al., 2022; Memmert et al., 2023

Two articles focused on language learning (Escalante et al., 2023; J. Li et al., 2023) and used ChatGPT as a personalized feedback tool for learners. For Escalante et al. (2023), the focus was on learners who were learning English, and ChatGPT was used as a complementary instructional tool to provide immediate and personalized feedback to learners. J. Li et al. (2023)

focused on scaffolding learner support for non-native speakers trying to learn Chinese. Both studies found that the use of ChatGPT gave learners more autonomy in their learning process.

X. Li et al (2023) and Wambsganss et al. (2022) focused on academic writing and how ChatGPT could be used for writing assessments. The X. Li study focused on an undergraduate-level course and used a collection of academic papers to develop an assessment mechanism to expedite learners' feedback. Wambsganss' study focused on improving writing in business courses. Specifically, they explored whether social comparison nudging—a digital nudge that references how other learners have performed on similar tasks—coupled with automated feedback would improve the demonstration of persuasion in a short-form business pitch. Ultimately, they found higher argumentation skills in learners who received automated feedback and social comparison nudges (Wambsganss et al., 2022). An interesting finding from their study is that combining both elements contributed to higher argumentation skills.

Two studies explored how a chatbot could improve learners' writing skills (Hu et al., 2023; Neo, 2022). Hu et al. (2023) integrated a chatbot to provide students with on-demand writing support and feedback, creating personalized assistance. In Neo (2022), the chatbot was integrated to provide real-time support to improve writing confidence. Both studies highlight the effectiveness of chatbots in offering immediate, personalized feedback that fosters self-directed learning and improves writing self-efficacy and proficiency. Lastly, four studies examined chatbots in STEM contexts (Hobert & Berens, 2023; Jasin et al., 2023; Lee et al., 2022; Memmert et al., 2023). The purpose of these chatbots was to engage learners and revise their understanding as if they were engaging with a peer student in courses to learn statistics (Hobert & Berens, 2023), chemistry (Jasin et al., 2023), and public health (Lee et al., 2022).

RQ2: What are the characteristics (instructional purpose, format, mechanism, technology) of GenAI automated feedback systems?

Instructional Purpose

The included studies used GenAI automated feedback systems for personalized learning and various instructional objectives, including collaborative problem-solving, self-regulated learning, and motivation and engagement (Table 3).

Table 3

Instructional Purpose of Included Articles

Purpose	Included Articles
Personalized learning	Escalante et al., 2023; Hobert & Berens, 2023; Hu et al., 2023; Jasin et al., 2023; Memmert et al., 2023; X. Li et al., 2023
Collaborative problem solving	X. Li et al., 2023; Memmert et al., 2023
Self-regulated learning	Hu et al., 2023; Lee et al., 2022 ; Jasin et al., 2023
Enhancing motivation and engagement	Neo, 2022; Jasin et al., 2023; J. Li et al., 2023; Wambsganss et al., 2022

The most significant number of studies found GenAI-enabled feedback promising especially for personalized learning (Escalante et al, 2023; Hobert & Berens, 2023; Hu et al., 2023; Jasin et al., 2023; Memmert et al., 2023; X. Li et al., 2023). In Hu et al.’s (2023) study, students’ learning data was collected and analyzed to automatically provide students with appropriate learning support, including suggestions and resources. In Hobert & Berens’ (2023) study, the developed digital tutor integrated all learning scenarios for an entire course, providing more comprehensive and individualized student feedback opportunities. This was particularly evident for classes focusing on language learning in which students often demonstrate varying proficiency levels and demand tailored feedback (Escalante et al., 2023; X. Li et al, 2023). The concept of “scaffolding” (Memmert et al., 2023; Jasin et al., 2023) was used, and the term “feedback” was often used interchangeably.

The specific pedagogical purpose of adopting the feedback system within a course varies, ranging from facilitating students’ collaborative problem-solving (Memmert et al., 2023; X. Li et al., 2023) to supporting students’ self-regulated learning (Hu et al., 2023; Lee et al., 2022; Jasin et al., 2023). Memmert et al. (2023) used the system mainly to provide students with soft scaffolding or problem-specific support to facilitate conceptual design development with Design Science Research (DSR). AI was also used to provide feedback to warn the students about failing an online course (Hu et al., 2023) and to help students clarify their understanding during the review process (Jasin et al., 2023; Lee et al., 2022).

Other pedagogical approaches to enhance motivation and engagement, especially in online learning environments, were used via an enhanced amount of interaction (Neo, 2022), communication immediacy (Jasin et al., 2023), empathetic support (Jasin et al., 2023), providing cultural resources and a comfortable environment (J. Li et al., 2023), and social comparison nudging (Wambsganss et al., 2022).

Lastly, in addition to educational needs deriving from pedagogical needs, administrative needs to leverage GenAI to alleviate assessment burden were mentioned prevalently. For instance, X. Li et al. (2023) used the system to provide instructors with information about the composition of knowledge in students’ unstructured writing. This enabled instructors to offer more objective

feedback, regardless of their writing assessment experience. It was often used in language learning (Escalante et al., 2023; J. Li et al., 2023) and academic writing classes (X. Li et al., 2023; Wambsganss et al., 2022) to serve the purpose where a high level of feedback is indispensable, often leading to teacher burnout.

Format

Feedback often consists of varied formats to serve the purpose of the feedback. While specific details of the feedback provided within each study varied, they could be broadly categorized into three categories: information, course resources, and analysis of student’s work, with few of the systems being included in more than one category (Table 4).

Table 4

Feedback Format of Included Articles

Category	Included Articles
Information	Hobert & Berens, 2023; Hu et al., 2023; Jasin et al., 2023; J. Li et al., 2023; Lee et al., 2022; Neo, 2022
Course resources	Hobert & Berens, 2023; Jasin et al., 2023
Analysis of student work	Escalante et al., 2023; J. Li et al., 2023; Memmert et al., 2023; Wambsganss et al., 2022; X. Li et al., 2023

Sales (1993) defined feedback as information presented to the learner, and especially in an online setting, “information” is how feedback is often conceptualized. Of the ten studies, six could be conceptualized as such. Depending on the components or the specific functions of each feedback system represented in each study, the information provided in each study varied. Most common was the information that was provided upon students’ requests to help clarify their understanding via hints, reminders, definitions, or explanations (Hobert & Berens, 2023; Jasin et al., 2023, Lee et al., 2022; Neo, 2022). In other cases, more metacognitive information was provided. For instance, Hu et al. (2023) provided information about the pass rates and instructions for self-regulated learning strategies. Two articles provided feedback as suggestions for course resources (Hobert & Berens, 2023; Jasin et al., 2023). Resources recommended included video resources (Jasin et al., 2023) and files and quizzes (Hobert & Berens, 2023). In both cases, course resources were provided in addition to other content, including information.

In five of the articles, the analysis of students’ work was provided as feedback. In these cases, the contents of the feedback were often conceptualized as “insights” or “suggestions,” implying that the feedback was created based on input from the student that resulted in the assessment of the submitted work. For instance, in the case of X. Li et al. (2023), Wambsganss et al. (2022), and Escalante et al. (2023), students’ writing was evaluated via the tool, creating insights to revise and improve the work. In the case of Memmert et al. (2023), predefined templates were used to generate suggestions to facilitate the design science research process. Lastly, in J. Li et al. (2023), students were asked to use a commercialized GenAI tool to work on their writing tasks, and it could be understood that they were getting both helpful information and

analysis since the instructors could not capture how they used the tool. The instructors were not able to access student’s accounts and see how exactly students interacted with ChatGPT, thus we had to assume that the student’s were getting the information and analysis. An improvement in the research design would have required the students to submit their chatlogs as part of the assessment for that assignment.

Mechanisms

According to Shute (2008), there are three ways to explain how feedback works: signaling a gap, reducing cognitive load, and correcting information. Our analysis showed that these mechanisms could account for how the AI-generated feedback system works (Table 5).

Table 5

Feedback Mechanism of Included Studies

Category	Included Articles
Signaling gap	Escalante et al., 2023; Hu et al., 2023; Wambsganss et al., 2022
Cognitive load	Hobert & Berens, 2023; Lee et al., 2022; Memmert at al., 2023; Neo, 2022
Correcting information	Escalante et al., 2023; Jasin et al, 2023; J. Li et al., 2023; X. Li et al., 2023

One mechanism for feedback systems to be effective is by signaling a gap. For example, in the study by Hu et al. (2023), the system provides information on the probability of students passing the course, along with diagnosis and suggestions to support their self-regulated learning based on students’ learning progress. In the study by Wambsganss et al. (2022), the writing was scored based on readability and argumentativeness, highlighting the gap between the ideal and current states, while students were provided with comments on six areas of writing in the study by Escalante et al. (2023).

Feedback could enhance learning by reducing students’ cognitive load. Several ways to reduce cognitive load by providing feedback were reflected in the research. One way was promptly providing the information so students could keep learning without interruption. In the cases of Hobert & Berens (2023) and Lee et al. (2022), information needed to continue learning was provided by answering students’ questions and providing resources. Another way was by enabling access to advanced knowledge. For instance, Memmert et al. (2023) made suggestions that would otherwise have been hard to access and integrate into their submitted work. Also, in Neo (2022), depending on students’ proficiency level, they were guided to review the contents or advance knowledge. If the evaluation results indicated that students achieved a certain level of proficiency in an area of knowledge, the bot would guide students to advanced knowledge.

Feedback could also enhance students’ learning by correcting the most common misunderstandings. J. Li et al. (2023) and Escalante et al. (2023) used the feedback system to provide students with information on their writing, specifically by identifying errors and

suggesting the correct usage. In addition, there were some cases where the system seemed to support students’ learning via all the mechanisms mentioned above, mainly when AI chatbots were used (Jasin et al., 2023; X. Li et al., 2023).

Technology

Different underlying techniques and tools were employed in each study to embody different instructional or pedagogical designs and uses of the feedback. While all the AI tools in the ten studies used Natural Language Processing techniques and machine learning to generate texts, the specific tools used to implement generative AI varied. They could be classified as commercialized tools (i.e., ChatGPT, Chatlayer) or specially designed tools to serve the particular purpose of the studies. According to the findings of this study, Generative AI embodied an automatic feedback system leveraging varying affordances. Unlike instructor feedback where students can receive feedback only when the instructors have the time to provide it, with an automatic feedback system, students can get feedback whenever they want. This implementation of on-demand feedback leveraged various technological affordances, which we have organized into into three categories: context-generalizing, course-integrating, and interpretive scoring (Table 6).

Table 6

Articles by Technology Use

Category	Included Articles
Context-generalizing	Escalante et al., 2023; Lee et al., 2022; Memmert et al., 2023; X. Li et al., 2023
Course-integrating	Hobert & Berens, 2023; Hu et al., 2023; Jasin et al. 2023; Neo, 2022
Interpretive scoring	J. Li. et al, 2023; Wambsganss et al., 2022

The first category of context-generalizable feedback includes tools developed to provide feedback that transcends specific domains and utilizes GenAI to offer suggestions without requiring problem-specific data. Because learning activities in higher education courses often underscore the importance of problem-solving and the domain for the activity is frequently up to students’ interests to enhance their motivation, it is frequently challenging for teachers to provide constructive feedback based on in-depth content knowledge. Examples include ChatGPT, T-Bert, and Chatlayer. Escalante et al. (2023) leveraged GenAI to provide writing assistance for English learners, and Lee et al. (2022) integrated GenAI to improve after-class review in a public health course. X. Li et al. (2023) developed a real-time knowledge-aware academic writing assessment tool, and Memmert et al. (2023) used GenAI to offer learners real-time problem-solving suggestions. These studies demonstrated leveraging GenAI to generate adaptable feedback without needing training data. This broadens the potential for implementation while supporting diverse learner backgrounds and specific needs, creating personalized responses.

The second category includes tools implemented to analyze student learning data and generate comprehensive feedback. Hobert and Berens (2023) developed a digital tutor chatbot to support students in a large-scale formal learning setting, providing continuous guidance throughout

the learning process and addressing the need for individualized feedback in extensive lecture courses. Similarly, Hu et al. (2023) implemented an intelligent tutoring robot (ITR) through robotic process automation (RPA) to create an early warning system that offers comprehensive learning support and timely feedback within a course. Jasin et al. (2023) focused on synchronous communication in an online chemistry course. Neo (2022) integrated a chatbot to assist students with their writing. The applications—from large enrollment courses to specific contexts—demonstrate the power and utility of GenAI in providing personalized, course-specific feedback to improve student outcomes.

The third category focuses on tools that provide scores for submitted work to provide score-attached feedback. Examples include interpretable AI, knowledge-aware strategies, and Named Entity Recognition (NER), all used to give rationales and formative suggestions. J. Li et al. (2023) developed an academic writing assessment tool using knowledge-aware strategies and NER to offer rationales and formative suggestions based on scores. Wambsganss et al. (2022) used Interpretable AI to automatically score persuasive writing assignments, providing feedback and social comparison nudging to improve argumentation skills. While both studies focused on writing assessment, J. Li et al. emphasized academic writing with detailed interpretive feedback, whereas Wambsganss et al. incorporated social comparison to enhance persuasive writing quality.

RQ3: What are the possibilities for implementing GenAI automated feedback systems in higher education?

The articles included in our study highlighted several possibilities for implementing a GenAI automated feedback system. We identified categories of transforming instructor roles, enhancing educational dialogues, and cognitive and emotional assistance (Table 7).

Table 7

Opportunities Presented in Included Articles

Category	Included Articles
Transforming instructor roles	Hobert & Berens, 2023; Jasin et al., 2023; J. Li et al., 2023; Memmert et al., 2023; Wambsganss et al., 2022; X. Li et al., 2023
Enhancing educational dialogues	Hobert & Berens, 2023; Hu et al., 2023; Jasin et al., 2023; J. Li et al., 2023
Cognitive and emotional assistance	Escalante et al., 2023; Lee et al., 2022; J. Li et al., 2023; Neo, 2022

GenAI automated feedback systems can potentially transform instructors’ roles by reducing instructors’ load and augmenting instructors’ expertise. The systems can significantly reduce instructor load by automating routine grading and feedback tasks, allowing instructors to focus on more critical and complex aspects of teaching (J. Li et al., 2023; Wambsganss et al., 2022). These systems provide personalized feedback for students, handling basic queries and analyzing their work, enabling instructors to address more detailed and challenging cases. J. Li et

al. (2023) and Wambsganss et al. (2022) demonstrated that these systems effectively manage repetitive grading and formative feedback, allowing instructors to engage in higher-level assessments and more personalized student interactions. Furthermore, Hobert & Berens (2023) and Jasin et al. (2023) emphasized that AI tools facilitate better communication and provide real-time feedback, further alleviating the burden on instructors by managing students' basic queries and offering comprehensive support throughout the learning process.

GenAI systems also enable instructors to extend their capabilities beyond traditional limits. For instance, GenAI automated feedback systems augment instructors' capabilities by complementing the specific knowledge needed for constructive learning. Memmert et al. (2023) highlighted the potential of AI to offer broad problem-solving suggestions, extending beyond the expertise of individual instructors. X. Li et al. (2023) emphasized the development of a real-time writing assessment tool that provides generalized feedback applicable across various contexts. Overall, implementing GenAI automated feedback systems enhances teaching efficiency and effectiveness by allowing instructors to dedicate more time and effort to complex and impactful educational tasks. GenAI automated feedback systems can significantly improve communication among different stakeholders within the system, including instructors, teaching assistants, and students (Hobert & Berens, 2023; Hu et al., 2023; Jasin et al., 2023). By reducing instructors' workload, these systems allow educators to provide a more tailored feedback system. In language learning classrooms, AI chatbots provide students with additional opportunities to practice dialogue, acting as knowledgeable entities that complement the instructor's role (J. Li et al., 2023). Hobert & Berens (2023) and Jasin et al. (2023) also emphasized that AI tools facilitate better communication and provide real-time feedback. Hobert and Berens (2023) showcased how digital tutor chatbots enhance communication in large-scale courses by facilitating interactions between students, teaching assistants, and instructors, thereby reducing instructor workload. Similarly, Jasin et al. (2023) demonstrated the effectiveness of chatbots for synchronous communication in an online chemistry course, providing real-time, course-specific feedback. Hu et al. (2023) developed an early warning system using GenAI to provide timely feedback and support, enhancing communication between students and the automated system. Overall, implementing GenAI systems enhances educational communication and expands the range of support available to students, leading to more effective and comprehensive learning experiences.

Lastly, GenAI automated feedback systems offer substantial cognitive and emotional benefits to students. Lee et al. (2022) demonstrated that GenAI systems enhance learning outcomes by offering tailored cognitive support. They provide individualized feedback supporting cognitive and metacognitive development, as evidenced by improved learning outcomes in public health courses (Lee et al., 2022). Escalante et al. (2023) found that AI feedback significantly improves language skills by rephrasing responses to ensure student understanding. These systems act as scaffolding for students' learning, adjusting responses to ensure complete comprehension, which enhances language skills (Escalante et al., 2023). Additionally, GenAI supports self-regulated learning by allowing students to reflect on their progress and plan their next steps, fostering a stress-free environment that encourages engagement and help-seeking behaviors (Neo, 2022).

From an emotional support perspective, GenAI automated feedback systems significantly enhance students' accessibility and interaction, particularly those who might not typically seek help (Neo, 2022; Lee et al., 2022). Neo (2022) highlighted the emotional benefits of GenAI systems, noting that they create a comfortable, non-pressured learning atmosphere that encourages students to seek assistance and engage more deeply with their studies. These systems create a comfortable atmosphere that reduces pressure and stress, making students more inclined to seek and benefit from feedback (J. Li et al., 2023). They also facilitate effective communication among students, instructors, and teaching assistants, ensuring timely and relevant feedback (Hobert & Berens, 2023). Neo (2022) and Lee et al. (2022) found that AI chatbots make it easier for students to seek assistance by alleviating stress and creating a supportive environment. J. Li et al. (2023) observed that these systems encourage greater engagement with feedback due to the comfortable learning atmosphere they foster. Hobert & Berens (2023) emphasized that GenAI tools enhance communication among all educational stakeholders, leading to more efficient and effective feedback processes. Overall, GenAI automated feedback systems not only make feedback more accessible and less stressful for students but also streamline communication, making the educational process more effective and supportive for all involved.

Discussion

This section offers insights about designing and implementing GenAI automated feedback systems.

Design of GenAI Automated Feedback Systems

This study reviewed the design of the AI-generated feedback system from various perspectives. As a result, it was found that there are differences in the design depending on the course's context and the system's characteristics (instructional purpose, content, mechanism, technology) compared to the extant automatic feedback system.

This study addressed instructional purpose in depth compared to previous systematic reviews that analyzed the purpose mostly from functional perspectives. This is because, unlike any automatic feedback system, AI-generated feedback systems are often not explicitly created for educational purposes. Thus, instructors are frequently required to make proactive decisions about how to adopt the system into the course. This study identified various instructional purposes ranging from facilitation of self-regulated learning to collaborative problem-solving, demonstrating the need for specifying the purpose of using the system.

According to Shute (2008), the purpose of feedback can be broadly divided into "directive" and "facilitative." Deeva et al. (2021) presented four purposes of automatic feedback: "corrective," "suggestive," "informative," and "motivational". They asserted that feedback can be of multiple types. Our distinction of purposes for AI-generated feedback is coherent with these distinctions but not entirely the same. This is because various GenAI tools in this study could handle diverse functions based on the learner's request, compared to the task-specific automatic feedback systems reviewed in previous review papers.

Nevertheless, we confirmed that GenAI-automated feedback still follows the feedback mechanism. Specifically, GenAI-automated feedback is also designed and utilized to improve the learner's experience through signaling gaps, reducing cognitive load, and correcting information like previous feedback systems (e.g., Shute, 2008). Furthermore, previous studies did not specify the format in which feedback was presented. This is because, although there may be differences in the specific content of the feedback provided by a single automatic feedback system, there were no differences in the forms. However, according to our analysis, the form of feedback provided by the AI-generated feedback system using GenAI could be broadly categorized into three types: information, analysis, and course resources.

Finally, compared to the methods and techniques used in the existing automatic feedback, the GenAI-automated feedback systems in this study could still be considered valid in the classification of the three feedback generation models mentioned earlier: data-driven model, expert-driven model, and mixed model (Deeva et al., 2021). Providing feedback through prompt engineering could be understood as a mixed model.

Implementation of AI-Generated Feedback Systems

There have been ongoing efforts to automate feedback, and with the advent of GPT models, it has become possible to transcend domains in feedback. Considering the role of the instructor in a learner-centered paradigm, it is vital to understand how AI-generated feedback systems augment their role. A framework delineating the role of AI in educational systems from a Complex Adaptive System perspective was proposed by Xu & Ouyang (2022). According to the authors, AI can play various roles with students and instructors as the leading learning and teaching agents, being seen as 1) a new subject, 2) a direct mediator, and 3) a supplementary assistant. Our study is coherent with the framework in that GenAI automated feedback systems analyzed in our study also perform these three roles as outlined by Xu & Ouyang (2022). For instance, in some studies, feedback systems act as a dialogue partner, serving as a new subject (e.g., Lee et al., 2022), while in others, they function as direct mediators bridging instructor, teaching assistant, and student roles (e.g., Hobert & Berens, 2023). In many studies, these feedback systems are also viewed as supplementary assistants, answering students' questions or providing emotional support (e.g., Jasin et al., 2023).

However, the studies covered by Xu & Ouyang (2022) and the ten studies analyzed in this research lack a discussion of the role of the instructor. The analysis in this study indirectly or directly mentions the role of the instructor within GenAI-automated feedback systems beyond the typical roles such as designing learning materials or giving lectures. Specifically, the following points were noted:

- Supporting students to use the tool properly (e.g., helping students recognize the limitations of the tools, preventing unintended usage or overreliance on the system)
- Providing higher-level or detailed feedback (e.g., offering clarification for confused students)

- Making final decisions or feedback (e.g., providing a comprehensive evaluation of the learning process and results)
- Prompt engineering (e.g., providing prompts that help students receive better feedback)
- Facilitating students' learning (e.g., stimulating and guiding students to further learning)

First, guidance from the instructor for using GenAI tools was most frequently mentioned (e.g. Memmert et al., 2023; J. Li et al., 2023). This guidance could be provided on an individual level by the instructor or on an institutional level in the form of guidelines to adhere to. An interesting point is that while many studies designate providing higher-level feedback, which automatic feedback fails to offer as a role of the instructor (e.g. Hu et al., 2023; X. Li et al., 2023), it is unclear what specific feedback they should provide. Considering that some studies assigned the role of complementing the instructor's expertise to AI-generated feedback systems (Memmert et al., 2023), it calls for discussion of what feedback the human instructor should provide that the system cannot. For example, one such role could be making "final decisions" when students cannot receive clear answers through automatic feedback and are confused (e.g. Jasin et al., 2023; J. Li et al., 2023). Alternatively, the instructor could provide long-term feedback that complements students' instant interaction with the AI-generated feedback system. Prompt engineering, as mentioned by J. Li et al. (2023) and Escalante et al. (2023) could also be one aspect of the instructor's role, highlighting collaboration between the instructor and GenAI to improve the quality of feedback provided.

Lastly, Hu et al. (2023) present the facilitator role of the instructor more concretely, emphasizing motivating learners to go beyond course contents by stimulating and guiding them towards further learning. This underscores the need for instructors to play a more active role in AI-generated feedback systems, where learners have more autonomy than in conventional, domain-specific, and structured systems. Because AI-generated feedback systems offer learners access to more specialized information with lower cognitive loads, instructors can more effectively facilitate students' active learning.

Limitations

Systematic reviews provide insight into the published literature that meets the requirements established by the authors. Our systematic review focused on empirical articles and used a quality assessment filter based on the journal publication. These limitations may have excluded articles that could have added insight to the systematic review. We encourage researchers to use our systematic review to identify future research directions and consider conference proceedings and dissertations, which we excluded from this review. Additionally, generative AI is an emerging concept, so we anticipate that there will be more research in the coming years that will allow a more complete picture to emerge of the landscape of GenAI. Our review did not distinguish between large and small language models (e.g., GPT vs BERT). As the field evolves and research matures in this space, we anticipate that future systematic reviews will want to consider these distinctions.

Conclusion

While artificial intelligence, specifically GenAI, is not a new concept, it is a rapidly evolving research area. In this systematic review, we synthesized the current literature on GenAI in educational contexts, focusing on articles that explored how GenAI can be used for automated feedback.

The first research question found that the contexts for GenAI automated feedback systems were not only limited to writing and language learning but also included creative thinking and STEM learning. Several aspects of the feedback systems were addressed for the second research question. First, the most widely used instructional rationale used to build the system was personalizing students' learning, which aligns with the findings from Banihashem et al. (2022). In addition, a GenAI-based feedback system was used to facilitate collaborative problem-solving (Memmert et al., 2023; X. Li et al., 2023), self-regulated learning (Hu et al., 2023; Lee et al., 2022; Jasin et al., 2023), and enhance motivation and engagement (Jasin et al., 2023; J. Li et al., 2023; Neo, 2022; Wambsganss et al., 2022). In addition to instructional purposes, assessment burden was commonly mentioned (Escalante et al., 2023; Wambsganss et al., 2022; X. Li et al., 2023), which aligns with the purpose of automated feedback systems reflected in the research by Cavalcanti et al. (2023). Next, the feedback format could be categorized into information, course resources, and analysis of student work, which often overlapped. While past research on (automated) feedback often conceptualized feedback as "information" (Sales, 1993) and focused on properties of feedback such as learner control (Deeva et al., 2021), we found that GenAI enabled providing many different formats or types of feedback possible within one system, expanding the boundary of feedback. In terms of feedback mechanisms, all three were still viable. While corrective feedback was the most common in automated feedback systems (Deeva et al., 2021), it was found that feedback systems utilizing GenAI were not only limited to correcting information but were also used to signal gaps and reduce cognitive load in this study. Specifically, providing information that students need to continue learning without being interrupted (Hobert & Berens, 2023; Lee et al., 2022; Memmert et al., 2023) or to advance learning (Neo, 2022) was found to be heavily dependent on the capacity of GenAI to create text easily. Lastly, three categories of affordances stemming from different underlying technologies were identified: AI chatbots, learning analytics-based systems, and automatic scoring-based systems. For the last research question, in addition to unburdening instructors, augmenting instructors' capabilities and providing emotional support and cognitive support for the students were identified as potential possibilities for integrating feedback systems utilizing GenAI.

GenAI has many potential applications within educational contexts, and our interest in focusing on feedback is just one part of a complex puzzle of research angles. Ultimately, the goal of integrating GenAI is to scaffold learners better. We anticipate that this systematic review will be the first of many to explore using GenAI and automated feedback.

Declarations

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Are They Literate on ChatGPT? University Language Students' Perceptions, Benefits and Challenges in Higher Education Learning

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Abstract

Despite the promising potential of artificial intelligence (AI) tools like ChatGPT for enhancing the learning experience, its integration as an educational tool in higher education poses disruptions that could affect students. This study explored university language students' usage, awareness, readiness, concerns, and perceived benefits and challenges of using ChatGPT in higher education learning. The study used an explanatory sequential mixed-method design, combining online surveys and semi-structured interviews. A total of 355 language students from five private higher education institutions in Indonesia were recruited using purposive sampling. These participants were asked to complete the closed-ended questionnaire, and nine participants were selected for interview sessions. The data was analyzed using descriptive analysis and thematic analysis. The findings reveal that a majority of students had been using ChatGPT for their learning purposes, especially for writing assignments. The findings also highlight that university language students had a high awareness, readiness, and concerns about using ChatGPT for their academic activities. Additionally, university language students acknowledged the potential benefits of ChatGPT in terms of writing support, personalized learning, increased productivity, brainstorming for generating ideas, and additional resources. However, they also identified the challenges of using ChatGPT, including inaccuracy, lack of critical thinking, plagiarism and AI detection, and technical problems. These findings provide a nuanced understanding of how university language students use and perceive ChatGPT for learning purposes, highlighting the need for support and guidance from higher education providers in the responsible use of AI in academic settings.

Keywords: ChatGPT, university students, learning, benefits and challenges, higher education

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The global expansion towards digitalization by adopting AI tools like ChatGPT has had profound impacts on various industries globally, including higher education (Kayali et al., 2023; Rasul et al., 2023; Vargas-Murillo et al., 2023). These innovations offer a range of potential benefits, including increased personalization of the learning experience and more efficient academic support for students. However, despite these promising benefits, the adoption of this technology has not been accompanied by understanding and wise use among students, particularly in Indonesian higher education, resulting in over-reliance on this tool to assist with assignment completion (Hartanto & Rohmah, 2024; Maulana & Dermawan, 2023; Suryono et al., 2023). Relying heavily on ChatGPT often leads to a superficial understanding of the subject matter, as students tend to prioritize this assistance over engaging in personal deep learning. Zhai (2024) confirmed that this reliance could stifle the development of critical academic skills, as students may bypass the rigorous cognitive processes essential for deep learning and comprehension. Consequently, this reliance has resulted in laziness in learning, diminished critical thinking and problem-solving, and decreased motivation for independent study (Acosta-Enriquez et al., 2024; Aruleba et al., 2023; Abbas et al., 2024; Obenza et al., 2024; Zhang et al., 2024). Additionally, the ability of ChatGPT to generate human-like text has raised concerns about academic integrity, with fears that students might use AI to produce work that is not their own, thus compromising the authenticity of academic submissions and the integrity of educational assessments (Huallpa, 2023; Vargas-Murillo et al., 2023).

As the use of AI tools like ChatGPT becomes more prevalent among students in Indonesia higher education as a learning tool, it is imperative to investigate the experiences of university language students' perceived usage of ChatGPT and the potential benefits and challenges of ChatGPT. Previous studies (e.g., Assad, 2024; Das & Madhusudan, 2024; Kayali et al., 2023; Michel-Villarreal et al., 2024; Obenza et al., 2024; Singh et al., 2023) have emphasized the utility and impact of AI tools like ChatGPT in education institutions. However, these studies have mainly focused on the general effectiveness and usability associated with AI tools, providing a general overview of their advantages and challenges, leaving gaps in in-depth exploration and understanding of the full implications of using ChatGPT, especially from the perspective of language students in Indonesian higher education. Specifically, the learning styles and contextual challenges faced by these students remain underexplored, necessitating further investigation to understand how ChatGPT can be tailored to support their academic development and language acquisition. These gaps hinder our understanding of how language students view and effectively integrate AI tools like ChatGPT in their academic context. To address this gap, the present study aims to assess language students' perceived usage of ChatGPT in higher education learning, identify language students' level of awareness, readiness, and concern with the use of ChatGPT in higher education learning, and identify the benefits and challenges language students perceive using ChatGPT in higher education learning. To achieve this aim, the following research questions were formulated:

1. To what extent do language students perceive the usage of ChatGPT in higher education learning?

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2. How do language students perceive their awareness, readiness, and concerns with using ChatGPT in higher education learning?
3. What are the benefits and challenges language students perceive using ChatGPT in higher education learning?

By responding to these questions, these findings offer a detailed understanding of how university language students use and perceive ChatGPT for learning, underscoring the need for support and guidance from higher education providers in effectively and ethically integrating AI into their curriculum. Additionally, the insights from this study can inform the development of training programs to assist students and educators in incorporating AI tools like ChatGPT into their teaching and learning. Ultimately, the research supports the advancement of educational technology policies and practices that are better aligned with the actual needs and experiences of students, fostering a more effective and responsible use of AI in higher education.

Literature Review

ChatGPT in Higher Education

In the field of educational technology (Edtech), AI tools, like ChatGPT, have had a significant impact on teaching and learning in higher education. Studies by Iku-Silan et al. (2023) and van Dis et al. (2023) have shown the potential of ChatGPT in enhancing various aspects of education, including programming, statistical analysis, essay and presentation generation, literature summarization, and development of educational materials. ChatGPT also aids students in writing tasks, providing advice, generating ideas, and successfully answering exam questions. This emphasizes the significant role of ChatGPT in supporting academics, researchers, and students in higher education. Additionally, recent studies (e.g., Elbanna & Armstrong, 2024; Nikolopoulou, 2024) have highlighted how ChatGPT can transform smart digital teaching and learning practices in higher education. By leveraging ChatGPT's ability to process large amounts of data, teaching methodologies can be enhanced to support personalized learning experiences. However, integrating ChatGPT in classrooms raises concerns about its benefits, drawbacks, and students' perceptions, particularly in diverse global settings with varying levels of technological literacy and educational customs. Educators must also consider the ethical implications of using ChatGPT, including concerns about data privacy, potential bias in AI algorithms, and transparency in AI-driven decision-making processes. As a result, the integration of ChatGPT in teaching and learning environments requires careful planning, consideration of curriculum design, teacher and student training, and technology infrastructure. Chan (2023) emphasized the importance of collaboration among policymakers in higher education to integrate ChatGPT-supported instruction with traditional teaching methods effectively. Addressing these challenges can help higher education institutions leverage AI technologies such as ChatGPT to create more dynamic, inclusive, and effective learning environments, potentially revolutionizing the education landscape for future generations.

Students' Awareness, Readiness, and Concerns with ChatGPT

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The impact of AI-powered language models like ChatGPT on education has been the focus of recent research studies. Scholars (e.g., Chan & Hu, 2023; Obenza et al., 2023; Rogers et al., 2024) have explored students' perceptions of ChatGPT and found that many are familiar with it and use it as a learning tool. Johnston et al. (2024) and Assad (2024) further discovered that many students are familiar with ChatGPT, with half using it primarily for academic purposes, particularly in assignments and multimedia projects. On the contrary, Singh et al. (2023) found that despite being familiar with ChatGPT, many computer science students need more skills and understanding to use it for academic purposes effectively. Kelly et al. (2023) emphasized students' lack of proficiency in using ChatGPT due to their unfamiliarity with it. In terms of readiness, a study by Chan & Hu (2023) found high-level students' readiness to incorporate ChatGPT in learning, while Güven et al. (2024) found moderate readiness among medical students, influenced by self-assessed technology skills and practical AI use perceptions. Despite the existing interest, these findings indicated a need for enhanced understanding and skills related to AI technology to optimize its application. However, the use of ChatGPT in education raises concerns about misuse, plagiarism, security, and ethical implications (Chan & Hu, 2023; Singh et al., 2023; Xu et al., 2024), potentially hindering critical abilities and reducing independence and critical-thinking skills (Obenza et al., 2023).

While there has been extensive research on university students' perceptions of ChatGPT, there is a need for more studies exploring how university students assess their awareness, readiness, and concerns about this technology. With the rising interest in ChatGPT as a learning tool among university students, it is necessary to investigate their experiences regarding its usage in an educational context. By understanding university students' attitudes and experiences with ChatGPT, we can gather valuable insights to enhance its use and ensure its effective integration into their learning experience.

Benefits and Challenges of ChatGPT in Higher Education Learning

ChatGPT is revolutionizing higher education by transforming the learning process. Researchers have explored the potential benefits and challenges of integrating ChatGPT in higher education settings. Recent studies (e.g., Chan & Hu, 2023; Fuchs, 2023; Lin et al., 2024; Michel-Villarreal et al., 2023; Younis, 2024; Zhou et al., 2024) have highlighted ChatGPT's ability to provide personalized learning support to students. It adjusts to their pace and style, offering customized explanations and immediate responses to queries. In addition, Rasul et al. (2023) emphasized ChatGPT's potential in writing assistance, stating that it can correct sentence structure and grammar, and perform editing (Graf & Benardi, 2023). Moreover, according to Chan & Lee (2023), ChatGPT significantly boosts students' productivity by automating tasks like email drafts, information searches, and grammar corrections, allowing them to concentrate on more complex academic tasks (Zhou et al., 2024). A study conducted by Zhang et al. (2023) revealed that ChatGPT is helpful for students in overcoming obstacles, sparking ideas, and brainstorming new concepts, highlighting its effectiveness as a creative ally.

Despite its benefits, the integration of ChatGPT into the educational setting presents notable obstacles. Researchers (e.g., Assad, 2024; Chan & Hu, 2023; Sallam et al., 2023; Swindel et al., 2024) highlighted the issue of inaccurate content in ChatGPT, emphasizing that the system's

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precision largely relies on the quality of training data and student input (Fuchs, 2023). Moreover, Das & Madhusudan (2024) emphasized that the ease of use and user-friendly nature of ChatGPT may result in students needing more time to rely on it, consequently impeding their capacity for critical thinking. This perspective is supported by Aruleba et al. (2023), who contend that college students who excessively rely on ChatGPT for feedback could witness a decline in their critical thinking and problem-solving skills. This overdependence could also hamper their ability to delve into and cultivate their ideas. Furthermore, concerns have been raised about the capability of ChatGPT to produce essays and aid students in fulfilling assignments, particularly in terms of plagiarism detection (Anderson et al., 2023). This issue is particularly troubling for students as there is a risk of misusing the model for content plagiarism (Michel-Villarreal et al., 2023).

Although previous researchers have explored the potential benefits and challenges of ChatGPT in higher education, more research needs to be done explicitly focusing on its use in learning within the context of higher education. Existing studies have primarily examined teaching and learning in higher education in general, leaving gaps in our understanding of how university language students perceive and use ChatGPT in their learning process. These research limitations include a lack of knowledge regarding the extent to which university students use ChatGPT for learning purposes and its effectiveness in enhancing their understanding of the subject matter. Thus, it is crucial to investigate how university students perceive the use of ChatGPT in their learning, as this will allow us to identify the benefits and challenges associated with implementing this technology in higher education settings.

Methods

Design of the Study

This study used an explanatory sequential mixed-method design, combining quantitative and qualitative approaches to comprehensively understand of a phenomenon by employing multiple data collection tools (Creswell & Clark, 2017). The benefit of an explanatory sequential using mixed methods is that it allows one method to take the lead in the analysis, while the other method provides important supplementary information (Creswell, 2014). This design was initially conducted with a quantitative phase using a descriptive approach through an online questionnaire for university language students, followed by qualitative phase employing a phenomenological approach to gain deeper insights into the participants' experiences and understanding of the impact of ChatGPT in higher education learning. Thus, qualitative findings were used to provide context to the quantitative data, enabling a more comprehensive assessment of the participants' experiences.

Participants

The participants were university language students from five private universities in Indonesia. Out of 560 university students who were given the survey, only 355 students responded. Among the participants, 106 were males (29.9%) and 249 were females (70.1%). The age range of the participants varied from 17 to above 29 years old, with the majority (55.8%) falling in the 17–20 age group, followed by 22.2% in the 21–24 age group, 12.4% in the 25–28 age group, and 9.6%

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were above 29. The participants were enrolled in various disciplines, including Indonesian and Literature Education (54.6%), English Education (26.8%), and Javanese Education (18.6%). Among the participants, 78.6% were undergraduate and 21.4% were postgraduate students. The demographic information of the respondents is presented in Table 1.

Table 1

Demographic Information of the Participants (N = 355)

Characteristic	N	%
Sex		
Male	106	29.9
Female	249	70.1
Age		
17–20 years old	198	55.8
21–24 years old	79	22.2
25–28 years old	44	12.4
Above 29 years old	34	9.6
Disciplines		
Indonesian Language and Literature Education	194	54.6
English Education	95	26.8
Javanese Education	66	18.6
Academic Level		
Undergraduate	279	78.6
Postgraduate	76	21.4
Universities		
Private university 1	94	26.5
Private university 2	83	23.4
Private university 3	66	18.6
Private university 4	55	15.5
Private university 5	57	16

The semi-structured interview participants were selected from an online survey using purposive sampling. This technique allowed the researchers to select individuals based on specific criteria relevant to the study's objectives. The selection criteria required participants to have experience with ChatGPT in an educational context and to be either an undergraduate or postgraduate student in a language-related field. The researchers identified suitable candidates through their networks and selected nine university language students from 355 survey participants. Table 2 provides details on these participants. The participants consisted of four males and five females with the backgrounds in undergraduate and postgraduate degrees in fields such as English education, Indonesian language and literature education, and Javanese education. They varied in their frequencies of ChatGPT usage for learning, providing diverse perspectives and experiences with ChatGPT in higher education. The decision to interview nine participants was based on data saturation. We determined that data saturation had been achieved (Lowe et al., 2018;

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Saldaña, 2015) by coding the ninth interview, as it did not introduce any new codes that had not already been discussed in interviews. As a result, we did not seek out additional interview participants. To ensure privacy, all participants' names have been replaced with pseudonyms.

Table 2

Demographic Information of Semi-structured Interviews Participants

Participants	Gender	Disciplines	Academic Level	Usage Level
Student 1	Female	English education	Postgraduate	Medium
Student 2	Female	English education	Postgraduate	High
Student 3	Female	Javanese education	Undergraduate	Medium
Student 4	Male	Indonesian language and literature education	Undergraduate	Medium
Student 5	Male	Indonesian language and literature education	Postgraduate	Medium
Student 6	Female	Javanese education	Undergraduate	Medium
Student 7	Female	English education	Undergraduate	High
Student 8	Male	English education	Undergraduate	Medium
Student 9	Male	Indonesian language and literature education	Postgraduate	High

Instrument

This study survey consisted of 22 closed-ended questions. In designing the survey, we adapted some questions from the work of Chan & Hu (2023) and constructed other questions based on research by Das & Madhusudan (2024). Our survey consisted of five sections. The first section gathered demographic information, including the participants' sex, age, discipline, and academic level. The second section focused on university students' perception of using ChatGPT in higher education learning. This section included questions about the participants' usage of ChatGPT (e.g., "Have you ever used ChatGPT?" 1 = Yes, 2 = No), familiarity with ChatGPT for learning (e.g., "How familiar are you with ChatGPT for learning?" 1 = Very familiar, 2 = Moderately familiar, 3 = Slightly familiar, 4 = Not familiar), frequency of ChatGPT usage (e.g., "How often do you use ChatGPT for learning?" 1 = Very often, 2 = Often, 3 = Sometimes, 4 = Not rarely, 5 = Never), and reasons for using ChatGPT (e.g., "What is your reason for using ChatGPT?" 1 = Assignment help, 2 = Self-learning, 3 = General chat, 4 = Language assistance, 5 = Writing generation). The third section assessed students' awareness level of ChatGPT (six items). The fourth section examined the readiness level to use ChatGPT (eight items). The final section addressed concerns about using ChatGPT (four items). The Likert scale was used for the third, fourth, and fifth sections, ranging from strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, to strongly agree = 5.

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We ensure the questionnaire's validity by conducting the Pearson Correlation Test. All items were found to be valid, with a correlation coefficient value (r) higher than the critical value of 0.104, which was determined based on a sample size of 355 respondents. Additionally, we assessed the reliability of the questionnaire using Cronbach's Alpha. The calculated Cronbach's Alpha value exceeded 0.60, indicating that the research instrument is reliable.

Data Collection

The online survey was distributed to university students in Indonesia using Google Forms. This approach aimed to represent the needs and values of all participants accurately. Respondents were selected using a convenience sampling method, considering their availability and willingness to participate. Participants were recruited via an online platform and provided an informed consent form before taking the survey. Each participant took approximately five minutes to complete the questionnaire. Participation was entirely voluntary, and the responses remained anonymous.

On the other hand, we gathered qualitative data by conducting face-to-face semi-structured interviews with university language students. To recruit participants, we sent WhatsApp invitations to students enrolled in private university language programs. The invitations briefly described the study's purpose, emphasized voluntary participation, and guaranteed confidentiality and anonymity. Students interested in participating responded to the invitations via WhatsApp to schedule interviews. A total of nine participants responded and agreed to take part in the study. Each interview lasted 10 to 15 minutes and was recorded with both video and audio. For the interview sections of this study, we designed four questions to explore the impact of ChatGPT on higher education learning from the perspectives and experiences of university language students. These questions were: "Have you ever used ChatGPT?" "How is your usage level of ChatGPT?" "What benefits do you perceive from using ChatGPT in higher education learning?" and "What challenges do you perceive when using ChatGPT in higher education learning?" These questions were collaboratively developed, initially based on the literature review (Chan & Hu, 2023; Das & Madhusudan, 2024) and study objectives. Two experts in educational technology and language learning reviewed and refined these questions to ensure clarity, relevance, and the ability to provide the qualitative data needed for our study. The final set of questions was verified by these experts. After the interviews, the recordings were manually transcribed verbatim. These transcriptions were then returned to the participants for member checking (Merriam & Tisdell, 2015), allowing them to review, confirm, amend, or clarify important points in the transcripts. This process was crucial for validating the accuracy of the data and ensuring that participants' perspectives were accurately represented.

Data Analysis

The data from the questionnaire was analyzed using Microsoft Excel. Descriptive analysis was used to show the frequency distribution of the responses. The analysis followed rating intervals proposed by Pallant (2016), where the average of each item was correlated with the level of agreement. The interval scale was calculated by subtracting the lowest score from the highest score and dividing by five, resulting in an interval of 0.80. This interval was used to categorize the responses as follows: a rating interval of 1.00 to 1.80 indicated strong disagreement; 1.81 to 2.60

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suggested disagreement; 2.61 to 3.40 indicated moderate agreement; 3.41 to 4.20 denoted high agreement; and 4.21 to 5.00 showed strong agreement.

The responses from the semi-structured interviews were analyzed using a thematic analysis approach (Braun & Clarke, 2006). The analysis was conducted inductively, with two coding cycles performed. Two researchers independently read and coded the responses to each question, and then met to compare their codes. The codes were combined in NVivo and similar codes were categorized. The researchers then discussed all the categories and codes, grouping them into themes based on the frequency of specific topics mentioned during the interviews. The major themes that emerged from the data were identified as the key findings of the study.

Results

Students' Usage of ChatGPT in Higher Education Learning

We investigated the students' perceptions of using ChatGPT in higher education learning. A large majority (89.2%) confirmed that they had used ChatGPT, while 10.8% reported having no experience with it (Figure 1). Among those who had used ChatGPT, approximately half of the students (52.4%) had a moderate familiarity with using ChatGPT for learning purposes, while 27.3% reported being very familiar. Only 7% indicated no familiarity, whereas 13.3% reported being slightly familiar (see Figure 2).

Figure 1

Use of ChatGPT

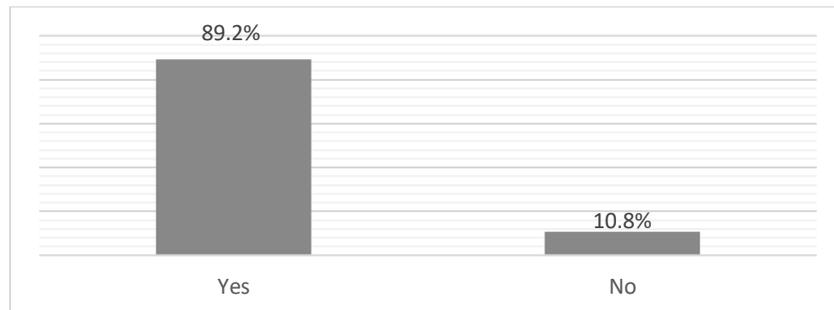
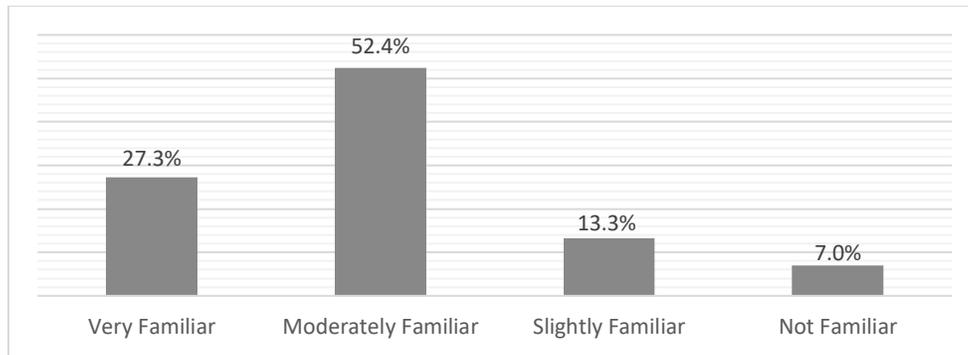


Figure 2

Familiarity with ChatGPT

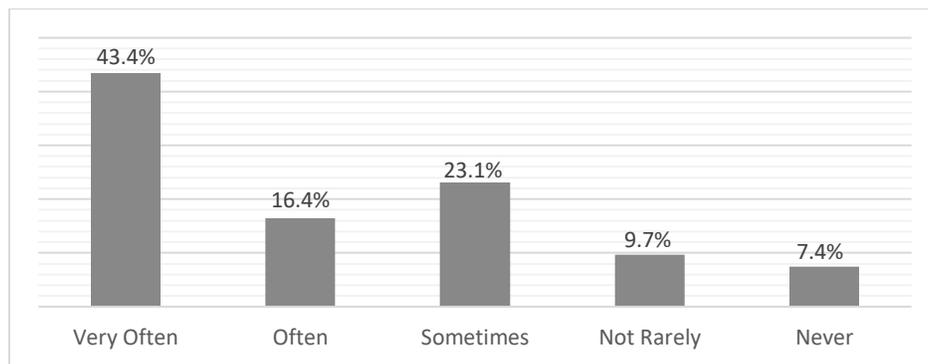
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Our survey further explored the frequency of ChatGPT usage (Figure 3). The survey results revealed that many students frequently use ChatGPT, with 43.4% reporting regular usage and 23.1% indicating occasional use. Additionally, the data showed that 16.4% of students use ChatGPT frequently, 9.7% use it quite often, and 7.4% reported never using it.

Figure 3

Frequency of Using ChatGPT

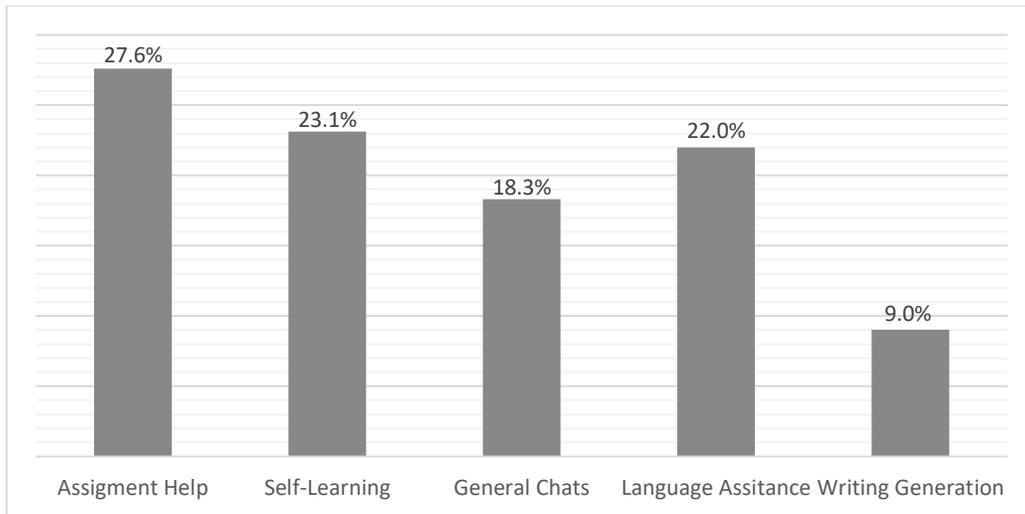


In terms of reason, the use of ChatGPT in higher education learning serves various purposes (Figure 4). The main reason for using ChatGPT is to provide assignment assistance, with 27.2% of students. Moreover, 23.1% of students use ChatGPT for self-learning, while 22% use it for language assistance. In addition, 18.3% acknowledged using the ChatGPT tool for general chats, and 9% used it for generating writing.

Figure 4

Reasons for Using ChatGPT

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Students' Perceptions of Awareness, Readiness, and Concerns with the Use of ChatGPT

We extended our analysis to comprehensively understand the students' awareness, readiness, and concern levels with ChatGPT in learning practice. Table 3 reveals the students' responses. Most students (Mean = 4.11 ± 0.72) agree that ChatGPT cannot fully handle complex assignments. They also believe this tool may overly rely on statistics, limiting their usefulness in specific contexts (Mean = 3.89 ± 0.70). Furthermore, they express concerns about the limited ability of ChatGPT to understand emotions and show empathy, which can lead to potentially inappropriate responses (Mean = 3.78 ± 0.81). The participants also believe that ChatGPT has the potential to generate inappropriate or out-of-context content (Mean = 3.77 ± 0.76) and may produce output with factual inaccuracies (Mean = 3.72 ± 0.81). On the other hand, several participants remain neutral about whether ChatGPT can provide unfair and biased results (Mean = 3.68 ± 0.78).

Table 3

Students' Awareness of ChatGPT Capabilities

S/N	Items	Mean	Std. Dev
1	I am aware that ChatGPT is not fully capable of handling complex assignments.	4.11	0.72
2	I am aware that ChatGPT has the potential to generate output that contains factual inaccuracies.	3.72	0.81
3	I am aware that ChatGPT can generate inappropriate or out-of-context content.	3.77	0.76
4	I am aware that ChatGPT can provide unfair and biased results.	3.68	0.78
5	I am aware that ChatGPT may overly rely on statistics, which can restrict their usefulness in certain contexts.	3.89	0.70

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6	I am aware that ChatGPT has a limited ability to understand emotions and show empathy, which can generate insensitive or inappropriate responses.	3.78	0.81
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Furthermore, the students' readiness level with ChatGPT was assessed through a survey (Table 4). A significant number of the students agreed with various aspects of using ChatGPT, including the importance of being proficient in ChatGPT (Mean = 3.86 ± 0.83), offering time-saving (Mean = 3.83 ± 0.70), providing 24/7 availability (Mean = 3.76 ± 0.81), provide with unique insights and perspectives (Mean = 3.72 ± 0.74), as well as facilitate to enhance digital competence and knowledge (Mean = 3.69 ± 0.81). In contrast, a notable number of participants adopted a neutral stance regarding the assertion that incorporating generative AI into their future learning practices (Mean = 3.44 ± 0.83), delivering personalized and immediate feedback and suggestions for assignments (Mean = 3.70 ± 0.78), and possessing ChatGPT is a great tool for student support services due to their anonymity (Mean = 3.57 ± 0.85).

Table 4

Students' Readiness to Use ChatGPT

S/N	Items	Mean	Std. Dev
1	In the future, I envision incorporating ChatGPT into my learning practices.	3.44	0.83
2	To enhance my career, it is essential for me to acquire proficiency in using ChatGPT.	3.86	0.83
3	I believe ChatGPT have the potential to enhance my digital competence and knowledge.	3.69	0.81
4	I believe ChatGPT can help me save time	3.83	0.70
5	I believe ChatGPT can provide me with unique insights and perspectives that I may not have thought of myself	3.72	0.74
6	I think ChatGPT can provide me with personalized and immediate feedback and suggestions for my assignments	3.70	0.78
7	I think ChatGPT is a great tool as it is available 24/7	3.76	0.81
8	I think ChatGPT is a great tool for student support services due to anonymity	3.57	0.85

Despite the favorable perceptions of the awareness and readiness to use ChatGPT in learning practice within higher education, students also expressed noteworthy concerns about these tools (see Table 5). A majority of students concurred that using ChatGPT on their educational and personal development (Mean = 3.73 ± 0.85) and using ChatGPT for completing assignments undermines the significance of university education (Mean = 3.66 ± 0.85). Moreover, concern was also raised regarding over-reliance on the ChatGPT tool (Mean = 3.60 ± 0.96) as well as the recognition of the potential impact on their social interactions, fearing that using ChatGPT for coursework could limit their opportunities for interaction and collaboration with peers. (Mean = 3.56 ± 0.94).

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Table 5

Students' Concerns of Using ChatGPT

S/N	Items	Mean	Std. Dev
1	The use of ChatGPT for completing assignments undermines the significance of university education.	3.66	0.85
2	Using ChatGPT may restrict my chances to interact and socialize with others while working on coursework.	3.56	0.94
3	ChatGPT could hinder the development of essential skills like teamwork, problem-solving, and leadership abilities.	3.73	0.85
4	I risk relying too much on ChatGPT.	3.60	0.96

Benefits and Challenges of Using ChatGPT in Higher Education

The semi-structured interview given to university students gathered information on the benefits and challenges of using ChatGPT in higher education learning. We identified five overarching themes regarding the benefits of ChatGPT in higher education learning: (1) writing support, (2) personalized learning, (2) increased productivity, (4) brainstorming for generating ideas, and (5) additional resources.

Writing Support

The main theme plays a role in providing support in writing. For students who struggle with generating ideas and organizing their thoughts, ChatGPT serves as a valuable virtual assistant by offering suggestions to start writing, as stated by the student 1:

I sometimes find it difficult to construct sentences for my essay assignments, ChatGPT is very helpful in providing the relevant suggestions that I need. (Student 1)

Another participant, student 3, highlighted how ChatGPT's abilities benefits beginners unfamiliar with writing skills.

ChatGPT greatly helped my first experience of being asked to create an article. I had yet to learn how to create one, but with ChatGPT, I could generate the article structure I needed. I received assistance with the title, introduction, methods, and results. This helped me better understand how to organize a good and correct article. (Student 3)

Additionally, participants student 6, 8, and 9 had similar experiences receiving language assistance, including translation, paraphrasing, and reviewing using ChatGPT.

I have used ChatGPT to translate Indonesian to English, as it is a better translation machine than Google Translate. (Student 6)

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I rely on ChatGPT to rephrase sentences I intend to quote from the articles I come across. I struggle with paraphrasing independently and lack the know-how to do it effectively. ChatGPT provides valuable assistance in this regard. (Student 8)

When my lecturer asked me to write a book review, ChatGPT supported me by allowing me to submit the file and provide a prompt-based review without reading the entire book. (Student 9)

Personalized Learning

The second theme is personalized learning, which focuses on meeting individual needs and enhancing the learning experience. A particular aspect that received high praise was the time flexibility provided by ChatGPT, as emphasized by student 3:

The flexibility offered by ChatGPT in terms of study time is highly valued. I can ask questions or seek clarification any time, even outside of class hours. (Student 3)

A similar view was expressed by student 1, emphasizing that ChatGPT allows flexible access to learning support.

ChatGPT can provide the additional explanation I need when I don't understand the lecture material. (Student 1)

In addition, student 5 highlighted the role of ChatGPT as a discussion buddy. He emphasized that ChatGPT serves not only as a source of knowledge but also as a learning partner that supports social interaction and academic discussion.

ChatGPT also helps me when I need a friend to discuss lecture material with. (Student 5)

Student 6 mentioned that ChatGPT can present information efficiently, helping students understand the material better in a short time.

It provides explanations, overviews, and other perspectives quickly and concisely as I need them. (Student 6)

Increased Productivity

We identified the third main theme as increased productivity. This theme is exemplified by efficiency, allowing for accomplishing assignment in less time. Student 2 strongly indicated that saving time to complete assignments was a common benefit, as one respondent said:

Using ChatGPT saves me time, especially when running up against a deadline. (Student 2)

Similarly, student 4 also mentioned:

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ChatGPT speeds up task time. I really appreciate how fast it can respond. (Student 4)

Student 5 further highlights that ChatGPT is easy for students to use.

ChatGPT makes it easier to find answers to questions that are difficult to understand. (Student 5)

Additionally, ChatGPT is incredibly helpful in times of difficulty or when facing a mental block. It helps find solutions to questions that cannot be answered by Google or book. As the following participant said:

I use ChatGPT when I am stuck answering difficult questions, and it helps me a lot to get answers I cannot easily find on Google or in a book. (Student 7)

Brainstorming for Generating Ideas

The fourth theme we identified was brainstorming for generating ideas. ChatGPT is an invaluable aid in the thought process and idea development. By engaging with ChatGPT, students can explore fresh perspectives and ideas she may not have considered. Student 3's experience reflects this:

ChatGPT helped me provide unique insights and perspectives I might never have considered. (Student 3)

Additionally, student 4 used ChatGPT to stimulate new ideas for his writing, highlighting the platform's role in fostering creativity and expanding ideas.

I use ChatGPT to generate new ideas for essays or articles I write. (Student 4)

With its ability to offer distinct insights and viewpoints, student 6 expressed the belief that ChatGPT has become an essential point of reference for students.

I believe that ChatGPT has emerged as a crucial reference point for many people seeking new ideas or perspectives. (Student 6)

Additional Resources

The fifth theme we identified was the availability of additional resources. Participant student 2 showed that ChatGPT has made a positive contribution to facilitating students' access to relevant information.

ChatGPT has made it easier for me to find study and reference materials on the topics I am studying. (Student 2)

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Furthermore, student 9 demonstrated a significant evolution in ChatGPT's ability to provide users with more specific and helpful information, especially those in academic research. However, it also highlighted that despite the progress made, there are still challenges in providing broader and easier access for users.

Recently, I discovered ChatGPT's new expertise. It can now provide real content and references that are directly linked to journal articles. Unfortunately, this access is limited. (Student 9)

Despite those benefits, the challenges experienced by university language students in using ChatGPT are identified into four themes: (1) inaccuracies, (2) lack of critical thinking, (3) plagiarism and AI detection, and (4) technical problems.

Inaccuracies

The consequences of using ChatGPT to generate content can result in inaccuracies, which is a major theme challenge for students. Students often encounter inaccurate or misleading information from this tool. Student 3 points this out:

A challenge I experienced while using ChatGPT was that the answers or information provided sometimes out-of-topic or context, which meant I had to spend extra time checking the accuracy and relevance of the answer. (Student 3)

Student 2 expressed a similar sentiment, emphasizing her concerns regarding fake sources.

When I asked to generate content with citations, the reference given by ChatGPT could not be found in Google Scholar. (Student 2)

A participant further elaborated that the quality of responses from ChatGPT depends on the instruction given by saying:

I believe that ChatGPT always responds to all my questions, but sometimes the responses are different from the answers I want and are out of context if I give detailed instructions to ask. (Student 8)

In addition, student 9 expressed a struggle to comprehend ChatGPT's responses. He states that the sentences and phrases provided by ChatGPT are quite sophisticated and complex to understand.

I feel that the responses provided by ChatGPT are difficult to understand. (Student 9)

Lack of Critical Thinking

This theme responded to the negative consequences of using ChatGPT. Students acknowledged that using ChatGPT for academic work could promote laziness, as it provides

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instant responses and answers to all questions without requiring analysis. Despite this, student 1 still used it, as expressed:

I became too lazy to think when I found out that ChatGPT could help me complete my coursework. (Student 1)

Student 5 also noted that over-reliance on ChatGPT for automatic feedback might hinder the development of critical thinking skills and decrease students' motivation to understand the material. This student stated:

Nowadays, I would rather get instant answers to my assignments than have to take the time to think about the answers, which can be draining. (Student 5)

Moreover, student 7 admitted that the reliance on instant solutions from ChatGPT diminished independence in learning, problem-solving, and critical thinking. This had a negative impact on respondents' long-term academic skills:

The reliance on instant answers from ChatGPT made me less practiced in developing arguments and weakened my thinking power. As a result, I did not try to find my own solutions and relied entirely on ChatGPT. (Student 7)

Plagiarism and AI Detection

This theme explores the academic integrity of using ChatGPT for plagiarism and AI detection. Participant student 3 expressed the ethical implications of using ChatGPT-generated content without clear attribution. She believes that using ChatGPT without proper citation raises the issue of plagiarism, as stated:

As a student, I often face challenges when using ChatGPT because the generated text does not always include clear sources. This makes it difficult for me to identify and give credit to original sources, increasing the risk of plagiarism in my academic work. (Student 3)

Another opinion comes from student 4 who disputed the potential ethical concerns, such as plagiarism and reduced originality. He emphasized that ChatGPT is useful, but it can lead to dependence due to its convenience and efficiency:

I am concerned with the potential of ChatGPT unintentionally encouraging plagiarism among students. While the tool is undoubtedly helpful in content creation and idea formulation, there is a concern that some people may become too reliant on it, leading to a lack of originality in their work. (Student 4)

In addition to the risk of plagiarism, the use of ChatGPT may also lead to works being identified as AI-generated by detection tools such as Turnitin, as student 6 experienced.

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For example, I was stuck on an idea and I asked ChatGPT to continue my content. After I checked Turnitin, AI detected the writing I copied to ChatGPT as written. I often experience this, and it makes me tired because I have to reduce the amount of plagiarism in the essays or articles I write. (Student 6)

Technical Problems

The fifth theme delves into the challenge of using or accessing ChatGPT-related technical problems. Student 4 has noted that they struggle using ChatGPT because it is unresponsive or certain features do not work properly, which hinders their ability to use it effectively.

I often have trouble accessing ChatGPT because the website has errors on my laptop. For example, the website can be opened, but I cannot do anything. (Student 4)

In addition, student 6 mentions that the sudden interruptions caused by ChatGPT disrupt their workflow, resulting in frustration and potential loss of productivity.

I have experienced while using ChatGPT is that it is sometimes inaccessible due to errors. When performing a task, it suddenly stops and does not continue or even get resolved. (Student 6)

Discussion

The study aimed to investigate the usage, awareness, readiness, concerns, and potential benefits and challenges of using ChatGPT in higher education learning among university language students in Indonesia. The results indicated that most university language students reported using ChatGPT in higher education learning. The high usage of ChatGPT can be attributed to its familiarity and frequent use, particularly for assignment assistance, self-study, and language support. This suggests that ChatGPT has become a tool students often rely on in their daily learning activities. This finding aligns with previous research (e.g., Johnston et al., 2024; Assad, 2024), which emphasizes the various uses of ChatGPT in academic settings, such as assignments, data analysis, and language translation. However, these findings contrast with Fuchs & Aguilos (2023), who reported that students primarily used ChatGPT for idea generation and feedback, highlighting that language students might use this tool more widely, using its capabilities for various purposes in their learning process.

The results also highlight that university language students were highly aware of ChatGPT's capabilities regarding the limitations and potential problems in using ChatGPT in higher education learning. This shows that students have a critical understanding of AI technology, particularly ChatGPT, and are aware of not only its benefits but also its risks and limitations. This is consistent with the findings of Obenza et al. (2023), who observed that university students show a high awareness of using ChatGPT. Chan and Hu (2022) further support this by explaining that university students had a high level of awareness due to their familiarity with AI tools like ChatGPT in their learning process. In a similar vein, Rogers et al. (2024) conducted studies which revealed that university students possess a significant level of awareness regarding ChatGPT. Their findings indicated that students frequently use ChatGPT as a study tool, rather than solely

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depending on it to complete assignments. Conversely, Kelly et al. (2023) found that most students, particularly those not exposed to ChatGPT in an academic context, have low awareness of the tool. This suggests that Indonesian language students, who interact with ChatGPT more frequently, tend to be more actively engaged compared to students from other contexts. Regular interaction with ChatGPT provides these students with personalized and immediate feedback, thereby enhancing their learning experience and fostering active participation in their academic endeavors.

In terms of readiness, students displayed a high level of readiness in using ChatGPT. This readiness can be attributed to the potential benefits of ChatGPT in improving career prospects and saving time, similar to the findings in Chan & Hu's study (2023). This highlights university language students' enthusiasm and strong desire to integrate this technology into their learning process. On the contrary, Güven et al. (2023) and Labrague et al. (2023) suggest that students' readiness is moderate, due to limitations in technological literacy and AI understanding. This suggests a discrepancy between high motivation and practical readiness. Thus, although students are highly motivated to adopt ChatGPT, technical skills and knowledge constraints may hinder their ability to use it optimally. Despite students' high awareness and readiness in using ChatGPT, they also expressed a high concern about its usage. These concerns mainly revolve around the potential negative impact on developing essential skills such as teamwork, problem-solving, and leadership abilities. In contrast, Obenza et al. (2023) found that university students had a moderate level of concern about using ChatGPT, which could inhibit personal growth and hinder the development of critical skills, such as teamwork and problem-solving. This suggests that although ChatGPT may affect critical skills, language students at the university may feel the impact or have a stronger perception of the potential negative impact of ChatGPT compared to students from other disciplines.

Our findings shed further light on the benefits of using ChatGPT for learning experienced by university language students in higher education. These benefits include writing support, personalized learning, increased productivity, idea generation through brainstorming, and additional resources. Our findings are consistent with current studies (e.g., Chan & Hu, 2023; Michel-Villarreal et al., 2023; Zhou et al., 2024), which also emphasize the positive effects of ChatGPT on the learning process. In terms of writing support, university language students have availed themselves of ChatGPT to seek guidance for assignments, enhance their writing proficiency, and procure language assistance such as translation, paraphrasing, and review. This resource has notably proven beneficial, particularly to those new to academic writing. Beyond its role as a writing assistant, ChatGPT has also significantly boosted students' productivity by saving time, providing immediate feedback, and facilitating quick access to information (Zhou et al., 2023). Regarding personalized learning, students greatly appreciate the ability to access information and receive virtual assistance that can enhance their learning experience. This aligns with what ChatGPT offers, as it can adjust to the pace and style of each student (Chan & Hu, 2023), enhancing their engagement and promoting self-directed learning (Michel-Villarreal et al., 2023).

Furthermore, ChatGPT serves as a valuable brainstorming tool, fostering creativity, and generating innovative ideas. Research by Zhang et al. (2023) supports the idea that ChatGPT assists students in developing new concepts and expanding existing ones. By generating innovative

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perspectives and ideas, ChatGPT encourages a more comprehensive and innovative exploration of thoughts. This not only aids in completing assignments, but also enriches the thinking process and broadens users' horizons. Thus, ChatGPT is not solely a tool for answering complex questions and composing texts; it is also an invaluable resource for students seeking to explore ideas and deepen their understanding. Additionally, ChatGPT provides additional references, streamlining the process for students to access the material they need. Its ability to supply authentic content and references, including direct links to journal articles, significantly enhances the student learning experience. These findings highlight the immense potential for ChatGPT to revolutionize the learning experience by providing personalized assistance, catering to diverse learning needs, enhancing efficiency, and promoting self-directed learning.

Despite the positive outlook, the study also revealed challenges experienced by university language students associated with ChatGPT, including inaccuracies, lack of critical thinking, plagiarism and AI detection, and technical problems, similar to the findings (Chan & Hu, 2023; Kayali et al., 2023; Zhou et al., 2023). Inaccuracies were a primary challenge for students, as ChatGPT provides out-of-context, fake references and is difficult to understand, as well as the quality of ChatGPT's accuracy depends on the user's prompt (Assad, 2024). Additionally, using ChatGPT to complete assignments or any academic task can lead to overreliance hindering critical-thinking skills, reducing student motivation, and hindering independent learning and problem-solving abilities. Obenza et al. (2023) agree and suggest that ChatGPT has the potential to inhibit the development of crucial skills, such as teamwork and problem-solving while also reducing independence. Moreover, they also raise challenge about potential misconduct, such as plagiarism and AI detection, that may arise when using ChatGPT (Anderson et al., 2023; Fuchs & Aguilos, 2023; Michel-Villarreal et al., 2023). In addition, students using ChatGPT encounter technical problems, such as errors originating from the website itself. These errors can potentially disrupt the user's experience and impact their ability to engage with the platform effectively.

Implications

The findings of this study suggest several implications for educators and institutions aiming to integrate AI tools like ChatGPT into higher education learning. Firstly, since many students are already familiar with and use ChatGPT for task assistance and language support, educators need to provide structured guidance on its effective use in an academic setting. This includes teaching students how to leverage ChatGPT for academic purposes, critically assess information, avoid plagiarism, and integrate it responsibly into their learning processes. Additionally, this suggests that institutions should recognize AI as a valuable asset in learning environments and consider rethinking and redesigning curricula to incorporate AI tools as a standard part of educational practices, including integrating AI tools into classroom activities, assignments, and assessments to enhance the learning experience and provide students with modern educational resources. Secondly, institutions should prioritize promoting students' awareness and readiness regarding the ethical use of AI tools. They can organize workshops and training sessions to educate students on using ChatGPT responsibly, emphasizing the importance of originality and critical thinking in their academic work. These initiatives will help students understand the ethical implications of using AI tools, foster a culture of academic integrity, and equip them with the skills to use AI resources effectively and ethically. Thirdly, the positive impacts of ChatGPT, such as writing support,

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personalized learning, and increased productivity, suggest that when integrated effectively, AI can significantly enhance students' academic performance and learning experiences. Therefore, continuous improvement and adaptation of educational strategies are essential to maximize the potential of AI tools, ensuring that they contribute positively to students' skills and knowledge development. Finally, the challenges of using ChatGPT underscore the need for educational institutions to guide the ethical and practical use of AI, implying higher education institutions may need to develop policies and guidelines that outline the ethical use of AI in education. By proactively establishing comprehensive AI policies and guidelines, educational institutions can create a safe and supportive learning environment that leverages the advantages of AI technologies while safeguarding against potential challenges.

Conclusion

This study investigated university language students' perceptions of using ChatGPT in higher education learning. Our results revealed that the majority of the university language students in Indonesia had already widely used ChatGPT, with those with prior experience reporting moderate familiarity due to frequent usage. The primary reason for using ChatGPT was to seek assignment help, facilitate self-learning, and get language assistance. In addition, students exhibit a high level of awareness, readiness, and concern regarding incorporating ChatGPT for educational purposes. The results also highlight notable benefits of integrating ChatGPT into higher education learning, including writing support, personalized learning, increased productivity, brainstorming to generate ideas, and additional resources, suggesting a significant positive impact on their academic performance and learning experiences. However, there were challenges associated with its use, including inaccuracy, lack of critical thinking, plagiarism and AI detection, and technical issues. We conclude that while ChatGPT presents promising opportunities for enhancing learning and academic support, addressing the associated challenges is crucial to maximising its effectiveness and ensuring academic integrity. Based on these results, we suggest further improving the user experience to prevent negative experiences such as over-reliance on the tool and spreading misinformation. These improvements may allow ChatGPT to be used more effectively and efficiently in education.

Limitation and Future Research

While this study offers value in enhancing our comprehension of the use of ChatGPT in higher educational learning, it also paves the way for further examination. This study has certain limitations that need to be addressed for future research. Firstly, the findings of this study may not be generalizable due to the sample size not representing the entire population, unequal gender distribution, and participants from various disciplines and educational backgrounds. This may result in bias and undermine the reliability of the findings. To address these issues, it is recommended that future studies involve larger and more representative sample sizes, and consider a more balanced distribution of gender and disciplinary backgrounds. Additionally, the use of a basic descriptive approach without exploring potential correlation between other variables may limit a deeper understanding of the phenomenon under study. Therefore, it is recommended that future research expands its scope by using more complex research designs and larger analysis samples, including integrating statistical analysis techniques, such as regression analysis, that allow

researchers to identify and evaluate potential correlation between variables, thus enhancing the depth of understanding.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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Pre-Service Teachers' Dual Perspectives on Generative AI: Benefits, Challenges, and Integration into their Teaching and Learning

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Abstract

This study examined pre-service teachers' perspectives on integrating generative AI (GenAI) tools into their own learning and teaching practices. Discussion posts from asynchronous online courses on ChatGPT were analyzed using the Diffusion of Innovations framework to explore awareness, willingness to apply ChatGPT to instruction, and potential benefits, challenges, and concerns about using GenAI in teaching and learning. The course discussions significantly increased pre-service teachers' awareness and foundational knowledge while reducing anxiety towards AI technologies. However, despite exposure to ChatGPT, only a few confirmed intentions to adopt AI tools in their teaching practices, potentially reflecting lingering uncertainties evidenced by emotional responses, such as worry and concern. Professional development in AI literacy can address these uncertainties and enhance teachers' understanding about using GenAI in class. The study offers insights into responsible GenAI adoption in education and how higher education can leverage ChatGPT to enhance pre-service teacher learning.

Keywords: GenAI, ChatGPT, online asynchronous course, instructional design, pre-service teachers

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As the development of artificial intelligence (AI) technologies for education continues to grow at a rapid pace (Prahani et al., 2022), teachers play a pivotal role in the conversation about how AI tools should be designed and implemented to support learning and teaching (Seufert et al., 2021). The recent launch of the Generative Pretrained Transformer in 2022 (e.g., ChatGPT) has triggered global interest in AI, particularly in using generative AI (GenAI) for teaching and learning in classrooms. Due to its easy, fast, and efficient ability to generate human-like text in response to the input it receives, ChatGPT has become one of the first GenAI technologies accessible to the public. For example, ChatGPT can perform various tasks, such as answering questions, writing essays, summarizing documents, and generating images. Initially, when GenAI tools were first introduced, educators raised concerns about potential issues, such as enabling plagiarism as well as perpetuating biases and circulating misinformation (Na et al., 2024). However, it was recently observed that instead of outright banning these AI tools, school districts began developing AI policy for schools and offering professional development programs to help in-service teachers better understand and use these tools (e.g., New York City banned the ChatGPT in 2022, but they lifted the ban in 2023).

This trend indicates a growing recognition of the importance of early exposure to AI concepts and tools for young students. This exposure helps build students' core competencies and workplace skills for their future careers, preparing them to adapt to AI-based environments across various fields (Huang, 2021; Kong et al., 2022; Touretzky et al., 2019; Yang, 2022). For instance, AI is already being used in numerous areas from diagnosing diseases to recommending advertisements. In addition, educators have raised equity concerns, noting that limiting students' opportunities to learn how to use AI tools at school and their lack of access to these tools can contribute to educational equity issues (Roscoe et al., 2022; Swindell et al., 2024). Despite the significance of teaching and learning AI concepts in school settings, teachers often face challenges in this area. One of the primary difficulties stems from their limited content knowledge related to AI concepts (Kim & Kwon, 2023; Su et al., 2022), as well as limited prior experience with AI tools. This can lead to teachers feeling unprepared and lacking the necessary competencies to implement AI tools effectively in classrooms, which in turn may result in self-doubt and reluctance to implement AI tools (Kim & Kwon, 2023).

Therefore, it is crucial to understand teachers' perspectives on incorporating AI tools in their classrooms to aid their successful adoption. Beyond technical proficiency, teachers must also cultivate pedagogical competencies to effectively integrate GenAI tools into their instructional practices. Recent research underscores the importance of incorporating strategies that illustrate how GenAI can enhance teaching, promoting critical thinking and creativity to equip students with the skills needed to navigate the complex digital environment infused with AI technologies (ElSary, 2023; Okulu & Muslu, 2024; Uzumcu & Acilmis, 2023). In this study, we examined pre-service teachers' perspectives on utilizing ChatGPT for their learning and teaching. The term *pre-service teacher* is used to describe a student enrolled in a teacher preparation program, who must complete coursework and field experience before earning a teaching license. They engage in academic study, gain supervised teaching experience, and often work with a mentor to prepare for their future careers in education. Pre-service teachers are unique in that they are simultaneously considering their own learning while preparing to teach, which can significantly influence their approach to teaching their future students (Borg, 2006; Farrell, 1999). Research studies

emphasized the importance of pre-service teacher beliefs/pre-conceptions, as it is widely acknowledged that pre-service teachers enter teacher training programs with firmly established ideas about learning and teaching that are developed during their prior experiences as students (Pajares, 1992). These initial ideas can act as filters, shaping how pre-service teachers perceive and interpret new information/tools they encounter. In other words, the pre-service teacher preparation effort is crucial in facilitating transformative learning experiences, wherein pre-service teachers assume dual roles/positions—not merely as passive recipients of knowledge but as active participants in dialogue who critically and practically engage with the technological and ethical aspects of tools for their learning (i.e., as an undergraduate student) as well as teaching (i.e., as a pre-service teacher). Thus, the goal of this study was to explore pre-service teachers' perceptions of GenAI in an online learning environment, focusing on their willingness to integrate it into their instruction, as well as the potential benefits, challenges, and ethical considerations of using GenAI in teaching and learning. Guided by the framework of the Diffusion of Innovations model, the following research questions were addressed in this study:

1. Through what stages do pre-service teachers progress in adopting GenAI tools, and how do they envision integrating them into their teaching practices?
2. What are the perceived advantages and challenges pre-service teachers anticipate when utilizing GenAI in educational contexts?

Teacher Preparation for Artificial Intelligence (AI) in K-12 Education

AI has reshaped education, opening a new pathway to personalized learning, efficient assessment, and enriched insights into student learning engagement (Markauskaite et al., 2022). While the sub-concepts of AI—including machine learning, natural language processing, and computer vision—remain crucial foundations in understanding AI, recent research has broadened their scope to encompass AI literacy from a critical perspective. Ng et al. (2021) suggest that AI literacy should extend beyond technical skills to include engagement with AI's ethical, social, and cultural dimensions. This literacy enables educators to use AI tools responsively in educational settings, thereby enhancing learning outcomes. This advancement highlights the essential role of equipping educators with a deep and critical understanding of AI's applications and implications. Bozkurt and Bae (2024), in a similar vein, emphasized to educators the need for a critical and balanced perspective on the effectiveness of AI. Sperling et al. (2024) underscore the necessity for AI literacy in teacher education, advocating for curricula that empower educators to effectively harness AI technologies. Similarly, Casal-Otero et al. (2023) advocate for embedding AI literacy into K-12 education, emphasizing the importance of preparing teachers with the foundational concepts of AI and its educational applications.

Recent studies (Chounta et al., 2022; Lindner & Berges, 2020; Salhab, 2024) reveal a mixed reaction among educators toward AI in education, acknowledging its potential to support personalized learning but also expressing concerns about ethical issues and the need for further

professional development. These studies highlight the gap in educators' understanding of both AI technology and its application in pedagogy. However, pre-service teachers, who are still in the process of forming their teaching philosophies and practices, may exhibit different attitudes and behaviors toward technology compared to their in-service counterparts. Pre-service teachers are often more open to adopting new technologies and pedagogical approaches (Tondeur et al., 2012), as they have not yet established deeply rooted teaching practices. Moreover, pre-service teachers' dual roles as learners and prospective educators uniquely position them to critically engage with AI tools and their implications for both their own learning and their future students' learning experiences.

A group of studies on ChatGPT in education (ElSayary, 2023; Lin et al., 2024; Okulu & Muslu, 2024) demonstrate their positive impact on creativity, understanding, and engagement, emphasizing the advantages of integrating GenAI into educational processes. This aligns with prior research (Lemon & Garvis, 2016; Luik et al., 2018; Wang, 2002) that explored educators' views on technology in education, noting the evolving role of the teacher in technology-enhanced classrooms and the importance of confidence in digital tool use. Pre-service teachers' exposure to GenAI tools during their teacher preparation programs can help promote their readiness and willingness to integrate these technologies into their future classrooms (Tondeur et al., 2012). However, it is necessary to consider the potential drawbacks of using ChatGPT in education. Fui-Hoon Nah et al. (2023) explain that the overreliance on AI-generated responses may lead to a decrease in critical thinking and problem-solving skills among students. Also, concerns about cheating and the erosion of academic integrity have been raised (Yeo, 2023). As pre-service teachers plan to integrate GenAI tools in their future classrooms, it is crucial for them to be aware of both the potential benefits and challenges and to develop strategies to mitigate the risks while harnessing the advantages of these technologies.

To address these concerns and maximize the benefits of GenAI in education, pre-service teachers should engage in discussions on the societal implications of GenAI, incorporating ethical reasoning and creative AI applications into the curriculum (Casal-Otero et al., 2023; Sperling et al., 2024). This approach ensures future educators gain technical proficiency and the ability to critically assess AI's broader impact on their teaching and guide their students accordingly. Pre-service teachers are pivotal in this transformative learning journey, crafting AI-empowered curricula that encourage critical thinking, creativity (Uzumcu & Acilmis, 2023), and ethical reflection. Introducing accessible AI tools, such as ChatGPT, showcases innovative learning experience examples generative AI can provide, fostering engagement and exploration across subjects. Such integration during pre-service teacher education is crucial for preparing future educators to navigate the complex digital environment, equipping them with the skills for critical and ethical interaction with AI technologies (ElSayary, 2023; Okulu & Muslu, 2024). Cultivating a thorough understanding of AI's capabilities and challenges enables pre-service teachers to prepare students and their future students for digital learning opportunities and obstacles.

Impact of Anxiety and Uncertainty of AI on Teachers

When thinking about AI and its educational implications, it is important to reflect upon what society thinks about the technology as social perception shapes the teaching and learning of the technology. The rapid advancement of AI has caused varying opinions about the technology. While it is inevitable that AI potentially has significant benefits for human society (Yang et al.,

2021), the uncertain aspect of AI is causing anxiety among people (Johnson & Verdicchio, 2016). In fact, public figures in the technology sector, such as Bill Gates and Elon Musk, have been raising concerns about AI potentially bringing catastrophic repercussions in the future when not utilized properly (Johnson & Verdicchio, 2016; Wang et al., 2022). Such worry mainly stems from the fear of losing control over AI due to its autonomous nature, and this sense of losing control is the main difference between AI anxiety and formerly prevalent computer anxiety (Wang et al., 2022).

Although the aforementioned issue of control can be considered one of the main factors of AI anxiety, there may be several dimensions of anxiety in play. By integrating fear acquisition theory by Rachman (1977) and Menzies and Clark (1995), Li and Huang (2020) organized eight anxiety factors: privacy violation anxiety, bias behavior anxiety, job replacement anxiety, learning anxiety, existential risk anxiety, ethics violation anxiety, artificial consciousness anxiety, and lack of transparency anxiety (p. 3). In a similar vein, Wang and Wang (2019) divide AI anxiety into four dimensions: learning, AI configuration, job replacement, and sociotechnical blindness (p. 624). Such categorization illustrates the multifaceted nature of AI anxiety. Oftentimes, AI anxiety negatively affects people's attitudes toward AI. Wang et al. (2022) found that learning anxiety and job replacement anxiety can negatively impact students' motivation to learn AI, and Kaya et al. (2024) found that AI learning anxiety and AI configuration anxiety negatively impact people's attitudes toward AI. This demonstrates that AI anxiety can be a roadblock for students and teachers alike in successfully teaching and learning AI concepts in schools despite its growing importance.

Moreover, due to technological advancement in schools, expectations toward teachers to be successful in internalizing and implementing new technologies exist, and this can also potentially cause anxiety (Henderson & Corry, 2021). Therefore, it is important to understand how teachers are coping with the AI integration in school settings, what types of AI anxiety exist among pre-service teachers who will be utilizing AI in schools, and how teachers can cope with it (Ayanwale et al., 2022; Hopcan et al., 2023).

Theoretical Framework: Diffusion of Innovation Theory

Diffusion of Innovations (DoI) is a well-established social theory that describes how innovations are adopted across different populations (Rogers, 2003). This framework is applicable to the investigation of the process of innovation adoption, particularly in the field of educational technology (Jwaifell & Gasaymeh, 2013). We used the term "innovation" to refer to any novel instructional strategy, tool, or learning resource that an instructor could employ to enhance student learning and engagement. This definition thus includes both educational practices and tools. Diffusion entails the acceptance or rejection of innovation by individuals and groups. Rogers (2003) characterizes the process of diffusion of innovations as "an information-seeking and information-processing activity," where individuals make sense of information about an innovation to decide whether they will adopt or reject it (Lund et al., 2020). Recent applications of DoI theory include studies on e-book adoption among university students (Qazi et al., 2018), such as the adoption of online proctored examinations during the COVID pandemic (Raman et al., 2021) and the adoption rate of AI applications in online learning environments (Almaiah et al., 2022). It is important to note that while several theoretical frameworks discuss innovation adoption, they primarily conceptualize the factors influencing the utilization or acceptance of the innovation. In contrast, this study specifically focuses on the comprehensive process of innovation adoption.

Using the DoI framework can afford researchers to identify the stages of students' experiences and proactively address their needs. This approach allows for targeted instructions at each adoption stage, from raising awareness to promoting sustained use. By tracking and analyzing adoption cycles, instructors can refine learning activities and materials to maintain student engagement and support meaningful adoption. In particular, we address challenges encountered during the implementation that led to the adoption process, aiming to fill a gap in the implementation stage.

Based on the DoI theory, we categorized the decision process for AI adoption, consisting of the following six stages (see Table 1). First, the Awareness/Knowledge Stage involves becoming aware of the innovation and gaining cognitive knowledge. This stage is related to being exposed to the innovation and seeking information about how to use it. In the Interest Stage, learners form opinions about the innovation while addressing knowledge gaps and uncertainties. They may be influenced by social encouragement to use the innovative tool, as well as by peer-group members' favorable subjective reviews of the tool. Otherwise, learners may have a negative attitude toward adopting AI due to the influence of social discourses on the ethical issues of using AI. The Decision Stage involves individuals deliberating whether to adopt or reject the innovation, influenced by factors like personal interest, social pressure, or policy requirements (Frei-Landau et al., 2022). After deciding to adopt, individuals test and evaluate the innovation in the Trial Stage, adapting it based on feedback and their specific needs. Making more adaptations for their own purposes might increase the chance for individuals to use them more consistently. In the Confirmation Stage, the users establish a strong judgment for their decision on the innovation adoption as they reflect on their experiences and its outcomes. In this stage, the users demonstrate more concrete use cases of the tool in their specific context. For the last stage, we added an Advocacy Stage, which entails garnering public support or recommendation for the tool. In today's digital-centered society, where information is readily accessible and widely shared online, it is crucial to showcase hands-on examples of how innovative tools are being successfully adopted and utilized. By sharing use cases online and advocating for these tools in public forums, such as through social media, blog posts, webinars, or presentations, individuals and organizations can highlight the tangible benefits and effectiveness of the tools. This not only helps to build awareness and generate interest but also establishes credibility and trust in the technology. Additionally, it provides valuable insights and inspiration for others who may be considering adopting similar tools, ultimately fostering a community of learning and innovation.

Table 1
Diffusion of Innovations Theory Framework

Stage	Definition	Example
Awareness/ Knowledge	Awareness of innovation and relevant cognitive knowledge	<i>After researching, I learned ChatGPT's responses are derived from web sources.</i>

Interest	Perspective and attitude regarding innovation	<i>I see an opportunity for individualized and personalized teaching and learning.</i>
Decision	Tentative plan or intention to adopt or reject innovation tools for future use	<i>I think that in the future as an educator I will have to look out for this to ensure that my students are getting a proper education and not taking the easy way out.</i>
Trial	Utilization of innovation tools and exploration of its results	<i>When I go back and use ChatGPT, I have had no issues but am always pleasantly surprised by the information provided.</i>
Confirmation (Adoption/rejection)	Explicit judgment on the adoption of innovation tools after trials	<i>Overall, I have thoroughly enjoyed utilizing this program as it has proven exceptionally beneficial in developing engaging lessons for two-year-old children.</i>
Advocacy	Endorsement of adopting innovation tools to the public	<i>So far, though, I like what I'm seeing and might even suggest this software be used where I work.</i>

Methods

Research Participants and Data Sources

The study involved 54 pre-service teachers (male = 28, female = 26) from a Southeastern university in the United States, within the age range of 19-30. Each participant enrolled in one of the four-week asynchronous online courses (i.e., Computer Concepts and Application, Computer Education Application, and Computer Education Curriculum Development). The data collection took place over a period of one month, followed by three months of data preprocessing and analysis. One of the research team members was the instructor for these courses, which focused on introducing generative AI for K-12 education. Before the study, none of the students were familiar with GenAI or ChatGPT, so the instructor provided pre-tutorial on how to use prompting questions/statements when interacting with ChatGPT to yield good results. The tutorial included a 30–40-minute video and supplementary text materials on the interface and user experience of

ChatGPT. The courses used ChatGPT as a teaching assistant, augmenting students' brainstorming and writing activities. No incentives or bonus grades were provided to study participants for their involvement. To ensure that there was no undue influence or coercion (even perceived) of students to participate, we conducted several steps. Participation was completely voluntary, and it was emphasized that non-participation would not negatively impact students' grades or standing. Informed consent was handled confidentially. To ensure effective use of ChatGPT during the course, the instructor provided pre-service teachers with a series of ChatGPT tutorial materials before the discussion activities. To enhance students' engagement and participation in discussion, we incorporated a gamified plugin called ClassCred in Microsoft Teams. This plugin allowed us to gamify the learning experience by awarding points and badges based on the quality and frequency of participants' contributions.

Under this discussion platform, the instructor facilitated weekly group discussions to engage in different topics regarding using ChatGPT. For each weekly group discussion, we presented one of the following prompting questions:

- (1) Do you have any existing expectations regarding the application of AI in learning tasks? If so, what are these expectations and what preconceptions do you have?
- (2) Have there been any issues, challenges, or points of difficulty concerning the content provided by ChatGPT?
- (3) What would be an effective strategy to use AI ChatGPT for task completion or problem-solving? What good strategies do you think are available?
- (4) Throughout your use of ChatGPT during this course, have you experienced, noticed, or considered any issues or concerns related to ethics in AI use? For example, what are your impressions about the representativeness of AI responses?

In addition, the pre-service teachers participated in an AI anxiety survey before and after the course, which was developed by *Wang and Wang (2022)* and consisted of 57 questions on AI anxiety to triangulate the findings from the discussion postings. The instrument measures AI anxiety related to learning (e.g., Learning to use AI techniques/products makes me anxious), AI configuration (e.g., I find humanoid AI techniques/products (e.g., humanoid robots) scary), job replacement (e.g., I am afraid that an AI technique/product may make us dependent), and sociotechnical blindness (e.g., I am afraid that an AI technique/product may be misused). The survey was administered fully via an online survey form. A total of 26 pre-service teachers responded to this survey with a 7-point Likert Scale (Strongly Agree: 1, Strongly Disagree: 7). Lower scores indicate higher anxiety regarding AI technology and its societal impact.

Data Analysis

Following the anonymization of students' names, our team engaged in a detailed discussion to operationalize the DoI framework, ensuring each state was clearly linked to specific behaviors observed in the data. We redefined each stage of the framework with illustrative examples to clarify its application to our codes. After finalizing the codes among the research team, two researchers conducted a detailed analysis of each sentence in students' discussion posts and their comments. Among 2966 sentences, a total of 2629 were analyzed using six stages of the DoI

framework (Rogers, 2003) (i.e., Awareness/Knowledge, Interest, Decision, Trial, Confirmation, and Advocacy.) The rest, which were not directly relevant to the framework, were coded as "Others," such as student questions (e.g., "Who is behind the coding to give AIs these types of intelligence?") and linguistic markers that support peer interactions in the weekly discussion threads, (e.g., "I agree with you"). These reciprocal statements and off-topic utterances (e.g., "I think it can be hard for teachers to meet the needs of every student in their classroom") were coded as "Others."

The analysis process included two phases. First, the researchers randomly sampled 20% of the entire discussion postings from each week of all courses and independently coded them. Then, we discussed the coding results with rationales to resolve any discrepancies and reach an agreement during research meetings. Once the inter-rater agreement for coding results reached 75.4%, two researchers independently coded the remaining data based on the finalized coding scheme. The calculated Cohen's kappa statistics value is .634 ($p < .001$), indicating substantial inter-rater reliability in the coding results. Then, the researchers employed inductive thematic analysis (Braun & Clarke, 2006) to examine students' discourse on integrating ChatGPT for their learning and teaching. Reading through discussion threads, we noted the emerging themes on pre-service teachers' perceived benefits, ethical and societal concerns, and challenges of using ChatGPT in educational contexts. After a couple of data sessions during the research team meetings, we recategorized and finalized distinctive themes. The specific themes are described in the findings section.

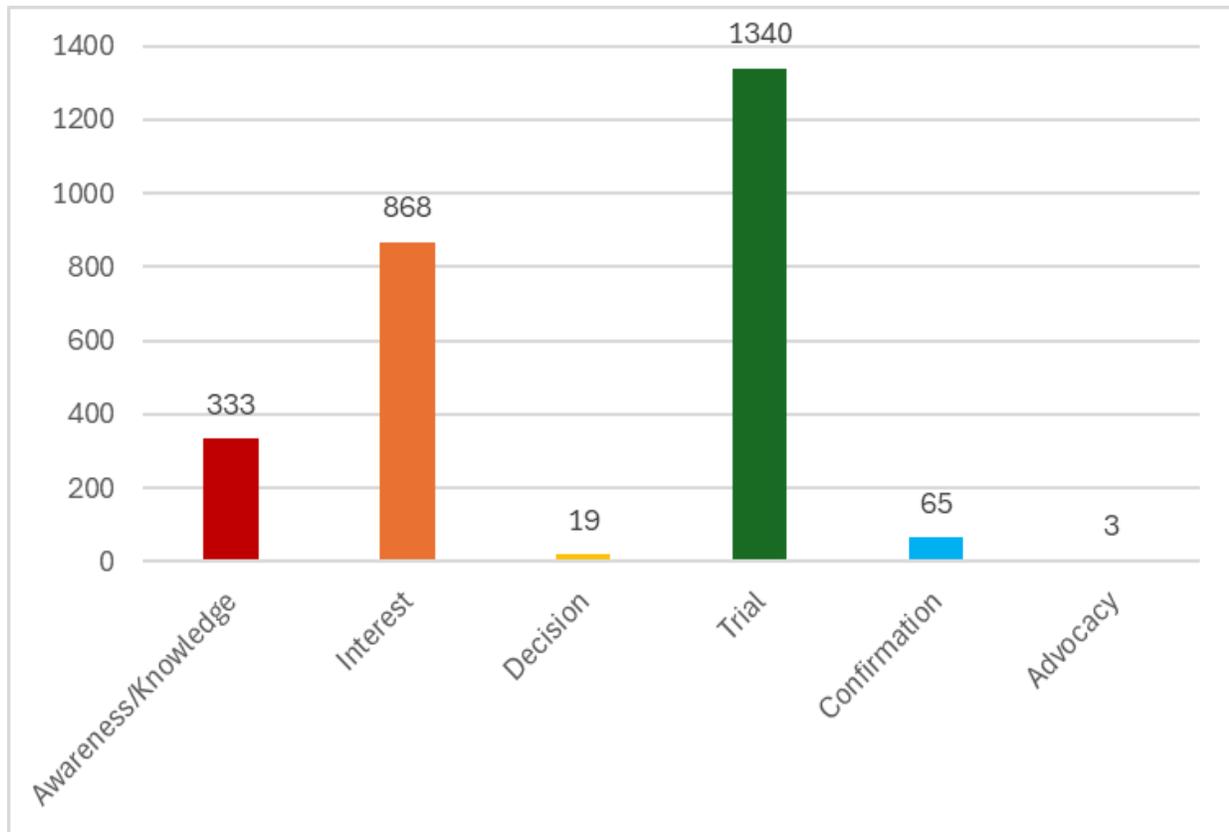
Findings

Different Stages of Pre-service Teachers' Adoption of GenAI Technologies

Throughout discussions on GenAI technologies, pre-service teachers demonstrated different stages of DoI (see Figure 1). Their discussions heavily centered on the Trial stage, where they shared hands-on experiences in using ChatGPT ($n=1340$, 51.0%), followed by the Interest stage, where they addressed their opinions and perspectives ($n=868$, 33.0%). General ideas and superficial level of knowledge were also mentioned (Knowledge/Awareness, $n=333$, 12.7%), and some students stated their decision on whether to use ChatGPT (Decision, $n=19$, 0.7%). Although discourse on user experience on ChatGPT was frequent, they rarely reached the Confirmation ($n=65$, 2.5%) or Advocacy ($n=3$, 0.1%) stages. The result indicates that students became familiar with ChatGPT as they were encouraged to use the AI tool in class, but they showed hesitance or confusion in adopting it for their teaching and learning. For instance, one student stated that they tried to "remain mindful of ethical considerations, avoiding using ChatGPT for promoting biased or harmful content."

Figure 1

Total Number of Coded Sentences for Each Stage



The most dominant stage and its distribution varied from week-to-week, as illustrated in Figure 2. In the first week, students were required to use ChatGPT and share their expectations or preconceptions of the application of GenAI technologies. As they shared their own perspectives and attitudes after using ChatGPT for the first time, the Interest stage appeared the highest ($n=346$, 54.7%). The Trial stage was the next highest ($n=149$, 23.5%) as they explored the ChatGPT tool to participate in online discussions and share their thoughts. However, some remained in the Awareness/Knowledge stage ($n=125$, 19.7%). This observation can be attributed to their recent exposure to these technologies, suggesting that they were still in the process of familiarizing themselves and were not yet expected to engage in discussions beyond their prior knowledge.

In the second week, the pre-service teachers were tasked with exploring issues or challenges associated with using ChatGPT. As a result, a significant number of students transitioned to the Trial stage ($n=477$, 71.4%), where they actively engaged with the tool to evaluate their experiences related to its performance and identify any potential issues, indicating a shift from their previous activities. In addition, there was an increase in their posts related to the Confirmation stage ($n=26$, 3.9%) and the Advocacy stage ($n=2$, 0.3%), showing that some students made confirmatory decisions on applying ChatGPT to their teaching after experimenting with the tool.

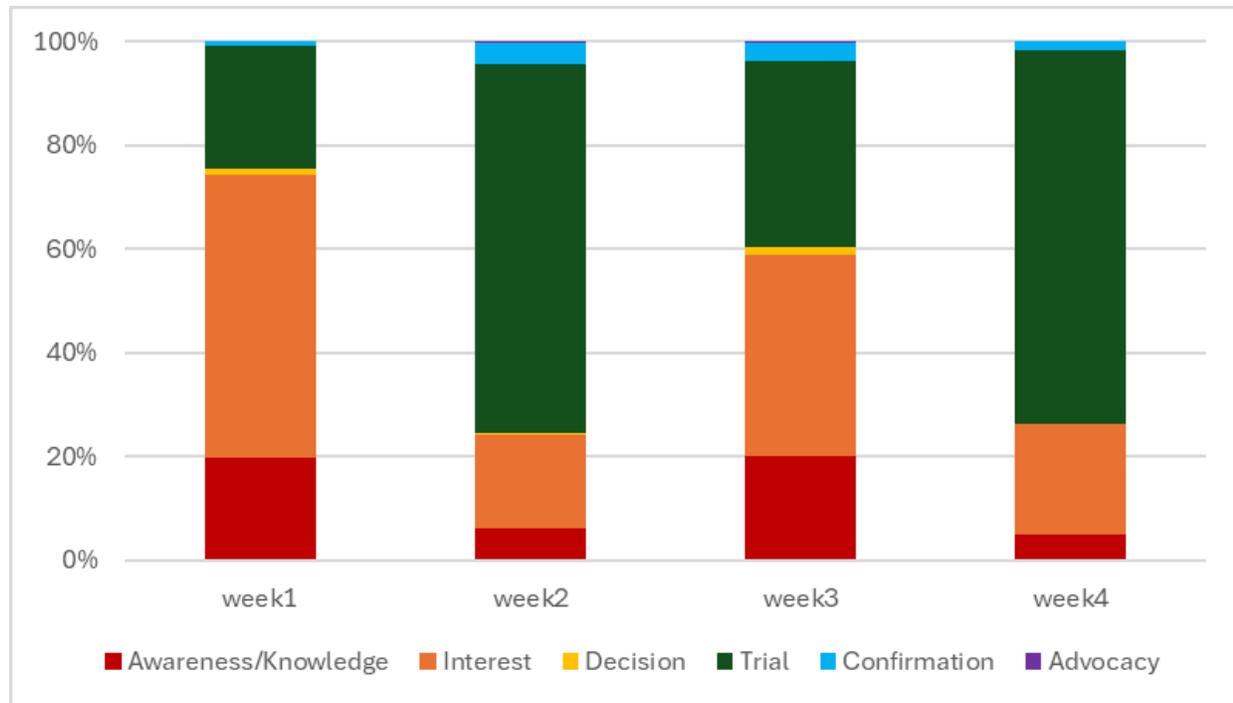
In the third week, students actively shared effective strategies for utilizing ChatGPT. These strategies were supported by diverse sources or evidence, including their own knowledge (i.e.,

Awareness/Knowledge stage, n=135, 20.1%) or experiences (i.e., Trial stage, n=242, 36.1%). While engaging in the weekly discussions and learning from one another, they critically evaluated ChatGPT's utility (e.g., "I don't think ChatGPT is the best place to use as a resource, but it does give pretty good responses sometimes") and expressed a range of perspectives (e.g., "So if ChatGPT could be helpful to students in a tutoring type of way showing them how to do something, I'm all for that.") or personal interest (e.g., "Even though I am not an MIS major, I am still pretty interested."), as reflected in the Interest stage (n=261, 38.9%).

In the final week, they delved into discussions surrounding ethical considerations arising from their interactions with ChatGPT. Consequently, the Trial stage emerged as the most prevalent (n=472, 72.0%), indicating an intensive engagement with the AI tool to evaluate its ethical implications for their teaching and their students. Alongside this, the Interest stage also featured prominently (n=140, 21.3%), manifesting continued curiosity and exploration regarding the ethical dimensions of GenAI utilization.

Figure 2

Weekly DOI Stages Distribution Across Courses



Although students' confirmation and advocacy on the ChatGPT tool did not considerably increase over the course of the week, their anxiety regarding GenAI technologies significantly decreased after taking part in online courses related to AI. We carried out an AI anxiety survey (Wang & Wang, 2022) both before and after the courses to examine whether students' anxiety decreased as they became more familiar with ChatGPT throughout the courses. Using a two-sided

paired samples t-test, we observed a significant decrease in post-test AI anxiety scores ($M = 4.5$, $SD = 1.2$, $N = 26$) compared to pre-test scores ($M = 3.6$, $SD = 1.1$, $N = 26$), $t(25) = -3.7$, $p < .001$. This result suggests that the online discussions facilitated pre-service teachers in acquiring knowledge and skills in AI technologies through direct or indirect experiences, as well as learning from and with their peers. While the majority of participants found the course to be helpful, some expressed a desire to further their understanding of GenAI and GenAI tools by enrolling in additional courses, noting, “To fully comprehend ChatGPT and its implications, I would need to participate in a semester-long course.”

Pre-service Teachers' Dual Identity and GenAI Adoption Plans

Pre-service teachers have unique characteristics in that they possess multifaceted identities as both current students and future educators. These dual roles significantly shape their perspectives on adopting GenAI technology. Throughout discussions on integrating GenAI tools into the educational context, the pre-service teachers elaborated on their plans and provided examples of utilizing ChatGPT in both learning and teaching contexts (see Table 2).

Table 2

Pre-service Teachers' Plans to Apply GenAI Technologies in Educational Contexts

Plan	Example
Learning contexts	
Writing	<p>“Most of the time, I use ChatGPT to check my grammar and punctuation.”</p> <p>“I really appreciated using it when correcting my papers.”</p> <p>“During the amount of time that I have used the AI application that is ChatGPT, I have come across some issues that are not bad but can be easily fixed, such as saving content that can be used for future applications and it does have extensive room for creativity which can allow me to format anything that I would like to use which is very liberating which is very good considering its an AI.”</p>
Preparing for Tests	<p>“For example, I asked for a study plan for my upcoming Praxis exam, and it provided a detailed day and week plan that was helpful.”</p> <p>“I use ChatGPT to help me study for test and make practice problems for me so I can get better at a subject that I am struggling with.”</p>
Understanding Concepts and	<p>“These coming semesters, I will definitely be using AI and ChatGPT to help me better understand concepts or just explain and answer</p>

Researching	some questions.” “If I were to use AI to aid me in research, this process would be less frustrating. I could start my initial prompt, for example, “Did Thomas Edison have a formal education?”. This would generate an answer. Now I could dig deeper by pretending I was having a conversation. Instead of spending an hour trying to find a credible source that answers my initial question, I can spend an hour reading about how his mother was his first teacher.”
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Teaching contexts

Lesson Planning	“I am very excited for ChatGPT to help me meet standards and incorporate lessons with something I did not think of.” “I plan to continue using ChatGPT for help with assignments and future lesson plans. I noticed that the content has different ideas from what I was originally thinking, so this has expanded my thinking and deepened the lesson plan. I believe this to be helpful as it is so easily accessible and provides a variety of examples and ideas that I can choose from that best fit the lesson.”
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Brainstorming Teaching Insight	“It gives great ideas on themes to introduce to my PreK class. It also provides wonderful ideas to support my nine-year-old daughter in reading.”
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Pre-service teachers began by formulating and identifying more concrete plans for implementing ChatGPT in their own learning context. They expressed an intention to utilize the tool for various writing tasks, such as checking for grammatical errors and formatting. Additionally, some indicated a plan to employ the tool for test preparation in their other courses. For instance, two students mentioned developing study plans and creating sample assessment items to aid in their test preparation. Others also said they would utilize ChatGPT to ask questions to understand course concepts and gain knowledge, using the tool as a study and research assistant. They found it particularly beneficial as a learning tool, as they were able to engage in an iterative conversation by posing prompts and receiving answers generated by ChatGPT.

In the teaching context, they expressed their intention to use it for lesson planning and to come up with teaching insights. They pointed out that ChatGPT could suggest various ideas that they had not considered on their own. Despite these plans for integrating technology, their envisioned adoption was mainly limited to brainstorming and lesson planning. They did not explicitly state their intentions to utilize ChatGPT in the implementation or evaluation stages of teaching, perhaps indicating that they were still exploring AI adoption at a preliminary level. While many pre-service teachers recognized the potential benefits of AI tools in both learning and

teaching contexts, some expressed concerns about their limited knowledge and hesitancy in adopting such tools. For example, one student stated, "I believe AI tools can help make teachers' lives easier, but I am also hesitant to explore them due to my limited knowledge." In contrast, another pre-service teacher proposed reframing AI anxiety as "curiosity and feelings of uncertainty" to foster a more open-minded approach to adopting AI tools for teaching and learning. Perceiving GenAI technologies as a double-edged sword, pre-service teachers were cautious in their decision to use ChatGPT for their students, opting for limited use cases.

Pre-Service Teachers' Perceived Benefits of GenAI Tool

As pre-service teachers started to gain their understanding and proficiency in using ChatGPT, they shared the benefits of the tool and its potential application in enhancing teaching and learning. They highlighted the advantage of quick access to information and resources, as well as the ease of obtaining answers. Upon entering questions or prompts, ChatGPT immediately generates responses within seconds. Users can then ask follow-up questions to elaborate on the previous output if needed or finish the search. This easy and streamlined process was highly valued by the pre-service teachers, as it helped them save time and assisted them in various tasks. They expressed positive attitudes about ChatGPT's ability to alleviate tedious work, such as grading, and increase productivity for both teachers and students.

Additionally, they positively viewed it as a private AI tutor, providing opportunities for personalized learning. Rather than solely relying on teachers, they said AI could satisfy diverse students' learning needs by providing appropriate materials or assisting learning at an individual's unique learning pace. One student also noted that AI could transform education by intelligently assessing students' strengths and weaknesses with real-time, individualized feedback. This is further connected to the potential benefits of diverse, equitable, and inclusive learning. For instance, one student stated, "AI-powered tools like speech-to-text and text-to-speech software, as well as real-time translation services, can help bridge language and accessibility gaps, making learning more inclusive." While some pre-service teachers expressed reservations about the reliability of ChatGPT as a source, they also proposed effective strategies for implementing the tool as a learning aid. For example, one pre-service teacher suggested the use of credible sources for verification or cross-referencing of the information generated by ChatGPT. By employing this approach, they can pose complex questions, critically analyze the responses, verify them through reliable sources, and develop a more comprehensive understanding of the topic. Despite recognizing the limitations of AI technologies, these pre-service teachers found ways to utilize ChatGPT responsibly and productively in their learning.

Another recognized benefit of using ChatGPT was its capacity to enhance writing skills and improve the quality of papers. Pre-service teachers found it to be a valuable tool for editing and refining their writing. Beyond simply correcting grammatical errors, they anticipated that ChatGPT could assist them in achieving greater clarity and coherence in their writing. For instance, one pre-service teacher remarked, "I find AI to be particularly useful when I'm stuck and struggling to find the right words for a paper or assignment." Another pre-service teacher expressed a similar sentiment, stating, "There are times when we struggle to convey our message effectively in writing, and I believe ChatGPT can help us articulate our thoughts more clearly." These insights highlight the potential of ChatGPT to support pre-service teachers in refining their writing skills and producing higher-quality academic work for their own learning and teaching.

Pre-Service Teachers' Perceived Concerns and Challenges on Using GenAI Tool

While discussing the potential impact of ChatGPT, pre-service teachers raised concerns and challenges associated with its use. These concerns were not only related to the limited functionality of the tool but also to the manner in how people use technology. In fact, they were concerned about issues that they would need to deal with in the near future. The concern revolved around the potential for academic dishonesty, with pre-service teachers expressing apprehension about the possibility of ChatGPT being utilized for cheating by their future students. They highlighted the ease of generating responses and copying from the tool, raising concerns about its implications for academic integrity. Thus, a few pre-service teachers emphasized the importance of AI regulation and policies to mitigate the risk of misuse and ensure ethical AI use in educational settings.

This concern was extended to the potential impact on critical thinking skills and creativity, with pre-service teachers worrying that excessive dependence on AI could lead to a decline in these higher-order thinking skills. They feared that their future students might opt to use AI to complete assignments rather than study the material. As one pre-service teacher remarked, "It can lead to people not being able to think or function on their own." This concern was not limited to students alone but also applied to the broader population. Another pre-service teacher highlighted the importance of maintaining a balance and not relying solely on AI, stating, "But all faith should not be put into ChatGPT alone. We still need to be using our own research, our own knowledge, and our own hard work in our classes and in our careers. We can take help from AI, but we should never let it do the job for us."

Furthermore, some pre-service teachers emphasized concerns about biased responses generated by ChatGPT, highlighting the potential negative impact on social justice. One remarked, "In my research throughout this course, I have learned that ChatGPT and other AI programs can potentially have social, gender, and racial biases," echoing the sentiments of many others who were concerned about the possibility of generating prejudiced and stereotypical content. Additionally, they discussed the misuse of AI tools in creating and spreading misinformation. While some attributed this to the limited or outdated training data of ChatGPT, others expressed worry about intentional manipulation by individuals. Consequently, they emphasized the importance of being aware of potential biases and the lack of transparency in the way how AI technology operates. One pre-service teacher summarized as an "advocate for responsible AI development that respects accuracy, fairness, and freedom of information."

Challenges encountered while using ChatGPT primarily revolved around inadequate prompting skills. Initially, the pre-service teachers struggled to obtain desired or expected results due to inappropriate approaches. For example, some treated AI as human, requesting judgmental responses or subjective opinions. At other times, prompts were poorly articulated, resulting in generic responses. Through practice and revision of prompts, the pre-service teachers learned to script prompts effectively, eliciting more accurate and relevant answers. One pre-service teacher reflected, "Oftentimes, it misinterprets my commands or prompts and directs me to an incorrect or partially wrong answer. This difficulty has decreased as I have learned to ask prompt questions or questions more concisely to receive a more accurate answer for whatever I am doing." Additionally, sharing effective search strategies proved beneficial. The pre-service teachers recommended chunking the problem, implementing a feedback mechanism to correct and improve ChatGPT's responses, and limiting response length.

Discussion

The present study demonstrated both quantitative and qualitative evidence which illustrates the views of pre-service teachers, delivering rich insights into the interplay between students and teachers when introducing a GenAI tool for their learning and teaching. Pre-service teachers expressed a unique dual perspective, balancing their own learning experiences with the preparation for future teaching roles, a dynamic that significantly influences their pedagogical approach (Borg, 2006; Farrell, 1999). Unlike in-service teachers, the pre-service teachers had an opportunity to utilize the GenAI tool for their own learning, including assignment submissions and discussion participation. It was notable that the pre-service teachers first experienced the tool as learners themselves before connecting their experiences with their future role as teachers. These experiences are likely to influence their intention to apply ChatGPT in their teaching, as the pre-service teachers' exposure to technology can lead to higher level of perceptions in terms of importance, helpfulness, and competence of digital technologies (Bakir, 2015; Polly, Martin, & Byker, 2023).

Based on their own experiences, pre-service teachers identified limitations associated with using ChatGPT and recognized societal and ethical issues that could arise from their use for learning (Karahan, 2023). For instance, they discussed how ChatGPT could potentially contribute to plagiarism and weaken critical and creative thinking skills among their future students. As a result of these discussions, pre-service teachers suggested implementing regulations on the use of ChatGPT to mitigate these concerns and impacts in educational settings. This process helped them reflect on how their firsthand encounters with AI tools afforded them to critically assess their pedagogical decisions for the future. Essentially, the pre-service teacher preparation courses played a pivotal role in fostering transformative learning experiences. It empowered the pre-service teachers to actively participate in the instructional discussions as active future teachers, not merely as passive students. This active engagement extends beyond personal learning experiences to include critical and practical reflections on the technological and ethical dimensions of educational tools, essential for both personal learning and future teaching practices.

However, during the discussions, pre-service teachers did not express confirmatory statements indicating they would adopt this tool for their teaching practices. This reiterates results from the previous studies that show reluctance of pre-service teachers adopting AI-related technologies (e.g., Kaufmann, 2021). Despite engaging in weekly discussions about using ChatGPT, which increased their awareness and foundational knowledge of GenAI tools, they primarily focused their conversations on the perceived benefits, concerns, and challenges associated with using ChatGPT. This finding suggests that while they recognized the potential advantages of GenAI tools, they still showed reservations and uncertainties about integrating them into their teaching practices. Furthermore, their discussions about using ChatGPT in their courses stayed at a general learning level without delving into specific instructional plans for integrating the tool into their teaching practices. For instance, pre-service teachers concentrated on topics, such as crafting effective prompts, and shared advice based on their experiences. This could be attributed to the condensed 6-week course structure, which may not have allowed enough time for pre-service teachers to fully explore and apply ChatGPT within their instructional strategies. Alternatively, they may have lacked a practical classroom setting to actively consider or implement

the tool in a meaningful way as a pre-service teacher. This focus on general aspects of using ChatGPT indicated a need for further exploration and development of concrete instructional strategies for implementation in educational settings, such as a lesson plan design activity.

Another notable finding is attributed to the perceived uncertainty that pre-service teachers demonstrated regarding GenAI tools. Despite an increase in their interest and knowledge about GenAI tools and a significant reduction in anxiety towards AI technologies by the AI anxiety pre/post survey, they still expressed uncertainty about their potential applications in classrooms, manifesting in a range of emotional responses, including both worry and excitement. This uncertainty surrounding GenAI tools' application in the classroom could be a significant barrier to their adoption for teaching and learning (Wang et al., 2024). To address this challenge, pre-service teachers may benefit from additional professional development opportunities aimed at understanding AI concepts and ethical considerations to reduce uncertainty and enhance familiarity with AI use in educational settings. Such initiatives could empower educators to confidently integrate AI tools into their instructional practices.

Lastly, for research into the adoption of GenAI tools for pre-service teachers, our findings can serve as a foundational guide for future research endeavors aimed at promoting the efficient and responsible adoption of GenAI tools within higher education environments. Employing the DoI framework can help us identify which stage students are in throughout their experiences and afford us opportunities to proactively respond to their needs (Sahin, 2012). By employing this framework, future design-based research could systematically assess and refine instructional strategies to ensure that GenAI-related course materials align precisely with pre-service teachers' readiness and openness to new technologies. This methodical approach allows for tailored interventions at each adoption stage, from raising awareness and sparking interest to facilitating informed decision-making and promoting sustained use and advocacy. Additionally, our findings underscore the significance of continuous feedback loops within pre-service teacher development courses. By tracking and analyzing pre-service teachers' adoption cycles and stages, we can tailor activities to either flexible or in-depth experiential learning as needed. This strategy not only optimizes the integration of GenAI tools in the curriculum but also maintains student engagement by encouraging them to critically assess and reflect on their experiences with these technologies.

Implications for Practice and Research and Limitations

This study explored pre-service teachers' discussion postings in an online learning setting to discover their perspectives on GenAI. In practice, analysis of the discussion postings can provide useful implications for designing and facilitating asynchronous online courses aimed at leveraging the potential of ChatGPT for pre-service teachers (Song & McNary, 2011). By analyzing the adoption stages within these discussions and examining the qualitative content, instructors can identify effective instructional strategies to integrate ChatGPT into their curriculum. In particular, the analysis can shed light on the types of prompts and activities that resonate most with pre-service teachers when utilizing ChatGPT, highlighting successful approaches for fostering meaningful engagement and learning outcomes. Additionally, this study could reveal challenges and barriers encountered by pre-service teachers, informing adjustments to course design and facilitation methods to optimize the use of GenAI tools like ChatGPT in educational contexts. For example, it was insufficient for students to simply adopt ChatGPT for their teaching only with the weekly discussions; it required deliberate, authentic assignments that allowed them to intentionally

leverage the tool in their teaching practice (e.g., a scenario that requires adjusting reading levels and multilingual teaching context). Furthermore, insights gained from the analysis can inform the development of best practices and guidelines for instructors seeking to incorporate AI tools into asynchronous online courses. By understanding how to structure discussions, provide support, and scaffold discussions around ChatGPT, instructors can create more effective and enriching learning experiences that enhance pre-service teachers' proficiency and confidence in utilizing AI technologies.

Although this study contributed to a deeper understanding of the pre-service teachers' experiences using ChatGPT, important questions remain. Because this study investigated one instructor in one institution, we need to expand our study to multiple institutions with more instructors to establish diverse learning contexts. With a larger sample size and instructors, researchers could become more confident about the findings representing the experiences of pre-service teachers in general, not just those at this specific institution. In addition, the participants' experiences may have been influenced by the specific course structure, curriculum, and the instructor who designed and implemented the courses. Future research could explore how these contextual factors shape pre-service teachers' discourse on and perceptions of GenAI tools in classrooms. These limitations highlight the need for further research. Additional studies with larger and more diverse samples across multiple institutions would strengthen the validity of the current findings. By replicating the study in different contexts, researchers can determine if the observed uncertainty surrounding GenAI tools is consistent across different pre-service teacher programs and design effective teacher professional development programs.

Conclusion

AI is not going anywhere, so it is our job to help students understand how to use it responsibly. Discussions surrounding ChatGPT within the courses contributed to a notable increase in pre-service teachers' awareness and foundational knowledge as well as a meaningful decrease in anxiety towards AI technologies. However, despite their exposure to ChatGPT during the courses, only a minority of participants confirmed intentions to adopt GenAI tools in their learning or teaching practices. Moreover, their contributions in discussions predominantly remained at a general level, lacking specific plans for integrating ChatGPT into their lessons. This may be indicative of uncertainties surrounding the application of GenAI in educational contexts, as evidenced by a range of emotional responses, including feelings of uncertainty and concern. Professional development opportunities targeting AI literacy could play a pivotal role in addressing these uncertainties and enhancing familiarity with GenAI technologies among pre-service teachers. Moving forward, the findings from this study will contribute to providing valuable insights into the effective and responsible adoption of GenAI tools in educational settings. Additionally, the study aims to shed light on how higher education institutions can strategically leverage ChatGPT to enhance the learning experiences of pre-service teachers.

Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

Ethical Approval

All procedures followed were in accordance with the ethical standards of the Human Subjects & Institutional Review Boards. Informed consent was obtained from all individual participants who were included in the study, and they were informed they could elect to withdraw participation at any time.

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Exploring the Utility of ChatGPT for Self-Directed Online Language Learning

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Abstract

As generative AI tools are increasingly popular in today's teaching and learning process, challenges and opportunities occur at the same time. Self-directed learning has been regarded as a powerful learning ability that supports learners in informal learning contexts and its importance rises in salience when incorporating AI into learning. This study employed a mixed-method design to understand how people self-direct their online language learning through the utilization of ChatGPT. Analyzing survey data from 276 survey respondents and 11 one-to-one interviews with language learners in the United States, we found that learners are motivated to use generative AI for its high flexibility and personalization which enables learners to access learning materials that align with their knowledge levels, personal interests, and learning goals. We also found self-monitoring skills that are inherent to learners help them to use ChatGPT more effectively and achieve their learning goals efficiently. This study contributes to the emerging field of AI in

education and explores possibilities to use ChatGPT to foster self-directed language learning and provide educators, instructional designers, and researchers with insights to design learning integrated with AI to best fulfill learners' diverse needs and expand learning opportunities to more people.

Keywords: Self-directed learning, language learning, artificial intelligence in education, generative AI, ChatGPT

Li, Z., Bonk, C.J. (2024). Exploring the utility of ChatGPT for self-directed online language learning. *Online Learning, Volume28(3)*, (157-180). DOI:10.24059/olj.v28i3.4497

The integration of artificial intelligence (AI) tools in teaching and learning has demonstrated its effectiveness in alleviating learner anxiety while elevating their confidence and fostering increased motivation for communication (Bao, 2019; Tai & Chen, 2020). In recent years, generative AI (GenAI) technology has significantly grown, particularly in educational settings (Baidoo-Anu & Ansah, 2023; Chan & Hu, 2023). GenAI features utilizing machine learning technologies to analyze patterns of existing data to generate new human-like content in formats including but not limited to text, visuals, and audio (Brynjolfsson et al., 2023).

ChatGPT is currently one of the most known and used GenAI platforms with its remarkable capacity to complete complex tasks and wide implementation in education (Adeshola & Adepoju, 2023; Baidoo-Anu & Ansah, 2023; Rahman & Watanobe, 2023; Yu & Guo, 2023). Recent research indicates that GenAI tools and platforms, such as ChatGPT, confer advantages to language learning through the generation of coherent and fluent text, the creation of authentic language materials, and the facilitation of personalized learning (Baskara, 2023a). However, despite these advancements, there is limited empirical research concerning the role of AI in self-directed language learning (SDLL), particularly in informal learning settings (Jeon, 2022). To close the knowledge gap, this research attempts to understand how adult learners self-direct their online language learning through the utilization of GenAI platforms such as ChatGPT.

Literature Review

Generative AI-Supported Self-Directed Learning

Self-directed learning (SDL) is a central element of adult learning and has been regarded as a powerful learning ability that strongly supports learners in informal learning contexts (Li & Bonk, 2023; Brookfield, 2009; Morrison & McCutcheon, 2019). SDL emphasizes learning autonomy, personal responsibility, and self-growth (Gibbons, 2002; Wilcox, 1996). It is often investigated through the perspectives of being a personal attribute, a process, or a context of the learning environment (Song & Hill, 2007). One of the most influential SDL frameworks was designed by Garrison (1997) over two decades ago. It recognizes SDL through the lens of (1) motivation, (2) self-management, and (3) self-monitoring. Garrison (1997) claimed that motivation is the internal desire or need that leads individuals to engage in SDL, which includes both entering motivation and task motivation. The focus of self-management is self-control towards what and how to learn, including the use of resources, control of the learning context toward the goal, and strategies to manage the learning schedule. Self-monitoring is the responsibility for the process of learning, including being reflective and thinking critically.

Research has proven that incorporating GenAI into SDL has a positive impact on learning (Preiksaitis & Rose, 2023). Lin (2023) suggested that ChatGPT particularly has great potential to address the challenges faced by adult learners, such as the difficulty of locating resources and the lack of a supportive learning environment. In addition, ChatGPT can support learners in establishing learning objectives, identifying accessible resources, creating personalized learning plans, tracking learning progress, reflecting on learning experiences, and ultimately achieving successful forms of SDL, though instructor support may still be needed in this process.

Furthermore, Baidoo-Anu and Ansah (2023) proposed that ChatGPT fosters personalized and interactive learning, thereby promoting SDL. They emphasized that ChatGPT encourages students to independently explore learning topics by inputting keywords or questions to access relevant information and resources (Firat, 2023; Rasul et al., 2023). While scholars have argued that ChatGPT provides personalized learning support, Chan and Hu (2023) noted that concerns about accuracy, privacy, and other ethical and social issues were raised by their survey participants.

Generative AI for Language Learning

GenAI platforms have become prominent for language learning and teaching (Anggoro & Pratiwi, 2023). Research suggests that ChatGPT could support language learning by providing scaffolding and feedback, developing necessary language skills, and recommending activities for language practice (Bin-Hady et al., 2023). Liu and Ma (2023) conducted a survey involving 405 Chinese undergraduate and graduate English learners to investigate their perceptions and acceptance of using ChatGPT in supporting their English learning. Their findings show that the ease of using ChatGPT influenced participants' perceived usefulness of the tool, which significantly impacted the students' utilization of ChatGPT in informal language learning settings. Liu and Ma (2023) suggested that ChatGPT provides easy access and increased opportunities to engage in SDLL among language learners.

Liu (2023) also examined English learners' attitudes towards ChatGPT and the effectiveness of using ChatGPT to facilitate language learning. This study sampled 109 Chinese students at the undergraduate level, including nearly 37% of participants currently enrolled in colleges in Mainland China, around 3% from Hong Kong, Macao, or Taiwan, and the remaining 60% of students studying overseas. Adapted from a questionnaire by Hasan (2019), five-point Likert scale questions were designed to measure perceptions of ChatGPT, attitudes towards actual practice with ChatGPT, perceptions of the advantages of ChatGPT, and the perceptions of disadvantages of ChatGPT. Hasan's (2019) findings suggested that participants have a slightly stronger tendency to use ChatGPT to improve reading and writing skills over communication skills, and they demonstrated generally positive attitudes toward ChatGPT's potential to boost their learning abilities. Interestingly, this study indicated that there is a relationship between students' geographic location and their acceptance of ChatGPT. Those who study in Mainland China displayed lower levels of motivation and a less positive attitude towards using ChatGPT for English learning than students who were studying overseas. Thus, when considering how learners use ChatGPT for SDLL, it seems likely that the learning context and social elements such as institutional policy and sociocultural norms significantly impact their learning experiences (Li et al., 2024). Liu and Ma (2023) and Liu (2023) shared some common research designs such as employing quantitative surveys among Chinese students in higher education settings. However, such quantitative approaches are not sufficient to measure learner attitudes and perceptions.

In addition, current research on GenAI for language learning has predominately focused on learning English as a second language in classroom settings as well as investigating perceptions instead of practice. For instance, Lee et al. (2024) investigated the perceptions of 80 English language learners (ELLs) from a Korean university. They reported that 30% of the participants felt

uncertain about the efficacy of these tools in facilitating English learning. Lee et al. (2024) suggested a need to investigate the possible integration of AI tools into English language teaching for adult learners worldwide. However, apart from these perception-based and classroom-focused language learning research studies, individual learners' self-directed language learning practices remain largely unexplored. Given that language learning technologies (e.g., Duolingo, Rosetta Stone) have been long and widely used in SDL (Li & Bonk, 2023), research should strive to understand how new generative AI technologies can impact self-directed language learning.

In this study, we investigated the SDL practices facilitated by GenAI tools like ChatGPT following Garrison's (1997) SDL framework. Aligning with each dimension of Garrison's framework, namely, motivation, self-management, and self-monitoring, we examined the following research questions accordingly:

1. What motivates learners to utilize self-directed learning with ChatGPT?
2. How do language learners select and apply self-management strategies when utilizing ChatGPT in their language learning routines?
3. How do language learners employ self-monitoring strategies when using ChatGPT for language learning?

Methods

This study aims to fill a prominent gap in the literature by investigating how language learners incorporate ChatGPT into their SDLL through an explanatory mixed-method approach (Creswell & Plano Clark, 2007). Drawing on Garrison's (1997) self-directed learning (SDL) model, the present study developed survey and interview instruments to measure SDL across three dimensions: (1) motivation, (2) self-management, and (3) self-monitoring.

Data Collection

Survey. The survey consisted of three demographic questions, five inquiries on general ChatGPT usage, and a set of three Likert scale questions with 23 items tailored to assess learners' SDL in utilizing ChatGPT for language learning. The survey items were adapted from instruments by Fisher and King (2010), Williamson (2007), and the Zhu and Bonk (2019), which are based on Garrison's (1997) SDL framework. As we developed the survey instrument, we had one SDL expert to check on items and a language learner to pilot this survey. We made changes accordingly after we gathered feedback. Example survey questions can be found in Table 1.

Table 1

Examples of Survey Questions and Aligning SDL Principles

Items	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Motivation (Note: this title is not included in the actual survey)					

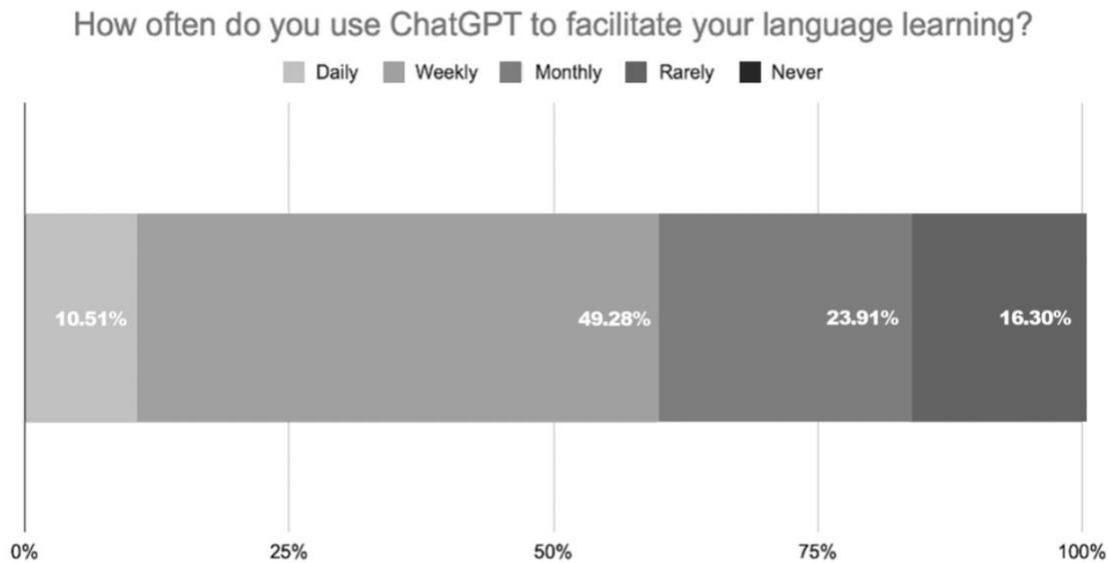
I have motivation to learn a language with ChatGPT.					
I enjoy learning new information related to language through ChatGPT.					
Self-management					
I seek assistance when facing problems learning a language online.					
I manage my time well while using ChatGPT to learn a language online.					
Self-monitoring					
I can direct my own language learning progress while learning with ChatGPT.					
I have high learning standards when I learn a language with ChatGPT.					

A survey distribution platform, Prolific, was utilized for participant recruitment, targeting individuals who met the following specific criteria: at least 18 years old, residing in the United States, currently enrolled as a student, and having engaged with ChatGPT for second language learning purposes.

A total of 276 completed survey responses were collected. Among all the survey participants, 33.45% identified themselves as female, 64.36% as male, and 2.18% as other (e.g., non-binary). In terms of educational levels, 24.73% of participants have their highest degree from high schools, 49.09% have bachelor's degrees, 13.82% have master's degrees, 1.45% have doctoral degrees, and 10.91% have other types of highest degrees (e.g., associate degrees, technical degrees). As Figure 1 indicated, 136 (49.28%) of the survey respondents reported that they used ChatGPT to facilitate their language learning weekly, followed by 66 (23.91%) on a monthly basis, 45 (16.30%) rarely, and 29 (10.51%) daily.

Figure 1

Frequency Of Using ChatGPT To Facilitate Language Learning.



Interviews. At the end of the survey, participants were asked if they were willing to participate in a one-time 40-minute interview through a Zoom meeting room of the researchers. If so, the respondents would provide their contact email address via the survey form. After collecting their email addresses (N=125), we used random sampling to select interview participants. Those selected would receive an interview invitation through email with an information sheet about the study. Those willing to engage in the interview would reply to the email invitation and confirm their participation. We contacted all 125 participants who left their contact information, and, eventually, 11 individuals agreed and participated in interviews. Their demographic information is included in Table 2.

Table 2

Demographic Information Of Participants

Participant pseudonym	Age	Gender	Current education level	Target language	Frequency of using ChatGPT for language learning
Amelia	31	Female	Graduate degree	Spanish	Weekly
Bennett	31	Male	Graduate degree	Spanish	Daily
Chandler	41	Male	Graduate degree	Spanish	Weekly
Danielle	29	Female	Undergraduate	Hebrew	Weekly

Elliott	35	Male	Graduate degree	Spanish	Weekly
Fallon	40	Female	Undergraduate	Spanish	Weekly
Giovanni	45	Male	Undergraduate	Spanish	Daily
Howard	24	Male	Undergraduate	French	Weekly
Ivan	41	Male	Graduate degree	Brazilian Portuguese	Weekly
Kai	23	Male	Undergraduate	Spanish, Italian, Turkish, French	Weekly
Lydia	48	Female	Graduate degree	Tamil	Daily

Artifacts. We either asked them to share their screens during the interview to walk us through their typical use of ChatGPT for language learning or send screenshots of previous language learning related interactions with ChatGPT.

Data Analysis

The analysis employed descriptive statistics for survey data (Mishra et al., 2019). Researchers used various graphical representations to summarize and indicate the distribution, central tendency, and variability among responses.

To systematically analyze data and identify recurring patterns, we used thematic analysis for interview data analysis (Braun & Clarke, 2022). We started with familiarizing ourselves with interview data and preparing them for analysis by transcribing all the audio recordings automatically and then re-listening to make corrections manually. During the first stage, we created initial codes to represent meanings and patterns that were observed across the data. In NVivo 14, we highlighted the excerpts and assigned appropriate codes to them, followed by reading through all excerpts within each code to adjust and revise codes as needed. Then, we grouped codes into themes that have nuanced and meaningful information about the research questions.

During the coding process, to reduce individual biases and increase the validity and reliability of the coding process, two researchers conducted a pilot test where each of them coded two interviews before coding the entire dataset. Then, when conducting individual coding, these researchers used a blind coding scheme where they were not informed of each other's coding decisions until the end, which minimizes the potential biases. Next, they compared coding results and openly discussed any discrepancies to refine coding guidelines to ensure agreement between

coders. They also had regular meetings to discuss if any challenges or discrepancies occurred. Table 3 delineates the coding themes, codes, and examples of excerpts.

Table 3

Coding Themes, Codes, And Examples of Excerpts

Themes	Codes	Examples of excerpts
Motivation	Initially motivated by people who used ChatGPT in the surrounding environment	“I talked to a friend who uses AI in place of actually speaking to a person one-on-one when learning a language. And she was talking about how her experiences are really positive, and she's learned a lot from it. And so I decided to kind of explore that and like, see how it goes.”
	Motivated by ChatGPT’s convenience for supporting independent learning	“But if I have a question where I'm stuck, I can ask ChatGPT. I don't have to rely on a study partner who may or may not know the answer.”
	ChatGPT makes learning efficient by offering contextualized and point-to-point answers	“It's more contextual, like you can tell him, ‘Hey I have a friend. We're not too close. I want to say this, how do I say it?’ Like, it's the context behind it.”
	Motivated by ChatGPT’s rich linguistic affordances	“I can always ask how this grammar was structured, or why is this and not that, or why is this word instead of that word?”
Self-management	Set habitual learning routines	“I usually use it in the morning before I start working. And I'll usually use it for like 10 or 15 min or so [to] have a short conversation before I work.”
	Prompt questions to align with learning goals	“I have found that the more detailed your question is, the better your answer and your outcome is.”

	Validate information with other resources throughout the learning process	“I actually have a dictionary to consult if the word is correct... I tend to even consult outside experts, I tend to use those two, [or] three things the most.”
Self-monitoring	Know what aspects of language learning need to be improved	“So what I do with it mostly is try to validate some of what I have... the way I'll use ChatGPT is to look for better ways to write something.”
	Compare the learning outcome with past learning experiences	“If I walk away from it feeling like I learned something... that's a bit of a victory that I'm doing well, and I'm learning something.”
	Integrate multiple resources or tools for assessment	“I'll just start talking [to family members who speak Spanish] and they'll respond. So that shows me where I'm at at that point.”

Researchers applied document analysis for artifacts—participants’ chat history—to analyze the language use, interaction dynamics, and patterns with ChatGPT (Bowen, 2009). This analysis of participants’ interactions with ChatGPT was used to triangulate with our survey and interview data.

Findings

Motivation

As shown in Table 4, the highly-ranked motivation from survey respondents is the enjoyment of learning new information through ChatGPT. The highest-ranked statement, “I enjoy learning new information related to language through ChatGPT,” has a mean of 4.21 and a standard deviation of 0.78. The least voted motivation from the survey is “I like to share my ChatGPT language learning experiences with others” ($M = 3.37$, $SD = 1.17$).

Table 4

Descriptive Statistics on Motivation Items

Statement item	Mean	SD	Variance
I enjoy learning new information related to language through ChatGPT.	4.21	0.78	0.61

I have motivation to learn a language with ChatGPT.	4.01	0.93	0.86
I want to learn new ideas related to language learning brought up by ChatGPT.	3.94	0.99	0.98
I have a need to learn a language with ChatGPT.	3.43	1.22	1.49
I need to know the deeper reasons for the language feedback by ChatGPT.	3.43	1.13	1.28
I like to share my ChatGPT language learning experiences with others.	3.37	1.17	1.37

Interestingly, even though this motivation is not significant from survey results, interviews found that many participants' entering motivation to use ChatGPT for language learning derived from the positive learning experiences indicated by people in their surrounding environments (e.g., friends, professors, social media users, etc.). For example, Amelia's friend shared her language learning experience with AI platforms which inspired Amelia to try ChatGPT. She mentioned that,

I talked to a friend who uses AI in place of actually speaking to a person one-on-one when learning a language. And she was talking about how her experiences are really positive, and she's learned a lot from it. And so I decided to kind of explore that and like, see how it goes... and it's gone really well, I feel like I've learned a good amount and that coupled with my language learning apps that I use and have been using for a couple of years. I feel like it helps a good amount.

Danielle also started to use ChatGPT for language learning after she perceived its benefits in a class where her professor suggested learning with ChatGPT and even provided guidance on how to use it effectively. Notably, social discussions on ChatGPT's potential in facilitating learning also influenced people's motivation to use it for language learning. For instance, Elliott indicated that the reputation of AI tools motivated him to try ChatGPT for language learning.

The most mentioned motivation by interviewees was that ChatGPT supports convenient and independent learning in various ways. Ivan, a graduate student who is learning Portuguese with ChatGPT, suggested that he preferred self-study at his own pace and ChatGPT facilitated this style of learning so that his learning was not dependent on other people. As he explained,

I typically don't like to do group study sessions or like a lot of one-on-one learning sessions. I like to study by myself and just work and study at my own pace. Like ChatGPT, AI tools are very well suited for me because I can do that. But if I have a question where I'm stuck, I can ask ChatGPT. I don't have to rely on a study partner who may or may not

know the answer. For me, in that regard, I feel like the AI tools work very well for my approach to studying.

Similarly, Danielle said, “one of the positives to me is that I know it's not a person, and so I'm not bothering someone.” She further conveyed feeling embarrassed when not presenting herself effectively to other humans. However, interacting with a chatbot that does not have personal opinions provided her with a safe learning space where she could error without fear. For some other people, ChatGPT could be the one-to-one tutor at no cost to provide personalized learning experiences. For instance, Amelia commented that because she did not have a friend who could coach her language learning, “ChatGPT is kind of a stand-in for a person or a tutor that knows the language natively.” Therefore, generative AI like ChatGPT enabled learners to be more independent in the learning process with easy access.

A very significant motivation for people to use ChatGPT for language learning is that it is capable of providing contextualized and point-to-point answers. Elliott commented that he had Spanish-speaking friends so sometimes he needed to figure out what his friend was saying. One strategy he used was to copy and paste random texts from chats to obtain translations. Elliott explained,

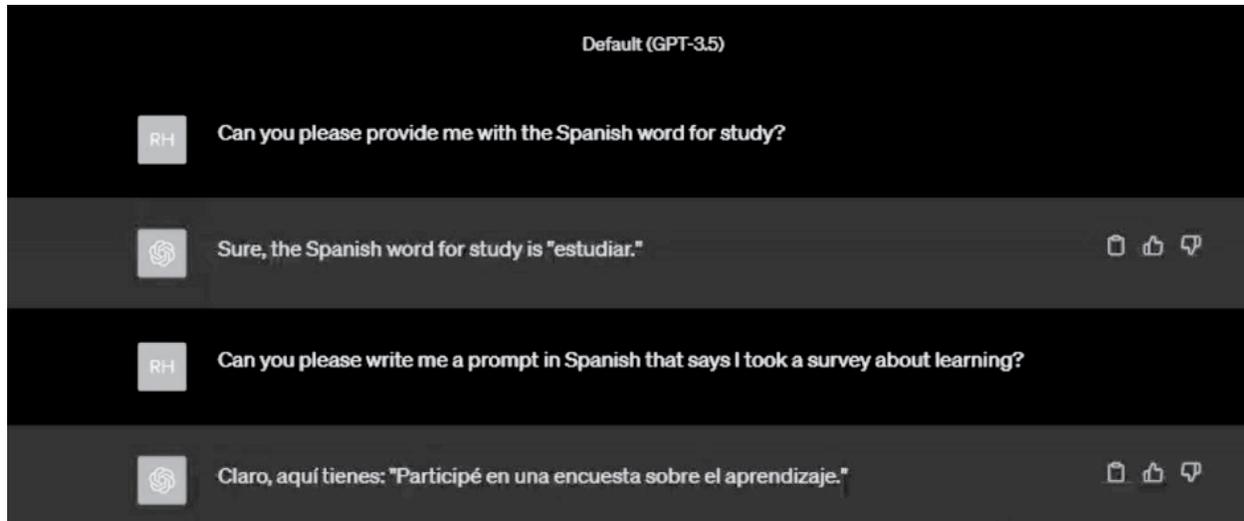
I copy it from here, paste it there, see what it says, what does this mean? I can do that on Google as well. But it doesn't give me the proper context. Or I kind of trust [ChatGPT] more, because it [is] to the point.

He further suggested that ChatGPT enabled him to ask follow-up questions, thus making his learning more efficient. He claimed, “I can always ask how this grammar was structured, or why is this and not that, or why is this word instead of that word? I can ask [anything], it can further elaborate the questions I have. With Google, it's totally different.”

As shown in Figure 2, Chandler, a Spanish language learner, demonstrated his interaction with ChatGPT on the screen. The screenshot provided a glimpse of how he phrased his questions and the kind of tasks he frequently asked ChatGPT for. As Chandler indicated, he asked ChatGPT to translate words or structure sentences, which was specific to his need at that moment.

Figure 2

A Screenshot of the Participant's Demonstration of His Interaction with ChatGPT

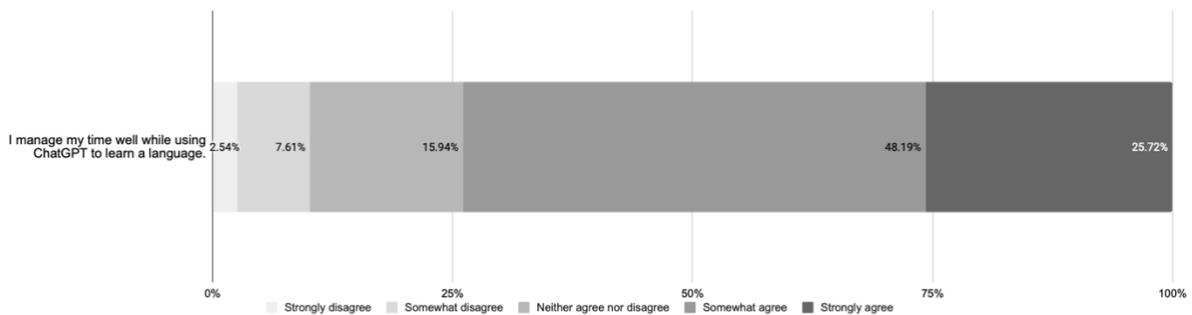


Self-Management

Our survey data indicated that time management has been considered in participants' learning process. Regarding the statement, "I manage my time well while using ChatGPT," nearly half of the participants (48.91%) reported that they somewhat agreed. This was followed by 25.72% who strongly agreed, 15.94% who neither agreed nor disagreed, 7.61% who somewhat disagreed, and a mere 2.54% who strongly disagreed. The mean value is 3.87, with a standard deviation of 0.98.

Figure 3

Learners' Responses to the Statement on Time Management Percentages of



Interview data reinforced that the flexibility of accessing ChatGPT anytime and anywhere motivates individuals to establish habitual learning routines, thereby supporting effective time management. For example, Bennett who used ChatGPT on a daily basis to study Spanish stated that he enjoyed practicing conversations at the beginning of the day. He detailed his approach as follows:

I usually use it in the morning before I start working. and I'll usually use it for like 10 or 15 min or so [to] have a short conversation before I work. If I have more time or I feel like I

want to go back in there and have another conversation. I'll hop back in. But it's usually at a minimum like 10 or 15 min a day at the beginning of the day.

Giovanni who has also used ChatGPT for Spanish learning also shared his learning schedule, stating that, "I try to study at least 30 min up to 60. And then, when I'm having a conversation, it's usually like, maybe recently, last week, I tried maybe 4 times out of that week. So, either by voice or text." He further emphasized the importance of time management, while challenges exist, particularly in staying on track with learning tasks with a busy life schedule. He noted,

One of the things I'm lacking is the time management aspect. Because I think if I had a specific time or schedule that I have set up to do these things. So I don't start slipping and just putting it off. Because I do work a lot, so that gets in the way. So I think that would be the major barrier. But that's something that ChatGPT can help you with really.

Furthermore, many interviewees indicated that an effective strategy they used to learn language with ChatGPT was prompting good questions. Chandler, who is learning Spanish on a weekly basis, discovered that "I have found that the more detailed your question is, the better your answer and your outcome is." He emphasized the importance of having the ability to promote good questions and validate information provided by ChatGPT. As Chandler shared, "I will sometimes try phrasing my question in a number of different ways to see what the responses are, and it's such a trick that I use with ChatGPT in general." Danielle has been learning Hebrew with ChatGPT; similarly, she recommended developing pre-prompt skills throughout the learning process with ChatGPT. She suggested including some contextual information to inquire for more accurate answers.

As our participants indicated that they recognized inaccurate or even false information related to language learning provided by ChatGPT, they often utilized various resources to assist their learning and validate the information. For instance, Fallon shared her experience as follows:

I've asked the same question [to ChatGPT], like maybe two or three times and it came back with a different answer. So sometimes I'll hit I'll put it into like the Google Translator. I don't have any other translator on my phone. So I just have been using that and seeing what that comes back. Most of the time. It's like, oh, it's alright. And if it doesn't, it'll tell me what the accurate one is. And then I'll go back in and I'll correct it.

In fact, most of our interviewees reported that they had used various resources or tools, both digital (e.g., phone applications for language learning) and non-digital (e.g., books), to support their information validation through language learning with ChatGPT. Howard suggested, "I actually have a dictionary to consult if the word is correct. I also use Duolingo as well. And as I was saying earlier, I tend to even consult outside experts, I tend to use those two, three things the most."

Self-Monitoring

Using various resources is not only a complementary learning strategy for self-management, but it also supports self-evaluation with diverse parameters. One interviewee, Giovanni, used fluency in communication with family members as an indicator of his learning improvement. He elaborated,

I've been sending those messages like I said, sometimes over the phone when I'm talking to a family member. All of them start talking to them out of nowhere, and just try to use some words and try to communicate, and I'll see where I failed there, and just stop. I won't warn them ahead of time. I'll just start talking [to family members who speak Spanish] and they'll respond. So that shows me where I'm at at that point.

Apparently, Giovanni would justify his language learning with ChatGPT approach if he has improved his Spanish language skills based on how far the conversation in Spanish with his family lasted and also cognitively identified where further improvement is possible. While it is an example of how people use native speakers to examine learning progress and facilitate self-monitoring when learning a language with ChatGPT, many other participants self-evaluate their learning by using other strategies and tools. Among the other language learning tools people use for self-monitoring, Duolingo, has been the most mentioned.

However, compared with other tools, participants indicated that ChatGPT has a unique advantage for language learning due to its high-level flexibility and personalization. For example, Elliott compared his experience with other language learning tools with ChatGPT as follows:

Duolingo is too repetitive. It does a good job if you're trying to learn something, but for quick things or the purposes that I have, I don't want to learn it like conversational kind of and I'm not at that point yet. So [my learning goal] is more like, okay, what do you call this in Spanish, or what do you call that in Spanish?

He explained that because his goal is to simply understand what a Spanish-speaking friend is saying, he just wanted to get quick answers by copying text and translating. He noted, “copy it from here, paste it there, and see what it says. What does this mean? I can do that on Google as well. But it doesn't give me the proper context.” This indicates that participants think of learning by outlining what aspects of language learning need to be improved and then match the most effective resource or tool with it.

In addition, another interviewee pointed out that tools like Duolingo are too basic for his level, whereas ChatGPT has been a good choice because it can meet him at the level he is and provide learning materials that match his needs. However, interestingly, some interviewees indicated that using other tools can complement language learning with ChatGPT because it is harder to self-monitor their language learning processes with ChatGPT. For instance, Ivan used a combination of Duolingo and ChatGPT for learning Portuguese. He acknowledged,

I think a ChatGPT is more of a supplement, I guess, rather than a primary language learning tool. It's good you have you use it, double check it, use Google Translate, and also a native speaker... I can just monitor my own progress and I just know then just this is kind of

where Duolingo comes in. But when I'm taking tests or quizzes within Duolingo, just like monitoring my performance, kind of in that as well.

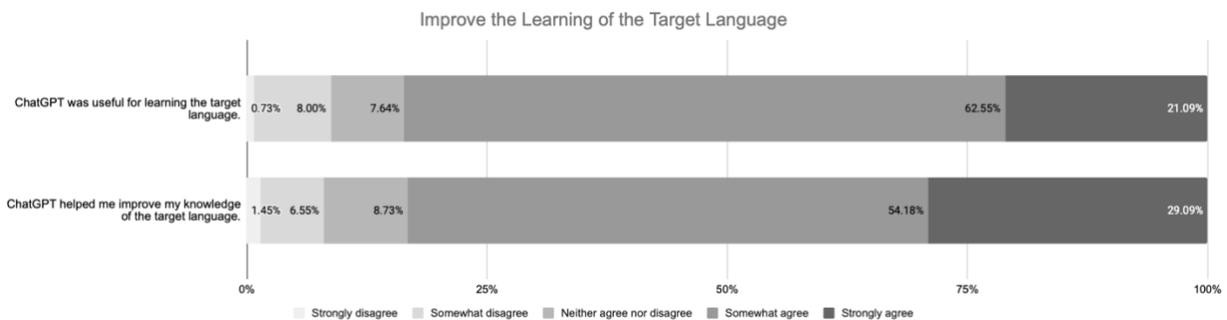
Similarly, another participant indicated that ChatGPT could not facilitate a self-monitoring process because it did not provide metrics, so she implemented other external tools to track her learning. As she shared,

No, I don't really use it that way [to measure my learning process]. I usually check my progress with the other apps. I kind of have built in quizzes or with workbooks. Like if I can complete those exercises more easily, that's sort of my metric, and I don't really know which thing necessarily made it better because I use them all in tandem, but all of it helps, and it helps more to have it than not have it.

Though it seems that ChatGPT is not effective in supporting self-monitoring, learners reported very positive results in terms of how ChatGPT improved their learning. As indicated in Figure 4, related to the statement that “ChatGPT helped me improve my knowledge of the target language,” 80 of 276 (28.99%) survey respondents indicated that they “strongly agree,” while 150 participants (54.35%) reported “somewhat agree.” More specifically, strong agreement was indicated from the perspective of having a higher awareness of vocabulary usage. Therefore, ChatGPT proves particularly effective in enhancing learners' awareness of vocabulary usage and how vocabulary and grammar are combined to form coherent and consistent texts.

Figure 4

Percentages of Learners' Responses to Statements on the Improvement of Target Language Learning



Furthermore, learners actually demonstrated a high level of self-control through the survey. The statement, “I carry out my own study plan while using ChatGPT for learning a language” has received 30% of “strongly agree” and 49% of “somewhat agree.” The statement, “I direct my own language learning progress while learning with ChatGPT,” also received a high agreement, with 35% indicating “strongly agree” and “54%” signaling “somewhat agree.” In effect, the survey data, along with interview data, suggested that self-monitoring is an inherent ability of the learners, instead of relying on ChatGPT to monitor their learning. In other words, the survey results indicate that learners exhibit a high level of responsibility towards their own learning.

Figure 5

Percentages of Learners' Responses to the Statement on the Study Plan

Q10_1 - I carry out my own study plan while using ChatGPT for learning a language.

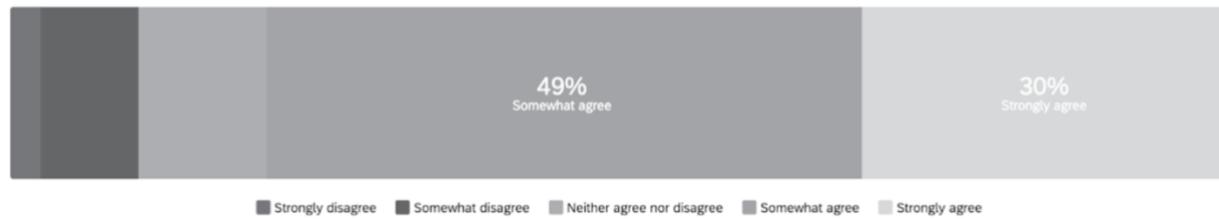
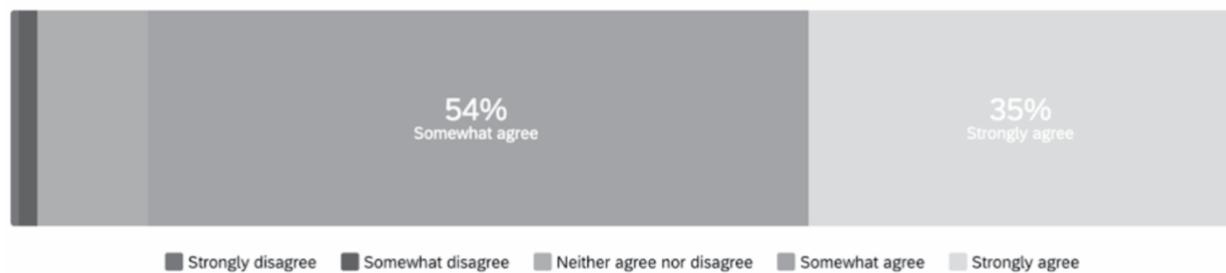


Figure 6

Percentages of Learners' Responses to the Statement on Self-Directing Language Learning Progress

Q11_1 - I direct my own language learning progress while learning with ChatGPT.

**Discussion**

Existing empirical studies on ChatGPT for language learning have certain limitations regarding the methodological approach, research scope, homogeneity of samples, language-specific focus, and learning context. For instance, a number of existing studies have been designed based on quantitative survey methods (e.g., Liu, 2023; Liu & Ma, 2023) to investigate Chinese learners' perceptions and attitudes towards using ChatGPT for learning English as a second language. However, such an approach neglects the diversity of language learners as well as their needs and practices in other geographical, cultural, and linguistic contexts. It is particularly problematic when comparing language learning in formal higher education settings with adult learning in more informal learning contexts which tend to have vastly different learner motivation variables and learning strategies (Li & Bonk, 2023; Botero et al., 2019).

Accordingly, this study aims to expand our understanding of SDLL of adult learners that occurs outside of classroom learning where learners take initiative and responsibility for their own learning. Importantly, with the emergence of GenAI in education, exploring different possibilities and strategies for incorporating ChatGPT to foster SDLL will benefit millions of adult learners who are learning languages for diverse life needs as well as leisurely pursuits and hobbies (Baskara, 2023b; Lin, 2023; Niyozov et al., 2023). As such, the present study revealed the role of motivation, self-management, and self-monitoring of language learners when using ChatGPT to facilitate their SDLL.

Motivation plays a crucial role in engaging learners with ChatGPT for language learning. The study found that learners are motivated by the flexibility and personalization that ChatGPT

offers, allowing them to access learning materials that align with their individual needs and goals when they are deemed necessary. The findings suggest that ChatGPT can cater to the diverse needs of learners, offering a tailored learning experience that other digital and non-digital learning resources cannot provide (Li et al., 2024; Mogavi et al., 2024). Furthermore, the influence of socially shared positive experiences among peers and other social interactions or discussion, demonstrates the importance of community and social validation in adopting new technologies, especially controversial tools like generative AI (Hwang & Chen, 2023), for learning.

In terms of self-management, learners who effectively manage their learning schedules, set learning routines, and strategically pose questions to ChatGPT can enhance their learning efficiency. The finding indicates the need for learners to possess and develop strong self-management skills to maximize the benefits of ChatGPT in language learning. The use of ChatGPT enables learners to practice language skills flexibly, but the effectiveness of this practice is significantly influenced by the learner's ability to self-manage their learning process (Lin, 2023). Additionally, self-monitoring strategies are essential for learners to evaluate their progress and adapt their language learning strategies accordingly. The self-directed language learners in this study used ChatGPT alongside various other resources and tools for validation and assessment, indicating that while ChatGPT is a valuable resource for language learning, it is part of a broader ecosystem of learning tools (Li et al., 2024). This highlights the importance of integrating ChatGPT with other learning resources and tools to provide a comprehensive learning experience that addresses different aspects of language learning (Al-khresheh, 2024), such as vocabulary acquisition, grammatical understanding, translation, and conversation.

It is apparent from this study that the experience of using other language learning resources to complement learning with ChatGPT plays an important role across the three dimensions of SDL. Most interview participants indicated that they have previously used other tools for language learning which enabled them to see the unique advantages of ChatGPT. For instance, many participants compared ChatGPT with Duolingo and Google Translate, suggesting that learners who use these tools often struggled to find features that provided hands-on practice, timely, individualized support and sufficient learning context (Li and Bonk, 2023; Jumabekovna, 2024). By contrast, ChatGPT fosters more self-directed and independent learning as well as contextualized point-to-point answers. Those unique benefits of ChatGPT helped form a strong motivation for people to learn languages with it. This finding confirmed that ChatGPT can support learners' independent exploration and information-gathering in a personalized manner through goal-driven inquiry and self-selected questioning (Baidoo-Anu & Ansah, 2023; Firat, 2023; Rasul et al., 2023).

While prior research suggests that ChatGPT fosters SDL by identifying accessible resources and providing personalized learning plans (Lin, 2023), our findings present novel insight which reveals that utilizing ChatGPT solely is not sufficient in terms of self-management and self-monitoring. In fact, we found that language learners often self-manage multiple learning resources to complement the use of ChatGPT, as well as combine various learning resources to evaluate their learning with ChatGPT and validate information provided by ChatGPT. As this study reveals, ChatGPT is one of the tools through which learners can practice and adjust their SDL strategies to

facilitate effective language learning. In other words, ChatGPT can be a useful technology tool for SDL, but it is often not the sole factor in effective SDL, particularly in terms of self-management and self-monitoring. Learners naturally select and apply a wide range of strategies and resources to enhance their SDLL experience where ChatGPT is one component of the entire SDL approach. Such findings imply that language learners often require resource integration, and the role of ChatGPT is as a facilitator instead of a substitute for SDL. These results suggest it is beneficial to integrate generative AI with other language learning platforms as a means to provide personalized and adaptive learning experiences.

Limitations and Future Research

Though we emailed all 125 participants multiple times who expressed interest in being interviewed and provided their contact information, only 11 actually participated in the study interviews. As a result, the sample size is small. We wish to expand this sample size in future studies to reach data saturation. Additionally, given that our participants were mostly Spanish learners, future investigations should compare and contrast the needs of learners of different target learning languages to understand the important nuances that might be embedded in different cases. In addition, as we collected the interview data, we discovered that the volunteer participants were predominantly non-traditional learners who continued or even returned to their education at a later stage of their lives.

Future research might consider the types of backgrounds and life experiences (Knowles, 1968) that contribute to adult learning and engagement with AI-supported tools and resources. Researchers might examine the role of previous language learning experience, technology competency, cultural background, and educational level in the process of using ChatGPT for language learning. By investigating the unique and diverse needs of adult learners, instructional designers and generative AI developers may build a more tailored, innovative, and effective learning experience with generative AI. Additionally, further research is needed to explore how ChatGPT can be effectively combined or supplemented with other educational technologies and pedagogical approaches to support language learning in diverse contexts. This approach will not only benefit learners in self-study environments but also provide valuable learning strategies and resources to those in classroom settings or language labs. By researching the integration of ChatGPT with other language learning tools, we can uncover the language learning outcomes across various educational settings.

Conclusion

This mixed-method research directly addresses several prevailing multiple research gaps marked by a scarcity of empirical studies on generative AI impact on SDLL in informal settings. It also reveals key opportunities as well as challenges in the self-directed language learning process, providing crucial resources for educational institutions, policymakers, and curriculum developers to make well-informed decisions when considering integrating different generative AI technologies

into language education. The present study suggests that while ChatGPT offers many advantages for SDLL, the successful integration of such generative AI tools for supporting language learning practices depends on how the learners leverage their motivation, self-management, and self-monitoring. As generative AI is increasingly integrated into people's daily lives, learners, educators, and researchers should seek ways to maximize the potential of generative AI tools to cultivate learner autonomy, agency, and engagement in a variety of manners.

Statement on Ethics

The study was approved by Indiana University Institutional Review Board with ID: 20611. Informed consent was obtained from all participants, and their privacy rights were strictly observed. The participants were protected by hiding their personal information during the research process.

Declaration of Competing Interest

The authors declare no conflicts of interest.

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The Use of Generative AI to Support Inclusivity and Design Deliberation for Online Instruction

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Abstract

Generative AI presents significant opportunities for instructional designers to create content and personalize online learning environments. Alongside its benefits, generative AI also poses ethical considerations and potential risks, such as perpetuating biases or disrupting the learning process. Navigating these complexities requires an approach to design deliberation that involves careful analysis, discussion, and decision-making throughout the design process. This paper proposes a conceptual framework to support instructional designers in leveraging generative AI to promote inclusivity within their design deliberations, emphasizing the importance of addressing ethical considerations and engaging in iterative design practices.

Keywords: Design deliberations, ethical analysis, localization of context, instructional design, decision-making

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Over the past decade, we have seen a growing body of scholarship exploring how instructional designers engage in decision-making across different contexts. These studies have explored their decision-making approaches, the various types of design judgments they make while working on a project, and how they engage in reflection-in-action during the design process (e.g., Boling et al., 2017; McDonald, 2023; Tracey et al., 2014). There has also been growth in exploring the localization of context as it relates to instructional design practices (Stefaniak, 2024; Glahn & Gruber, 2020; Tracey & Baaki, 2022). Decision-making is deeply influenced by context, as the specific circumstances, environmental factors, and available resources directly impact the choices instructional designers and educators make. The context ultimately guides the decision-making process towards outcomes that are perceived as most effective or appropriate for learners.

Acknowledging contextual factors such as learners' prior knowledge, cultural backgrounds, and learning affordances can significantly influence the effectiveness of instructional strategies. This is even more important for the instructional designer to address when developing online experiences where learners may be spread out geographically since this can present challenges for fostering learner-to-learner interactivity and customization of instruction. By designing online instruction through a localization of context, instructional designers approach their tasks through two distinct lenses: the designer context and the learner context (Baaki & Tracey, 2022). To approach design through these two lenses, instructional designers can leverage generative AI technologies to help them adhere to sound design processes to craft more personalized instructional experiences that are adaptable and learner-centric.

Generative AI has the potential to support the instructional design of online learning environments to be more learner-centric, inclusive, and responsive to individual needs. With this increase in design affordances, there is an opportunity to explore how generative AI can be leveraged to support design deliberations for online learning. Designers and instructors can leverage efficiencies from generative AI to focus online instructional design efforts in deliberative ways to optimize designs and design time around personalization, innovation, and inclusivity in online learning. They can also evaluate existing tools for features that facilitate increased accessibility and inclusivity and identify ways in which generative AI tools may be leveraged in online learning spaces to better facilitate accessibility and inclusion, such as auto-captioning, voice interfaces, and adaptive interface designs. Realizing those potentialities, however, requires that the use of generative AI be situated within a deliberative design process—thus generative AI can be both a support for design deliberation and the object of deliberative design.

Potential Benefits and Harms of Using AI in Instructional Design

Generative AI encompasses artificial intelligence systems designed to generate new content in the form of text, images, and videos that is increasingly difficult to distinguish from content created by human beings (Hodges & Kirschner, 2024; Hsu et al., 2023). Generative AI offers several learning affordances that have the potential to change the way instructional designers design and develop content. Building upon Gibson's (1979) conceptualization of affordances, generative AI should be evaluated for the opportunities and challenges it may contribute to learners' perception of their learning experience. One primary advantage lies in the realm of content generation. Large language models (LLMs) are a subset of generative AI and are designed

to process and generative language (Hsu et al., 2023). GPT4-4 is a LLM that is gaining traction in higher education. Automated processes powered by generative AI enable the rapid development of diverse instructional materials, from written content to multimedia elements (e.g., Bozkurt, 2023; Tlili et al., 2023; Trust et al., 2023). Furthermore, generative AI facilitates adaptability in learning experiences by tailoring content to individual learner needs. Through continuous analysis of user data, AI algorithms can personalize learning paths, ensuring that each learner receives content and assessments aligned with their strengths and weaknesses (Firat, 2023; Kuhail et al., 2023). This adaptability enhances engagement and promotes a more inclusive learning experience for individuals with diverse educational backgrounds.

Another significant capability is the augmentation of feedback and assessment processes. Generative AI enables automated and immediate feedback mechanisms to provide learners with quicker results related to their academic performance on assignments (Kadaruddin, 2023; Su & Yang, 2023). This not only fosters a sense of continuous improvement but also lightens the burden on instructors by automating routine grading tasks. The efficiency gained through AI-driven assessment processes allows educators to redirect their efforts toward more personalized guidance and support for learners (Hsu & Ching, 2023; Kohnke et al., 2023). Additionally, generative AI contributes to the creation of dynamic and immersive learning environments through scenario and simulation generation. These affordances collectively position generative AI as a powerful tool in shaping a more personalized, efficient, and engaging instructional experience (Bozkurt et al., 2023; Ray, 2023; Ruiz-Rojas et al., 2023).

However, capabilities are not just about the positive possibilities of a given design but all the possible ways a user may use features. Laptops, for example, similarly have many capabilities that support learning, but they also have affordances that can be disruptive and distracting to the learning process. Online learning itself affords a variety of learning and societal impacts, both beneficial and harmful, from increased access to education to adjunctification of higher education to designs that interfere with learning—all dependent upon design decisions and how the systems are optimized. The potential harms of educational technologies broadly and generative AI specifically have received increased attention, as these technologies can also afford disruptions to the learning process and perpetuate biases or facilitate misuses and abuses of the technology (e.g., UNESCO, 2022). For example, one study on a large-scale natural language processing (NLP) system demonstrated a tendency for the model to generate negative sentences when word strings included a reference to disabilities (Hassan et al., 2021). Conversely, disabilities and accessibility communities have been exploring how uses of generative AI can make online and digital environments more accessible and inclusive through improved captioning, text-to-speech and speech-to-text, and accessibility testing of websites and digital artifacts (Henneborn, 2023).

Navigating potentially harmful and potentially beneficial affordances of complex technologies such as generative AI requires a deliberative process during all stages of design, development, implementation, and evaluation (Moore & Tillberg-Webb, 2023; Moore et al., 2024; Stefaniak, 2023). In this paper, we seek to explore the increasingly necessary competency of *design deliberation*, essential for instructional designers in working technologies like generative AI into desirable shapes and directions (Moore et al., 2024). *Design deliberation* is the careful process of considering various factors and exercising design judgment during the creation or improvement of a design. This comprehensive approach involves a form of reflection-in-action (Schön, 1983)

characterized by careful analysis, discussion, and decision-making to ensure that the resulting design is both effective and well-suited to its intended purpose (Penuel et al., 2022). Design deliberation encompasses multiple stages, starting with a clear understanding of the problem or challenge at hand, identification of potential benefits and harms, followed by research and exploration of potential solutions (Visscher-Voerman et al. 1999).

Purpose of Paper

The purpose of this paper is to propose a conceptual framework that supports instructional designers' use of generative AI for inclusivity in design deliberations. Emphasis will be placed on exploring how generative AI can be used to instructional designers' abilities to conduct a more in-depth learner analysis and engage in recursive design deliberations that prompt designers to address inclusivity and other ethical considerations in their online instructional design processes and designed artifacts. To explore this, after presenting the framework, we work through a common scenario encountered in online learning where an instructor or designer might consider using AI to help them quickly address last-minute information that a student in the online class will have one or more disabilities. Drawing on our framework and what is illuminated in the scenario, we then propose an emergent research agenda on generative AI and accessible, inclusive instructional design to invite scholars and practitioners to test and expand methods and techniques we can use to work generative AI in such desirable directions.

Theoretical Underpinnings

Generative AI and Instructional Design

2023 has seen scholarship published at an exponential rate exploring the capabilities and concerns associated with generative AI and education. The field of learning, design, and technology has begun to see the potential that generative AI poses for transforming the instructional design process (Hodges & Kirschner, 2024). Generative AI algorithms can analyze datasets of educational content, identify patterns, and generate new and contextually relevant materials to ensure a more personalized learning experience that caters to the diverse needs of individual learners (Kadaruddin, 2023).

By continuously analyzing learner interactions and performance, designers and instructors can adjust the learning journey for individual learners (Chang et al., 2023; Hodges & Kirschner, 2024). This adaptability may help to ensure that learners receive content and assessments at an appropriate difficulty level, fostering a more engaging and effective learning experience (Chan & Hu, 2023). As a result, instructional designers can leverage generative AI to build flexible, learner-centric learning pathways that respond to the evolving needs and progress of each student.

Generative AI can also play an innovative role in assessing and improving instructional design outcomes which can support instructional designers' ability to refine their design decisions and optimize the learning experience. By leveraging generative AI for ongoing assessment and optimization, instructional designers can create a more iterative and responsive design process (Salinas-Navarro et al., 2024; Thanh et al., 2023). This has the potential to expedite instructional designers' decision-making abilities and move from the design of instructional solutions to development and implementation much quicker.

Despite the potential to leverage generative AI to support instructional design activities, several concerns warrant careful consideration. One significant issue related to promoting learner-centered instruction is the potential for algorithmic bias. If training data used to develop generative AI models are biased or incomplete, existing educational disparities can be perpetuated and even amplified (Kadaruddin, 2023). Another concern relates to the ethical implications of using generative AI for personalized learning. Instructional designers and educators must be mindful of the level of detail they provide when attempting to use generative AI to create a customized learning experience for their learners. A balance is needed between developing personalized learning experiences and protecting the rights and privacy of learners (Ruiz-Rojas et al., 2023). To achieve this balance, instructional designers need to carefully deliberate during their design process to uphold their responsibility to the design process and their learning audience.

Deliberative Design

To support how instructional design practices should evolve in the context of generative AI technologies, we want to introduce the concept of *deliberative design* as an essential design practice. Cambridge Dictionary defines “deliberative” as “involving careful thought and discussion,” and defines “deliberation” as “a slow, careful way of doing something.” Merriam-Webster defines “deliberate” as “to use one’s powers of conception, judgment, or inference.” Deliberative processes or deliberation as an act are often defined as participatory practices as well, meaning that the deliberation is done with others, especially other stakeholders or decision-makers. In a sense, one might liken *deliberative design* to *participatory design* where the design process intentionally engages learners and others impacted by a design (Cook-Sather, 2003; Könings et al., 2005, 2011, 2014). However, a key distinction is that there is an intentional cognitive and reflective engagement with the design task or activity to engage in any given design task “carefully.” The word “careful” appears in every definition of deliberative, deliberation, or deliberate that we found. Thus, *deliberative design* is an intentional act of exercising care in design. Here we formulate *care* not merely as a feeling of caring but also as a form of duty or responsibility in the course of one’s design praxis, forming a distinctive characteristic of professional practice.

In the context of using generative AI to support instructional design tasks such as learner analysis, it becomes essential to evoke professional knowledge and skill when managing the output of a generative AI. In the specific instance of designing for diverse learners, generative AIs—such as ChatGPT—will often generate output and recommendations based on debunked theories of learning such as learning styles. In one example of this, Hodges (2024) recently shared results from one AI tool when prompted to generate a lesson plan that is differentiated for all learners. The resulting lesson plan was entirely anchored in the theory of learning styles, mapping out what to do for visual learners, auditory learners, kinesthetic learners, reading/writing learners, collaborative learners, and individualized instruction.

Despite a longstanding body of evidence demonstrating that learning styles do not exist and are not effective as a strategy (Reiner & Willingham, 2010; Kirschner, 2017), LLMs draw from very large data sets that include all manner of information sources including many that perpetuate bunk theories of learning. This low-quality information then clogs the arteries of these systems. The computer science adage of “garbage in, garbage out” (GIGO) remains true with generative AI. These issues highlight how a designer cannot merely punch in prompts and expect a generative AI

to function like a calculator that does reliable math (even the use of generative AI for math tutoring generates problematic results; see Barnum, 2024). Instead, the results are a composite return of all the available information in a given ecosphere, including the junk. The tool itself is not doing any sort of analysis of what is quality and what is not; it is merely predicting what the most likely next word would be based on a large set of linguistic data. If discussions on learner diversity, for example, often veer into learning misconceptions or even biases or discrimination, then the product of a generative AI is going to reflect those features. Sorting through what is wheat and what is chaff in that output requires both professional knowledge (in this case, knowledge of the research on learning styles and knowledge of better alternative theories and practices) and a deliberative process by which the designer carefully considers and reasons through the output.

The implications of this are that the use of a generative AI can never be the last step in a design process or design task. Use should always be situated in a deliberative process during which the designer is intentionally engaged in what Schön (1983) calls “reflection-in-action.” Schön described reflection-in-action as a sort of conversation that a designer or design team has with a particular problem or situation. In studying reflection-in-action in instructional design practice, Tracey and Baaki (2014) described how IDs evidenced a series of “questioning, making a decision, reflecting on the consequences of the decision, then making another move” (p. 4). This is what deliberation during the design process looks like, whether done as internal deliberation by the designer or externally in partnership with other members of a team or other stakeholders.

Localizing Learner and Contextual Analyses to Inform Design Deliberations

Conducting a learner analysis is often regarded as an important task during the instructional design process, yet many instructional designers will attest that there are significant challenges with gathering sufficient data that emphasize and highlight the needs of their learners (Stefaniak, 2024; Tracey & Baaki, 2022). Designing effective learning experiences requires a nuanced understanding of learners' differences and needs which makes it challenging to create a one-size-fits-all product.

A common issue among instructional designers is that they are often required to make assumptions about their learners when designing instruction (Boling & Gray, 2015; Stefaniak et al., 2023). This becomes particularly problematic when designing instruction that may be sold to clients because little or no information may have been provided about the learning audiences' unique needs. It also becomes challenging to balance the needs of many learners when designing for environments such as higher education and K-12.

Instructional designers face a common pitfall when they make assumptions about their learners, potentially leading to significant problems in the effectiveness of educational materials and experiences. Assuming a homogenous learner profile can result in content that is either too advanced or too basic for certain individuals, leading to disengagement or frustration (Gurjar & Bai, 2023). Overlooking the varied needs of learners can hinder the effectiveness of instructional activities. If instructional designers base their assumptions on generalized characteristics, they may inadvertently perpetuate stereotypes related to gender, race, or socio-economic status. This not only compromises the inclusivity of educational content but also creates a learning environment that may alienate or marginalize certain groups (Gunawardena et al., 2018; Rao, 2021). This ultimately becomes an all too familiar predicament where the instructional designer is navigating design

tensions between needing to advocate for information regarding their learners and attempting to engage in design conjecture to maintain the momentum of the project.

Shifting to a Localization of Context

Adapting to context is another task performed by instructional designers throughout the design process (Baaki et al., 2017; Baaki & Tracey, 2022; Herman et al., 2023). Recognizing that instructional design is recursive, instructional designers often approach their design with a flexible and adaptive mindset (Authors, 2024). This allows them to make the necessary adjustments as more information becomes available regarding learners' and instructional affordances and expectations for how learners will transfer their newly acquired knowledge to other settings.

Similar to gaining access to sufficient data to understand learners' needs and learning affordances, instructional designers also encounter obstacles when trying to encapsulate how their learners will transfer knowledge and skills gained through instruction (Stefaniak, 2024; Yang & Watson, 2022). Unless the instructional designer works in-house for an organization and has immediate and ongoing access to a learning audience, this can become a daunting task.

Traditionally, context analysis had placed autonomy on the instructional designer to ensure alignment and coverage between the organizational, immediate environment, and learner goals as they relate to orienting, instructional, and transfer contexts (Tessmer & Richey, 1997). Instructor designers often experience challenges making connections among these contexts due to the limited availability of information (Stefaniak et al., 2023; Boling & Gray, 2018). Furthermore, these challenges are further exacerbated when learners will be applying their newly acquired knowledge in different transfer settings. Recognizing that instructional designers often hold the most control in the instructional context, they can reframe how they approach their design with the transfer context in mind. Stefaniak et al. (2023) suggest instructional designers can support learners' transition from instructional to transfer contexts by providing tools to offload their cognitive demands.

Researchers in human-computer interaction and user experience design have begun to shift the conversation of context in instructional design to a more localized use of context that provides autonomy to the user engaging in an experience. Such an approach enables users to integrate their perspectives to support their abilities to engage in meaning-making. This empowers users with a more contextualized and adaptive environment that fosters a symbiotic relationship where technology seamlessly aligns with their individual preferences.

Baaki and Tracey (2019, 2022) have shifted the conversation of contextual analysis in instructional design to take a more localized approach whereby contexts (e.g., orienting, instructional, and transfer) are examined through the lenses of the learner and the designer. Such an approach engages the learner earlier in design conversations and positions them to be at the forefront of design. They argue that approaching design in this way promotes a more dynamic environment and is grounded by five premises: Learner and designer contexts are dynamic, are about interpretation, are focused on filling spaces, are about meaning-making, and are about creating meaning to support moving forward (Baaki & Tracey, 2022).

As more advanced and adaptive technologies become available to instructional designers, they need to consider the impact that these technologies may pose for both learner and designer

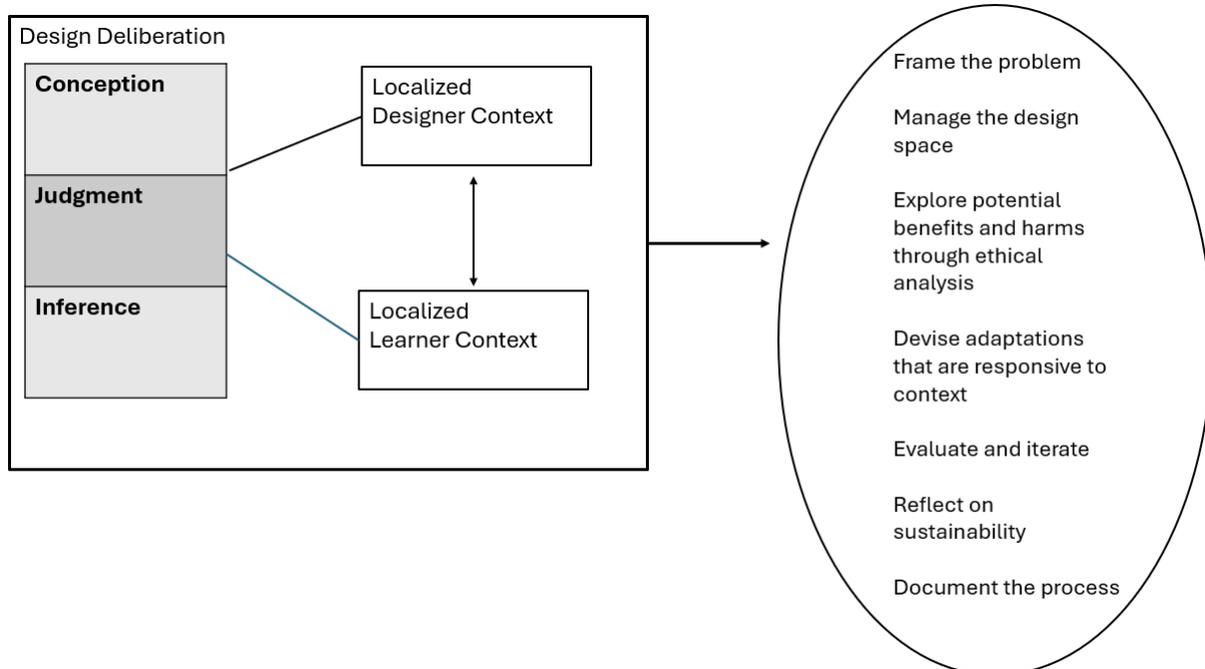
contexts. In the following section, we introduce a conceptual framework to guide (a) design deliberations (b) approach design through a localized context and provide (c) a summary of specific design activities that serve as outcomes for taking a more localized approach to design decision-making.

Conceptual Framework

To support instructional designers' abilities to engage in careful design deliberations that involve the use of generative AI to support their decision-making, we present a framework that guides how designers can approach their deliberations through a localized context of use that approaches design from designer and learner contexts (Figure 1). In this framework, deliberation is the starting point. It evokes the role of a designer as one who devises a plan or idea (conception), exercises decisions that are carefully considered (judgment), and draws conclusions based on evidence and reasoning (inference). Given Baaki's and Tracey's (2022) definition of localization of context, we can see how conception, judgment, and inference are exercised through recognizing the complexities of context, engaging in intentional and thoughtful interpretation and meaning making, and making decisions on how to move forward. Localizing design deliberations into designer and learner contexts allows for the instructional designer to negotiate and prioritize decisions from different perspectives. This is particularly important when attending to careful design practices and prioritizing learners' needs.

Figure 1

Deliberate Localization Design Framework



Instructional designers pull from their intellectual and creative powers—conception for generating ideas, judgment for making decisions, and inference for drawing conclusions—to guide their design deliberation process. This process begins with accurately framing the educational problem at hand, which sets the foundation for all subsequent steps (Svihla, 2021). Designers then

manage the design space, a phase that involves organizing and prioritizing resources, constraints, and potential solutions (Stefaniak, 2024). Ethical analysis plays a critical role as designers explore the potential benefits and harms of their designs.

Throughout this iterative process, instructional designers employ a reflective practice to evaluate and refine their designs. As instructional designers refine their practice, they engage in ongoing reflection to consider the sustainability of the solutions they are designing (McDonald, 2022). They consider environmental, economic, and social impacts. While documentation is listed as a final step in this framework, instructional designers should document their design decisions throughout the project. This is of particular importance when documenting prompts that are used within generative AI to support their design deliberations.

Early Deliberative Activities

Early design activities include *framing the problem* and *ethical analysis* that identifies potential harms and benefits, which can then become a part of the problem framing. *Framing the problem* is defined by Svihla (2020) as a process by which a professional takes ownership of a problem and works iteratively to define it, often with other designers or stakeholders. This process is an act of conception through which a designer also exercises judgment about what is included or excluded and how to proceed in solving the problem. This also helps to explain why designers may approach what seems like the same problem in different ways. Svihla (2020) observes that designers solve different problems because they've framed what appears to be the same problem in different ways. Moore and Tillberg-Webb (2023) drew on Svihla's conception of problem framing to argue that ethics are not about rules that require adherence but—especially in design—function as individual perspectives that influence problem framing and definition process. Often the influence of one's ethical perspective may be latent, even to the designer, but it can also be explicitly evoked through *ethical analysis* to intentionally map out both potential benefits and potential harms (Moore et al., 2024). Those potential benefits or harms help to identify ethical and systemic considerations in addition to technical and learning specifications and requirements; thus, the designer's ethical perspectives and priorities become part of problem framing, both through what is included and what is excluded.

In the example of generative AI, as with most technologies, our work can be framed in different ways. It can be framed in very technical terms that focus on the technology and developing technical competencies, such as prompt engineering. The problem of generative AI can also be framed as a learning problem, attempting to conceive of impacts on learning by drawing on various ways learning is theorized and by inferring from both theory and research what the best use may be (as well as when it may interfere with learning). The problem can be framed more systemically, considering both ripple effects that constitute ethical considerations as well as other types of infrastructural or longitudinal impacts such as what supports learners, designers, and/or educators have, what incentives or disincentives are created by policies and resourcing, and what environmental impacts exist. While learning and systemic framing together introduce a great deal of complexity, we posit that they also introduce necessary considerations that are precisely why professional conception, judgment, and inference are essential in driving any new technology toward desired impacts.

Ongoing Deliberative Activities

One of the challenges with many instructional design frameworks is that they are often interpreted as promoting a linear and systematic process of design. It is important to note that the seven outcomes presented in this framework are not intended to occur in a linear process; rather, many of them will be revisited several times throughout a project. *Managing the design space* calls for the instructional designer to engage in a continuous scan of their environment, design constraints imposed on the project, and learners' needs. All of these areas are subject to change or be modified as additional information becomes available.

Continuous surveillance of the design environment involves the careful consideration of various elements such as time, budget, technology, content, and learner needs. By understanding the scope and context of the project, designers can delineate boundaries and identify opportunities within the design space. We propose that designers should approach their design deliberations related to the management of their design space by examining the situation from both designer context and learner contexts. To fully account for the tensions that may occur between these two contexts, the designer needs to recognize where there is synergy and where they may appear to be operating in mutually exclusive contexts. Design deliberations from the designer's lens should uphold the expectations of the profession and adhere to sound design standards. At the same time, the instructional designer should work to customize and flex their approach to design to accommodate and nurture the needs of their learning audience.

Depending on the design constraints imposed on the system (or the design space), the instructional designer may be in a position to negotiate and compromise their decisions to satisfy these two contextual lenses. This is no less true for ethical considerations, such as accessibility and diversity, which can present design tensions that force each designer or design team to make choices about how they will navigate those tensions. Lomellini et al. (2023), for example, discuss how instructional designers must "grapple with the practical reality that achieving 'perfection in' accessibility can be a challenging and, at times, unattainable goal" (para. 2). Rather than an all-or-nothing approach, they describe how an iterative, flexible, and reflective design-based approach helps to propel design forward and reduce preoccupation with the unattainable goal of perfection. Thus, the non-linearity of design and different design activities is a boon for tackling complicated design spaces.

Generative AI has the potential to support instructional designers as they navigate these two contextual lenses of learner context and design context during their design deliberations. One significant advantage lies in its ability to create contextualized learning experiences. By analyzing vast amounts of data, generative AI algorithms can generate customized content and activities that can be tailored to the learners' needs and account for the realities of environmental and technological affordances imposed on the design space. This contextualized approach not only enhances engagement but also promotes more effective knowledge retention and transfer.

Instructional designers can leverage generative AI in rapid prototyping and refining their design solutions. With the assistance of generative AI, instructional designers can input various design constraints and information about the designer and learner contextual lenses to generate instructional activities and assessments. This iterative process allows designers to scale their activities to create multiple versions and iterations of activities and instructional content that can be adapted to learners' individual needs.

Reflective Deliberative Activities

Reflecting upon the sustainability of design decisions is an important aspect of design deliberation, particularly when leveraging generated AI to support the process. We have tried to weave themes of *carefulness* and *intentionality* within design deliberation. One of the skepticisms of generative AI is that it may not be able to address the necessary level of complexity associated with various subject matter. Researchers have also shared concerns regarding generative AI perpetuating stereotypes among learners (Bozkurt et al., 2023; Hodges & Kirschner, 2024).

We propose that this framework can serve as a blueprint to guide instructional designers as they engage in design deliberation to avoid such pitfalls. Morrison et al. (2013) suggest that instructional designers should promote efficiency and effectiveness of learning and contribute to ease of learning. While scholarship on reflection-in-action as it relates to instructional design (e.g., McDonald, 2022; Tracey & Baaki, 2023) has addressed providing instructional designers with the necessary tools, they need to embrace the recursiveness that is instructional design. These guidelines proposed by Morrison and colleagues call for instructional designers to intentionally consider the sustainability of their design solutions.

We believe that reflecting upon the sustainability of our design decisions is an inherent part of the design process and warrants additional attention as our field continues to explore the possibilities that generative AI has to offer instructional design. This can be accomplished by further investigating the efficiency, effectiveness, and ease of learning that generative AI may offer the designer and learner contexts.

Instructional designers can also reflect on the economic and social dimensions of their design decisions by assessing the cost-effectiveness of instructional materials and technologies. They can consider the accessibility and inclusivity of their designs, ensuring that all learners, regardless of background or ability, have equitable access to educational resources and opportunities (Asino et al., 2017). Additionally, instructional designers can reflect on the scalability of their designs within the broader system. They examine the scalability of instructional solutions, considering factors such as adaptability to different contexts, ease of maintenance, and potential for expanding offerings.

We began our conversation of design deliberation with *problem framing* and we conclude with documentation. While both activities provide bookends for deliberation activities in instructional design, they do not occur as isolated and singular events. Rather, they are ongoing throughout a design project. Documenting instructional design decisions and processes is not a new concept for instructional designers. Documenting design decisions and keeping track of variation iterations of a design are common practices in many, if not all, design environments.

When leveraging generative AI in instructional design, detailed documentation allows instructional designers to maintain transparency and accountability throughout the project. By recording each step, designers can trace back decisions and iterations to ensure the ability to reproduce their decisions. For generative AI, this is important as the technology rapidly evolves and a development environment can differ greatly across mere months. This serves as a valuable resource for future reference, aiding in troubleshooting, refinement, and adaptation of AI-generated content. Doing so will aid instructional designers in gaining a deeper understanding of the AI's strengths, limitations, and biases and help them fine-tune prompts to align with the affordances of

the design space. Such transparency enhances the reliability and efficacy of generative AI in instructional design and promotes responsible and ethical AI deployment in design.

Applying the Framework to an Online Learning Scenario: Designing for a Deaf-Blind Online Learner

In applying the framework to online learning and learner diversity specifically, we imagined a common scenario for online instructors that has happened to both of us: the disability or accessibility center at your institution notifies you a few days before the start of classes that a student has registered for your online class, and that student has a hearing disability, a visual disability, or both. We explored the use of generative AI in supporting an online designer or instructor in adapting an online course for a student with a mix of these disabilities using the framework we presented above. In reporting the output below, we have opted to incorporate screenshots instead of text boxes so that readers may have a sense of how ChatGPT formatted the output. In some instances, the screenshot may be truncated because it was impossible to get all of the output onto one screen for capture and keep the text readable; our goal is not to try to provide all of the output (which can be accessed in full through the links provided) but to provide a representative sample sufficient for discussion.

We started with a prompt articulated around an initial problem framing: “How can I modify my online course for a student who is deaf and blind?” A screenshot of the response provided by ChatGPT 3.5 (on 3-10-24) is provided in Figure 2, capturing 8 of the 10 items in its list.

Figure 2

Screenshot of Output from ChatGPT on How to Modify an Online Course for a Deaf-blind Learner

1. **Communication Methods:**
 - Utilize tactile communication methods such as Braille for written content.
 - Use sign language interpreters for video content, or provide transcripts and captions.
 - Consider text-based communication methods like email or text messaging for non-verbal communication.
2. **Accessible Course Materials:**
 - Convert all course materials into accessible formats such as Braille, large print, or electronic text that can be read using screen readers.
 - Provide tactile graphics or models for visual information.
3. **Assistive Technology:**
 - Ensure that your online platform is compatible with screen readers and refreshable Braille displays.
 - Provide training on how to use assistive technology if needed.
4. **Alternative Assessments:**
 - Offer alternative assessment methods that align with the student's abilities, such as oral exams or tactile projects.
 - Allow for extended time on assignments or exams if necessary.
5. **Accessibility Features:**
 - Ensure that your online platform supports accessibility features such as keyboard navigation and screen reader compatibility.
 - Provide options for adjusting text size, color contrast, and other visual settings.
6. **Supportive Environment:**
 - Foster a supportive learning environment by encouraging communication and collaboration among students and providing resources for support.
7. **Regular Feedback and Communication:**
 - Maintain regular communication with the student to address any concerns or difficulties they may encounter.
 - Provide feedback on their progress and offer assistance when needed.
8. **Accessibility Statement:**
 - Include an accessibility statement in your course syllabus or on your course website, outlining the steps you've taken to make the course accessible and providing contact information for

In this case, the suggestions generated were accurate, if basic. It's also important to note that these generated responses do not function like search results. Because of a disruption to the ChatGPT session, we had to re-enter that same prompt (same date and version). In doing so, we received a different response that had some similar suggestions that also waxed generic and basic. Both responses raise a host of additional considerations that the online designer or instructor must then consider.

Analyzing the first recommendation on "Communication Methods" and its sub-recommendations illuminates why design deliberation is so important and provides an analytic frame for all the other items in the output. In the first sub-item ("Utilize tactile communication methods such as Braille for written content"), little is known about both the design or instructional context and the learner context. Does the institution have equipment that can produce Braille output? One must wonder whether having the institution produce Braille output is even the best approach for an online class, as that would mean someone has to produce printed materials and mail them to the student. Braille keyboards have existed for many years, and learners with a mix of visual and hearing disabilities frequently use such keyboards. Perhaps the learner already has a Braille keyboard or some other sort of access device they prefer. Better understanding the needs and resources of the actual learner would clarify, and possibly even simplify, the solution set in this case. A generative AI cannot substitute for that sort of hyper-local analysis; it only provides a jumping-off point for what the designer could investigate further.

For the second bulleted suggestion ("Use sign language interpreters for video content, or provide transcripts and captions"), the designer will again need to determine what resources exist at the institution and whether tools that provide captioning, such as Zoom, may be an option. Additionally, these two solutions are not the same in terms of learner engagement. This simple-seeming suggestion requires a lot of unpacking. The use of a sign language interpreter during a live video conference session would afford the learner the ability to participate directly in any discussion or collaboration. Providing transcripts is an after-the-fact solution that can exclude learner-to-learner, learner-to-instructor, and learner-to-content interactions critical for online learning (Moore, 1989, 1993). Real-time captions may be a more viable alternative that allow the learner to at least listen in real time if those captions can be read by a Braille keyboard. The generative AI prompts, however, do not account for how the learner can be an active participant. The output tends to emphasize accessibility as information access versus learning access (Rieber & Estes, 2017). Does a Braille keyboard interface with Zoom or some other software that allows the deaf-blind learner to participate? An instructional designer needs to carefully unpack these considerations for learners in the online environment, overlaying frameworks such as the Community of Inquiry model (Garrison et al., 2000), types of interaction (Moore, 1989, 1993), and learning access (Rieber & Estes, 2017) as tools for critical analysis of the output. It is also necessary to work collaboratively with the actual student in finding viable solutions, likely including research on how Braille keyboards interface with virtual conferencing software (FYI, in this case, there are indeed several viable options).

For the third bulleted suggestion ("Consider text-based communication methods like email or text messaging for non-verbal communication"), most online learning tends to be text-heavy already. While that may be a point of critique for other reasons, in this scenario, that becomes a

potential affordance of common online learning practices. Still, the designer or instructor may want to reconsider tools such as video discussions.

In all, ChatGPT generated 10 main items and 17 sub-items. While this appears to be a rich response full of ideas, making meaning from the generated suggestions requires that the ideas be situated in a more localized learner and context analysis that a generative AI simply cannot provide but may be able to support. Generative AI is devoid of context, so it becomes the designer's responsibility to overlay the specific design and learner context as a way of exercising judgment about what ideas are viable and worth iterating on. We explored using generative AI for some initial learner analysis and then incorporated localized design and learner analysis to further refine our prompts.

Iterations on the Use of ChatGPT for Learner Analysis and Accessible Online Design

In exploring the use of ChatGPT to help with some general learner analysis in this scenario, we asked, "How can a student who is deaf *or* blind access online learning?" and then, "How can a student who is deaf *and* blind access online learning?" (emphasis added here for clarity). In the first response, suggestions were broken down into categories of only supporting students who were deaf or blind, mirroring the structure of the prompt. In the second response, options focused on the intersection of blindness and deafness, with recommendations focusing on the use of tactile communication, Braille displays, haptic feedback devices, and tactile devices. This suggests that using generative AI helps narrow the field of options in this scenario. From there, the output trailed off into more generic recommendations like "promote inclusivity," with the elaboration that one should create an environment where the student who is deaf-blind feels valued, supported, and empowered to participate fully. Such suggestions are hardly actionable and require a designer or instructor to determine exactly what that means and devise specific strategies for accomplishing that within class culture. However, using generative AI for a preliminary learner analysis may provide designers unfamiliar with accessibility options a good starting point that can help them further investigate possible solutions.

Drawing on both localized design context and framing the problem to include online interactions, we then introduced design context constraints and drafted a more specific prompt focused on ideas for accessible but interactive online learning ideas. The following is our revised prompt that incorporates more localized design context, learner context, online interactions, and inclusive/accessible design as problem framing (bounded to three ideas). We have annotated in italics the components that reflect this framing (these italicized phrases were not included in the prompt given to ChatGPT 3.5):

Devise three different online learning activities, including live interactions via video conferencing and asynchronous discussions or activities (*drawing on types of interaction*), that would be accessible for an online learner who is deaf-blind (*inclusive/accessible design*). Assume that I do not have a Braille printer available (*local design context*) but that the student does have a Braille keyboard (*local learner context*).

With these different design considerations incorporated into the prompt, the output becomes more specific and actionable. Figure 3 is a screenshot of the output for this prompt.

Figure 3

Localized and Situated Output for Interactive, Accessible Online Learning Ideas

1. **Live Tactile Diagram Exploration via Video Conferencing:**
 - Activity Description: Host a live session via video conferencing where the instructor shares a tactile diagram or model related to the course material. The instructor describes the diagram verbally while the student explores it using their Braille keyboard to interact with the digital version.
 - Implementation:
 - Prepare tactile diagrams or models related to the topic of study, such as a map, graph, or geometric figure.
 - Share your screen via video conferencing software to display the diagram.
 - Verbally describe the elements of the diagram, providing context and explanations as needed.
 - Encourage the student to ask questions or request clarification using text-based chat during the session.
2. **Asynchronous Collaborative Document Creation:**
 - Activity Description: Facilitate a collaborative document creation activity where students work asynchronously to contribute ideas and information related to a specific topic.
 - Implementation:
 - Create a shared document using a collaborative platform like Google Docs or Microsoft Word Online.
 - Assign a topic or question related to the course material for students to discuss and contribute their thoughts.
 - Provide clear instructions and guidelines for formatting and organizing the document.
 - Encourage the student to participate by using their Braille keyboard to input their contributions directly into the document.
 - Monitor the document periodically to provide feedback and guidance as needed.
3. **Interactive Quizzes with Tactile Response Options:**
 - Activity Description: Design interactive quizzes or assessments where the student can provide responses using tactile input methods, such as a Braille keyboard, while receiving immediate feedback on their answers.
 - Implementation:
 - Create a series of quiz questions related to the course material using an online quiz or assessment tool.
 - Include multiple-choice or short-answer questions that allow for tactile input.
 - Provide clear instructions on how the student can navigate the quiz interface and input

Features of this prompt include (1) employing more robust problem framing that incorporates localized design and learner context to help manage the design space, (2) explicitly leveraging generative AI to derive potential benefits (e.g., making online learning more accessible), and (3) anchoring the prompt in a professional body of knowledge on effective online learning characteristics where the learner's ability to interact with other learners, the content, and the instructor are essential ingredients and reflect an emphasis on active participation in learning rather than passive reception of information. We interpret the outputs from this prompt as being more robust scaffolding for actionable ideas in this scenario.

We then iterated yet again, incorporating more specific contextual considerations into the prompt such as the course topic and the specific types of learning activities we would like the student to be engaged in. Here is that revised prompt, again incorporating more localized design context, learner context, online interactions, and inclusive/accessible design as problem framing (and again, bounded to three ideas and annotated with italics for clarity).

If I am teaching a course on online communication practices (*design context*), create three instructional activities that would be accessible to a student who is blind and hard of

hearing (*learner context*) that would engage students in developing a communication plan for a local school regarding homework expectations (*learner-content interaction*). One of the activities should be designed to be completed asynchronously, the second synchronously online, and the third should be one a student could download and complete offline (*leveraging synchronous and asynchronous online affordances*).

Even though slightly different design considerations are incorporated into the prompt, the output is once again specific and actionable. It can be further tightened by incorporating additional contextual considerations, such as the assumptions about available resources or infrastructure and the student's setup. Figure 4 is a screenshot of the output for this prompt (the third suggestion was truncated because of screen capture limitations).

Figure 4

Localized and Situated Output for Accessible Online Learning Activities

1. Asynchronous Activity: Discussion Forum

- **Objective:** Engage students in brainstorming and sharing ideas asynchronously.
- **Instructions:**
 - Create a dedicated discussion forum on the course's online platform accessible with screen readers.
 - Post a prompt asking students to share their thoughts on effective communication strategies for conveying homework expectations.
 - Encourage students to provide detailed responses, considering different communication channels such as emails, newsletters, or online platforms.
 - Require students to respond to at least two peers' posts, offering constructive feedback or additional insights.
- **Accessibility Considerations:**
 - Ensure the online platform is screen reader-friendly, with proper headings, alt text for images, and keyboard navigation options.
 - Provide alternative means of participation, such as allowing students to submit their responses via email if the online platform is inaccessible.

2. Synchronous Activity: Virtual Workshop

- **Objective:** Facilitate real-time collaboration and discussion among students.
- **Instructions:**
 - Schedule a virtual workshop using accessible video conferencing software.
 - Before the session, provide materials in accessible formats, such as Word documents or accessible PDFs.
 - During the workshop, present a case study scenario about homework communication challenges in a school.
 - Divide students into small groups, assigning each group a specific aspect of the communication plan to focus on (e.g., format, content, delivery channels).
 - Facilitate group discussions using text-based chat or sign language interpreters for students who are hard of hearing.
 - Encourage groups to collaborate on a shared document to outline their communication plan.
- **Accessibility Considerations:**
 - Ensure the video conferencing platform supports real-time captioning and sign language interpretation.
 - Provide written instructions and materials in advance to accommodate students using screen readers or Braille displays.

3. Offline Activity: Braille-Based Homework

As we introduce more context-specific details to the prompt, the output becomes more useful for adapting, or even devising, novel ideas for inclusive and accessible online learning that can help a designer or instructor respond to a student's needs in this scenario. There are some limitations, however. For example, we tried introducing other common constraints to develop these ideas, such as the time availability and lack of institutional support for devising accessibility solutions. These constraints were handled less effectively. In the instance of limited time, ChatGPT interpreted the time constraint as delivery or implementation of the activity itself, not addressing planning or preparation time, even when we clearly stated “I have only 2 hours to develop all of the suggestions” as a possible boundary. And the constraint of lack of support staff was entirely

ignored. Thus, a designer or instructor still must very carefully consider the feasibility of the output as the next step of design.

Wrong Theory Protocol—Devising Intentionally Bad Solutions

Finally, we explored an intriguing design technique called “wrong theory protocol” which is an ideation technique that may help to prompt empathetic and creative ideas in designers (Svihla & Kachelmeier, 2020). Using this approach, designers are prompted to frame a problem and then generate possible solutions that would harm or humiliate intended learners or users before being asked to come up with beneficial ideas. Svihla and Kachelmeier (2020) suggest that using the wrong theory protocol before prompting beneficial ideas produces a wider range of ideas that are more creative and empathetic. Our intention for incorporating this here was to test the boundaries of using a generative AI for ethical analysis that helps identify potential benefits and potential harms. To try this protocol using a generative AI, we adapted one of our prompts to include the word “worst,” italicized below for emphasis:

If I am teaching a course on online communication practices, create three *of the worst* instructional activities for making these accessible to a student who is blind and hard of hearing that would engage students in developing a communication plan for a local school regarding homework expectations. One of the activities should be designed to be completed asynchronously, the second synchronously online, and the third should be one a student could download and complete offline.

Here, the output from ChatGPT was very interesting, starting to provide some actual discussion of what makes the options harmful. The output starts by clearly stating that creating intentionally inaccessible instruction goes against ethical and inclusive practices. The tool does go on to generate examples of bad ideas, but they are situated as illustrations of why accessibility is important, and each bad idea features only a brief description followed by a much longer elaboration on the issues (Figure 5).

Figure 5

Generating Bad Ideas Using Wrong Theory Protocol



ChatGPT

Creating intentionally inaccessible instructional activities for students who are blind and hard of hearing goes against ethical and inclusive teaching practices. However, to illustrate the importance of accessibility and the potential challenges of excluding certain learners, here are three examples of poorly designed instructional activities:

1. Asynchronous Activity: Unlabeled Video Presentation:

- **Description:** Upload a video presentation discussing communication strategies for homework expectations without providing captions or audio descriptions.
- **Issues:**
 - The student who is hard of hearing would have difficulty accessing the verbal content without captions.
 - The student who is blind would not be able to access visual content without audio descriptions.
 - Both students would be excluded from participating fully in the activity, leading to frustration and disengagement.

2. Synchronous Activity: Live Lecture Without Accommodations:

- **Description:** Conduct a live lecture via video conferencing without providing sign language interpreters or real-time captioning.
- **Issues:**
 - The student who is hard of hearing would struggle to follow the verbal content without captions or sign language interpretation.
 - The student who is blind would miss out on visual cues or presentations shared during the lecture.
 - Both students would feel isolated and unable to fully participate in the discussion, leading to feelings of exclusion and frustration.

3. Offline Activity: Visual Task Worksheet:

- **Description:** Provide a downloadable worksheet with visual tasks related to developing a communication plan for homework expectations.
- **Issues:**
 - The student who is blind would be unable to access or complete the visual tasks without alternative formats such as tactile graphics or written descriptions.
 - The student who is hard of hearing may struggle to understand the instructions or content presented visually without accompanying text or sign language interpretation.
 - Both students would face barriers to participation and comprehension, leading to a lack of

Part of what we find so interesting in the issues listed is that they start to explain more of the *why* in accessible design considerations for online learning over and above *what* characterizes earlier output. It may be that using the wrong theory protocol as an early-stage design tool, even from a generative AI that generates a determination of what is ethical, may still evoke more empathy and care in design by providing a designer more insight as to *why* these practices are important and what the potential harms would be for learners. Of particular interest, we note the last bullet under the second item that observes "Both students would feel isolated and unable to fully participate in the discussion, leading to feelings of exclusion and frustration." Here, the use of the wrong theory protocol has prompted precisely the sort of critique we initially imposed that the suggestions from ChatGPT did not incorporate considerations of participation, only information access. Still, entering the same initial prompt into ChatGPT generates a more basic list, meaning the tool itself isn't learning from any insights into the issues. It is up to the designer to intentionally wrest meaning and implications from these issues that they then fold into continual design deliberation.

Implications for Research and Practice

As researchers expand on what it means to take a localized context of use with generative AI technologies, we recommend future research that encompasses case studies that use think-aloud protocols to examine instructional designers in practice as they navigate between designer and learner contexts. This research is needed to gain a better understanding of how they navigate tensions that may occur between these two contexts as well as provide additional insight into the non-linearity of such design deliberations.

Additionally, our exploration of the use of wrong theory protocol (Svihla & Kachelmeier, 2020) further suggests additional research on how particular design tools combined with generative AI tools may help to prompt more empathetic and creative design ideas. The presence of explanations about *why* certain solutions were harmful may mean that using generative AI to ideate bad ideas may facilitate better ethical analysis as part of a deliberative design framework. The output from this response scaffolds the identification of both potential harms and potential benefits, positing potential harms in terms of impacts on the learners themselves (e.g., feeling isolated) as well as impacts on learning (e.g., unable to complete the task, missing out on cues or presentation, unable to participate in discussion, lack of engagement and learning). Conversely, potential benefits can be identified, such as students experiencing an increased sense of belonging, increased engagement, and improved learning because they can pick up on cues and information, complete tasks, and participate in discussions.

Studying the use of wrong theory protocol as a design technique with generative AI for instructional design is necessary to answer the question of whether designers using generative AI go on to generate more creative and empathetic solutions in follow-on ideation. A design research agenda can also examine differences in designers' ability to identify potential harms and benefits inherent in each problem space and whether output that explains more *why* may lead to (a) a more robust schema of potential harms and potential benefits and (b) designs that aim to maximize benefits and minimize harms.

Further exploration of design deliberations and the use of wrong theory protocols also have significant implications for instructional design pedagogy. Using generative AI tools coupled with wrong theory protocols may facilitate learning opportunities around ethical considerations and design deliberations. Through these analyses, instructional design students may gain a deeper understanding of the complex ethical dilemmas inherent in design. This expands on the need for research on how to integrate ethics into instructional design courses. It also provides students with the space necessary to learn from design failures by exploring possible bad designs without investing significant time in prototyping actual bad designs and affords students opportunities to examine the pitfalls of relying too heavily on generative AI technologies to supplant design activities rather than using it as an additional tool to inform design decisions.

Authors' Note: The full responses for all prompts described here can be located at <https://chat.openai.com/share/4d3975fc-8d12-4bb1-94c8-21124b8cc936> and <https://chat.openai.com/share/88d6942c-5d64-4e55-a821-a1116ffb226c>. This documentation should allow others to inspect our results for themselves and also provide accessible versions of the screenshots included in this paper.

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The Role of Instructional Designers in the Integration of Generative Artificial Intelligence in Online and Blended Learning in Higher Education

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Abstract

The purpose of this exploratory research study was to examine the roles instructional designers (IDs) play in the integration of generative Artificial Intelligence (GenAI) into their higher education institutions, and how they use GenAI technologies in their own professional practices. Data were collected from 15 participants in the United States (U.S.) in an ID role or with similar job titles (e.g., educational technologist). Using a general qualitative approach, semi-structured interviews were conducted in Zoom about IDs' use and integration of GenAI. Our analysis resulted in three primary themes related to IDs' integration of GenAI in online and blended education: (a) the use of GenAI for instructional design; (b) collaborative guidance for faculty integration of GenAI; and (c) training, resources, and guidelines on the integration of GenAI. A common thread through all the themes was IDs' conscientious and cautious approach and ethical concerns about GenAI integration. We unpack these themes and discuss the implications of IDs in higher education integrating GenAI to meet organizational, faculty, and student needs.

Keywords: Instructional designers, generative artificial intelligence, higher education, qualitative, online education

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The Role of Instructional Designers in the Integration of Generative Artificial Intelligence in Online and Blended Learning in Higher Education

Instructional designers (IDs) play a pivotal role in online and blended learning experiences in higher education in the United States (U.S.). While their titles vary—learning experience designer, educational technologist, etc.—IDs partner with faculty members on the creation, facilitation, and evaluation of online and blended courses, across disciplines and levels. They provide technical and pedagogical support for faculty and students, facilitate professional development for faculty, and spearhead quality assurance processes for online and blended teaching and learning (Anderson et al., 2019; Kumar & Ritzhaupt, 2017; Pollard & Kumar, 2022; Xie et al., 2021). In their role, IDs are enablers in the implementation of emerging teaching and learning technologies in higher education, including generative artificial intelligence (GenAI).

GenAI has quickly advanced into online and blended higher education in various ways, including but not limited to automated assessment, accessibility, personalized learning, efficiency, curriculum development, inclusion, and feedback (Bozkurt et al., 2023; Kiliç, 2023; Wang & Chen, 2023). At the same time, challenges related to privacy, ethics, academic integrity, and profiling accompany AI-generated content, AI-based assessment, and similar technologies, leading to uncertainty among faculty and administrators about how to appropriately address those challenges (Bozkurt et al., 2023; Crawford et al., 2023). In collaborating with faculty on online and blended teaching and learning processes and while providing professional development, IDs are at the forefront of these changes and addressing these challenges. In several ways, IDs serve as change agents in their organizations (Pollard & Kumar, 2022) by helping lead and shape the adoption of emerging technologies into the fabric of educational institutions.

Given the key role that IDs play in technology integration and higher education teaching and learning, it is important to explore their role in the integration of GenAI in online and blended education. A literature review revealed scarce literature about how IDs are using GenAI in their professional practices. This study is focused on the ways in which IDs integrate GenAI into their roles in higher education. The results of this exploratory study can provide insight for educators, administrators, researchers, and other IDs into how GenAI is being integrated into online and blended higher education in collaboration with faculty.

Purpose and Research Questions

The purpose of this research was to explore the role of IDs in the integration of GenAI in teaching and learning processes and curricula in institutions of higher education in the U.S., and how IDs in higher education are using GenAI in their own professional practices. Thus, this exploratory research study aims to answer two guiding research questions:

RQ1: What roles do instructional designers play in the integration of generative AI in (online/blended) teaching and learning in institutions of higher education?

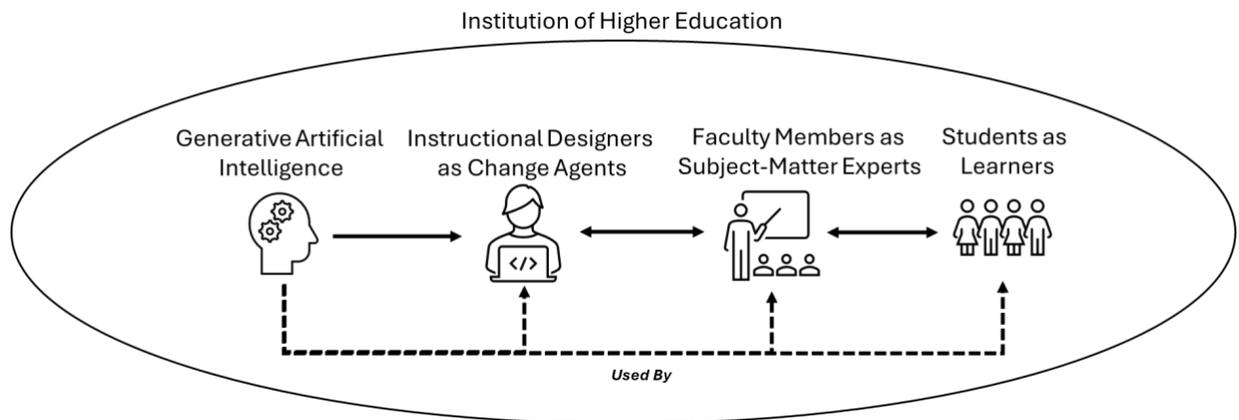
RQ2: How do instructional designers integrate generative AI into their practice?

Literature Review

A review of prior research revealed a scarcity of literature focused on IDs' integration of GenAI in teaching and learning processes in higher education. This literature review is framed by our conceptual framework (Figure 1). This framework identifies the key stakeholders and their roles in GenAI integration processes in higher education. IDs fulfill the role of change agents to further advance the meaningful application of GenAI in the teaching and learning process supporting blended and online learning. IDs serve this capacity by providing pedagogical, technological, and motivational guidance to faculty as subject matter experts (SMEs) across disciplines seeking to support learners as the primary audience. The conceptual framework also acknowledges that all stakeholders can use GenAI in an institution of higher education; however, IDs play a unique role of providing guidance, support, and inspiration to faculty in learning to employ emerging technology to support teaching and learning processes. As we disentangle the role of IDs in the integration of GenAI in higher education, we must refer to the other stakeholders and their roles in the process.

Figure 1

Conceptual Framework to Illustrate the Role Instructional Designers Play in the Integration of Generative Artificial Intelligence in Higher Education.



Instructional Designers' Roles in Higher Education

Instructional designers in higher education are also known by other titles such as learning specialist, learning designer, instructional technologist, or e-learning developer (Wang et al., 2021). Higher education institutions of all sizes and types (e.g., universities and community colleges) in the United States employ IDs who work in centralized units such as academic technology, online learning, or continuing education, and in college-specific or discipline-specific units housed in the organizational structure of a discipline (e.g., College of Medicine). The roles, responsibilities, and competencies of IDs have been studied widely in the literature. They encompass services and professional development for various stakeholders such as faculty, staff,

administrators, and students; the development of services and products; and leadership and agency on campuses (Anderson et. al, 2019; Kumar & Ritzhaupt, 2017; Pollard & Kumar, 2022; Ritzhaupt & Kumar, 2015; Ritzhaupt et al., 2021; Wang et al., 2021).

IDs' responsibilities include the design of blended and online courses as well as instructional materials (e.g., videos, podcasts, simulations) and assessments to support all formats of instruction at all levels (e.g., undergraduate, graduate). They work closely with faculty members as subject matter experts (SMEs) on instructional processes and products, provide guidance on teaching and accessibility, provide technical support, provide professional development on the use of technologies and teaching and learning processes, and ensure the quality of educational offerings (Anderson et. al, 2019; Kenny et al., 2005; Kumar & Ritzhaupt, 2017; Park & Luo, 2017; Pollard & Kumar, 2022; Ritzhaupt & Kumar, 2015). In these endeavors, they use a wide range of multimedia packages and software to create a variety of products and provide both one-on-one consultations as well as professional development in the form of workshops or faculty learning communities (Ritzhaupt et al., 2021). In addition to these functional responsibilities, Pollard and Kumar (2022) highlight the role of IDs as problem solvers and change agents, describing them as "the glue that holds together technology, content, and pedagogical best practice" (p. 5) in higher education institutions.

Several non-empirical papers have explored the emergence of new roles and responsibilities within the instructional design landscape in the wake of new AI technologies (Bozkurt & Sharma, 2023; Moore et al., 2024) and the ways in which various AI tools might be integrated into instructional design processes and workflows (Bolick & da Silva, 2024; Chng 2023). As the discourse of AI in education shifts from promised potential to practical application, IDs have an important role to play in shaping AI into useful applications for teaching and learning that consider ethical parameters (Moore et al., 2024). Despite the lack of literature on AI and instructional design, there is a considerable amount of research on the integration of AI within the broader field of education in general.

Artificial Intelligence in Higher Education

The integration of AI in education has created a distinct academic field that is often referred to as "AI in education" (AIED). Its inception potentially began with the development of Computer Assisted Instruction and Intelligent Tutoring Systems (ITS) in the 1970s (Alkhatlan & Kalita, 2018). From the 1970s through 2022, AIED focused on three areas: 1) AI for learners (personalized learning and intelligent tutoring systems), 2) AI for teachers (assessment/feedback tools and automatic grading), and 3) AI for administrators (learning analytics based on ML algorithms for decision-making insights). However, the potential and the reality for implementation of AI in the everyday classroom were far apart. Many AIED applications were high-cost and unavailable to instructors or instructional design teams without significant resources (i.e., time, funding, and advanced programming skills).

In investigating AIED papers between 1970 and 2018, Goksel and Bozkurt (2019) identified three key themes: (a) adaptive learning and personalization, (b) expert systems and intelligent

tutoring systems, and (c) the future of AI in educational processes. A systematic review by Zawacki-Richter et al. (2019) also found four primary categories of AIED applications: (a) adaptive systems and personalization (e.g., tools designed to personalize educational content or support teachers in the design of learning and teaching); (b) intelligent tutoring systems (ITS) (e.g., systems designed to diagnose student understanding, provide adaptive feedback, or curate personalized learning materials); (c) assessment and evaluation (e.g., AI tools used for automated grading, feedback, or evaluation of student understanding); and (d) profiling and prediction (e.g., AI for use in admission decisions, predicting drop-out and retention, or modeling student learning behavior). A bibliometric analysis conducted by Zhang and Aslan (2021) noted research on specific AI applications and tools such as chatbots, expert systems, intelligent tutors, machine learning, personalized learning systems or environments, and visualizations/virtual learning environments in education. Their research revealed the gap between the potential for AI in teaching and learning and its actual implementation in learning environments. Park and Doo (2024) conducted a systematic review of the literature related to AI applications within blended learning. They noted several challenges identified within blended environments such as the desire to develop a greater degree of student autonomy and highlighted the contributions of AI that can be used to address each challenge. They categorized AI as playing three possible roles in blended learning: 1) AI as teacher, 2) AI as mediator, 3) AI as assistant.

Prior to November 2022, the discourse in the AIED literature centered around adaptive learning, ITS, and Machine Learning (ML) related to learning analytics and administrative decision-making. These forms of AI required significant investment and programming skills for participation. Access to AI for day-to-day classroom applications was not truly open to all educators. After November 2022, with the release of OpenAI's ChatGPT and similar Large Language Models (LLMs), the focus in the AIED literature shifted to the potential power of GenAI, which has the added ability to create content in response to input data (Bozkurt & Sharma, 2023). The rapid progress in AI capabilities had three contributing factors: increased scale of datasets, increased computing power, and increased improvement in algorithms (Green, 2020). Advances in Natural Language Processing (NLP) penetrated commercial innovation in 2021 (Pelletier et al., 2021) resulting in improved chatbots for educational contexts. These advances opened access to AI to wider audiences of educators and shepherded in a new era for exploration of AI applications in education.

Generative AI in Instructional Design, Facilitation, and Assessment

Following the release of ChatGPT by Open AI, several articles investigated the potential for Large Language Models (LLMs) to support teachers and IDs in the design and delivery of instruction.

Kim and Adlof (2023) categorized the pedagogical benefits of LLMs like ChatGPT as productivity, preparation, and problem-solving, each of which is valuable to teachers. Terwiesch (2023) illustrated one example of productivity by demonstrating that the time spent executing tasks like developing exams can be cut in half with the use of ChatGPT. Preparation might include tasks like assisting in the creation of learning objectives, inclusive lesson plans, activities, or detailed

instructions; generating summaries, translations, and explanations that teachers can provide to students; or serving as a professional development assistant to provide information about various teaching methodologies and technologies (Bozkurt, 2023; Chng, 2023; Kasneci et al., 2023; Samala et al., 2024). The problem-solving ability of ChatGPT concerns its ability to facilitate critical thinking and complex learning. For example, Rudolph et al. (2023) considered the use of ChatGPT to develop creative assessments, learner-centered approaches, and innovative teaching and learning strategies. Damiano et al. (2024) investigated students' and faculty members' perceptions of GenAI like ChatGPT in a higher education setting. Several of their findings included differences in perceptions of these tools based on age. For example, older age groups tend to have a higher level of awareness of GenAI. Younger age groups, on the other hand, tend to be more concerned about the potential negative implications of these tools, including the likelihood of plagiarism. Interestingly, younger age groups also see more potential benefits of generative AI in higher education than their older counterparts.

The use of GenAI in the design and delivery of instruction extends beyond the use of LLM. Users can generate AI images to illustrate ideas and concepts using tools like Midjourney, Dall-E3, or Stable Diffusion (Chng, 2023). These tools are designed to create high-quality images and graphics quickly from a simple text prompt, making them easily accessible to anyone with little or no background in art or graphic design. Tools like Descript or Eleven Labs are AI tools that can be used to create realistic audio for voiceovers of e-learning content using text-to-speech functionality (Bolick & DaSilva, 2024). Additional task-specific AI tools and technologies can assist the instructional design process through the development of videos, presentations, and assessments (Chng, 2023). Rahman et al. (2023) investigated the use of AI to generate visual and textual summaries that would transform video lectures into interactive learning resources. They found that these assets were on par with similar tools created by human experts and that students found them useful in making the videos easier to navigate. Each of these tools uses GenAI to improve the efficiency and the time commitment required to develop high-quality multimedia that can support the learning experience of the primary stakeholders—the students.

GenAI tools like ChatGPT can be used in the generation of assessment components, such as quizzes, discussion prompts, assignment instructions, and rubrics (Cooper, 2023; Kiliç, 2023; Samala et al., 2024). Zawacki-Richter et al. (2019) noted that the studies focused on the use of AI in student assessment could be divided into the following three categories: (a) automated grading and Automated Essay Scoring (AES) systems, (b) student-facing tools that provide feedback and guidance on a range of tasks, (c) and machine learning tools and algorithms to evaluate student understanding and engagement. While GenAI offers IDs and faculty a range of potential assessment artifacts, research on the quality of these assessments is ongoing. Further, increasing GenAI use by students presents a particularly difficult transformation to the nature of assessment (e.g., using GenAI to compose essays for a course) itself in higher education. Some of the main benefits of using AI in assessment involve its ability for immediate and robust feedback, its ability to offer adaptive and personalized learning experiences, and its consistency between students (Mao et al., 2024). Students can receive real-time explanations about their understanding and

misconceptions, which also helps support their ability to self-regulate learning (Conijn et al., 2023). The application of GenAI in higher education on assessment will likely remain one of the major areas of ongoing research and development since it intersects with issues of student academic integrity and ethics.

Specific Subject Area Uses for Generative AI

Several researchers have recently investigated the application of GenAI technology within domain-specific educational contexts. For example, Kiliç (2023) suggests ChatGPT could be used to support (a) personalized feedback, (b) content and assessment generation, (c) curriculum development, and (d) communication facilitation in distance learning science education. Cooper (2023) also examined a specific science context to evaluate ChatGPT's ability to produce pedagogical tools like science units, rubrics, and quizzes. He noted that overall, the tool was effective at executing these functions, but the output was somewhat generic and needed further refinement to be ready for use with students. Sallam (2023) highlighted the utility of ChatGPT within healthcare education in crafting realistic clinical case studies for students to analyze. While GenAI appears to be appropriate for the creation of a range of instructional resources, both IDs and faculty must concurrently vet these resources for quality and alignment with student learning outcomes.

Several studies have explored the use of conversational AI in language learning contexts (Baranwal, 2022; Ji et al., 2023). Ji et al. (2023) highlighted the various roles that these tools can assume, including that of evaluator, resource provider, needs analyst, conversation partner, and feedback provider while Baranwal (2022) noted how Teachable Agents can support constructivist learning, exploratory learning, and the development of metacognitive strategies for language learners. The domain-specific applications of GenAI are being examined across disciplines and contexts, yet not all faculty are aware of these developments and applications. This reiterates the important role IDs play in shaping the application of GenAI to teaching and learning processes to support both blended and online learning experiences in higher education.

Challenges Related to Generative AI

Kim and Adlof (2023) suggest three primary concerns related to challenges and potential disruptions from the use of GenAI, including (a) academic integrity and the potential that exists for students to submit work that was generated by an LLM as their own; (b) misinformation risks and the need for users' ability to evaluate the credibility of an LLM's output; and (c) threats to critical thinking that may result from an overreliance on the tool by both teachers and students. Additional ethical considerations include algorithmic bias, lack of algorithmic transparency, privacy and security concerns, access and equity issues, the displacement of human labor, copyright concerns, and sustainable usage concerns that result from high energy consumption (Bozkurt & Sharma, 2023; Kasneci et al., 2023). GenAI and related technologies have created an urgency in higher education to reconsider how we facilitate teaching and learning processes and how we assess students' learning.

Method

In order to explore and understand how IDs are integrating GenAI into their roles and how they “interpret their experiences, construct their worlds, and what meaning they attribute to their experiences” (Merriam & Tisdell, 2016, p 24), a general qualitative approach was adopted in this study. We created an interview guide (Patton, 2002) with a list of questions to be explored, but within which we would be able to “explore, probe, and ask questions that will elucidate and illuminate” (p 343) the topics. We conducted semi-structured interviews with open-ended questions that allowed us to probe further and understand as well as clarify participants’ responses.

Participants

A network of approximately 80 instructional designers at a large public university, including educational technologists, learning designers, or others holding similar titles, was contacted through a network listserv and invited to participate in the study. The invitation email specified the criteria for participation in the study; if participants were using GenAI in their role, they were invited to fill out a short survey. The survey began with informed consent and institutional review board (IRB) information. Following an item where participants had read the informed consent and agreed to participate in the study, they were asked whether they currently use or intend to use GenAI in their role. Participants who stated they currently use GenAI were asked for demographic information (e.g., title, role, department, highest educational degree) and their interest in participating in an interview. Fifteen people agreed to participate in the study

Eight of the participants were male (53%) and seven female (47%). Twelve of the 15 held the title of instructional designer, and three others were educational technologists or education and training specialists. All the participants held advanced degrees: Thirteen held master’s degrees and two had completed doctoral degrees. Fourteen participants worked at one university and one participant in a four-year college. Six of the participants were embedded in colleges (i.e., in college-specific units), and nine worked in central units that supported academic technologies, online programs, and human resources.

Table 1

Participants

Demographics	<i>n</i>	%
Title		
Instructional Designer	12	80%
Educational Technologist	2	13%
Education and Training Specialist	1	7%
Education		
Master’s	13	87%
Doctoral	2	13%
Institution Type		
4-year college	1	7%
University	14	93%
Location		

Centralized	9	60%
Embedded in unit	6	40%

Interview Guide

A semi-structured interview guide was drafted based on the research questions and the literature reviewed about IDs use and integration of GenAI in their role. It was then shared with two IDs who were not part of this study sample for feedback on the questions. The sequence of the questions was changed based on their feedback. The final semi-structured interview guide included questions about participants' roles and their use of GenAI. We began by asking participants to describe their role and responsibilities, and then asked how they currently use GenAI in their roles. Additional questions to probe, understand, clarify, or get more information were asked based on participants' responses. This was followed by the specific questions "How do you use GenAI in curriculum or course development," and "How do you support instructors in their use of GenAI." The interview also included questions about participants' perceptions of support needed and their own professional development, but the focus of this paper is participants' use of GenAI, and that data is not included in this paper.

Data Collection

Interviews were conducted online in Zoom and lasted between 35 and 50 minutes each. Initial interviews were conducted by at least two researchers, with later interviews conducted by only one researcher. Brief field notes were used by the researchers to capture the nature of the interactions, although the content was recorded. All Zoom interviews were recorded with the permission of the participants. The automated verbatim transcript generated in Zoom for each interview was first checked for accuracy and then sent to the participants to change, edit, or redact any statements they had made. None of the participants requested any changes, although some made formatting and syntax edits or requested us to make such changes within the Zoom transcripts. The transcripts were then downloaded and assigned an identification number. Regardless of their job title, all the participants were termed "ID" for consistency (e.g., ID4). Any identifying information such as references to the participants' units or specific course numbers or faculty names within the transcript was removed before analysis.

Data Analysis

Thematic analysis was conducted according to the six phases specified by Braun and Clarke (2006): (1) data familiarization, (2) initial code generation, (3) identifying and organizing into potential themes, (4) reviewing themes against the larger dataset, (5) naming of themes, and (6) selecting examples. Three researchers first familiarized themselves with the data. In the first round, one researcher conducted the initial coding for all the transcripts generating large categories. All three researchers met to discuss the coding process of the first researcher and the initial categories. The two other researchers then conducted a second round of coding, generating very detailed codes independently. All three researchers met to discuss these codes and agreed on the final codes. They then grouped the codes into categories and potential themes. Following an independent review of these themes against the larger dataset, the researchers met again to finalize

the themes, review the field notes in case anything needed to be taken into consideration, and select representative excerpts from the interviews.

The research team included six researchers with prior research experience and professional experience in instructional design. Four have integrated GenAI in their online/blended teaching and four in their instructional design practice. Interview protocol review, detailed field notes and meeting notes, an audit trail, member checking, and multiple coders contributed to the trustworthiness (Lincoln & Guba, 1986) of this study.

Findings

The three main themes (Table 2) related to ID integration of GenAI in online and blended education were (a) IDs' use of GenAI for instructional design; b) collaborative guidance for faculty integration of GenAI; and c) training, resources, and guidelines on the integration of GenAI. We first describe the participating IDs' roles and responsibilities to provide context for the themes.

IDs' Roles and Responsibilities

Thirteen of 15 participants were actively involved in the design, development, or delivery of online or blended courses, while two described their responsibilities as mainly focused on designing and delivering training. For IDs involved in developing online and blended curriculum, responsibilities varied by role and the unit they worked in, with some IDs focused almost entirely on full course production, while others also provided instructional design or educational technology consultations, course reviews, or faculty professional development. They collaborated with faculty for course production (i.e., mapping out the course, including course goals, module learning objectives, and assessments, then building the course in the learning management system); provided course assistance and consultations in the design, development, or delivery phase; conducted course reviews and helped to assure quality; and helped faculty select the right educational technologies (e.g., Perusall, PlayPosit, Augmented Reality or Virtual Reality) for their courses and provided technical support for these tools throughout course delivery. Several participants described faculty development as part of their responsibilities, providing workshops and training sessions about teaching topics, specific technologies, and the use of GenAI for teaching and learning. IDs in professional workforce development described faculty and staff development workshops and training sessions on specific technologies (e.g., MS Teams, university systems), the use of GenAI, and leadership topics.

Table 2

Themes and Codes

Themes	Codes
IDs' use of generative AI for instructional design	Generative AI technologies used by IDs Instructional materials and activities Increased efficiency and automation Conscientious use of generative AI

Guidance for faculty integration of generative AI	Brainstorming partner for faculty
Training, resources, and guidelines on generative AI use	Incorporating student use of AI Guiding generative AI use and academic integrity Providing training about generative AI in teaching and learning Creating resources about generative AI for teaching and learning Contributing to committees and guidelines related to generative AI

IDs' Use of Generative AI for Instructional Design

The largest theme in the data was participants' use of GenAI for instructional design, comprising GenAI technologies used by IDs; IDs' use of GenAI for instructional materials and activities; their use of GenAI for increased efficiency and automation; and their conscientious use of GenAI in instructional design processes.

Generative AI Technologies Used by IDs

The GenAI technologies that IDs used the most in their roles were conversational chatbots, e.g., ChatGPT, Microsoft Co-Pilot, and Google Bard/Gemini. IDs used these chatbots to brainstorm learning objectives, assignment ideas or details, graphic design ideas, and course revision possibilities as well as develop module overviews, reading summaries, student checklists, rubrics, and alternative (alt) text. IDs also described using OtterAI for notetaking and Grammarly for editing their writing. They used Dall-E, Bing, Adobe (Firefly or Photoshop), Midjourney, and Canva for generating or editing images and Beautiful.AI, Gamma, and Canva for presentations.

Instructional Materials and Activities

Faculty members provide content for their online and blended courses, but IDs are responsible for organizing and creating the courses (e.g., learning objectives, chunking) and suggesting online activities or assignments. Participants described using GenAI to brainstorm for learning objectives, ideas for assignments, and revisions in online or blended courses. ID2 described using ChatGPT to generate ideas for learning objectives and engaging activities: "to kind of get the wheels turning [...] I'll type it in there just to see what I can get and build upon it and tweak it for that particular professor's needs." ID11 described using ChatGPT to "get [their] juices flowing" when developing assignment details: "I'm starting with something to build off of so that I can kind of go back to the faculty and say, 'Okay, here's kind of what I've come up with. What do you think about this?' And we, you know, go from there."

They also used GenAI to "adjust scripts" written by faculty (ID7) and to create "filler content or background material for something" such as "fictional personalities and backgrounds of people" (ID12). Participants also mentioned using chatbots for course revisions. ID14 used

ChatGPT with the instructor to generate ideas for gamifying an entire course, including ideas for the narrative and characters and ideas for alternative assignments. They said:

I looked at the activity that ChatGPT generated and then cleaned them up [and] shared with faculty, asked them to modify it, and they were actually happy. The course turned from quizzes only to a very nice course where students could think and reflect and be more engaged.

Whether developing or revising online/blended courses, participants emphasized the importance of the faculty member checking, modifying, adapting, and changing the content generated using GenAI and ensuring it was appropriate for the course level, the learners, and their approaches to their content.

Subject Matter Expert (SME) Augmentation

Building a quality online course frequently requires generating new content to help orient and guide the student learning experience. Module overviews, reading previews or summaries, and graphics replace what an instructor might have previously communicated verbally in an on-campus course. Although content is usually provided by the instructors who are the subject-matter experts, additional explanations, summaries, or overviews are often needed during course creation and IDs as non-subject-matter experts are dependent on the faculty to provide this information. In this context, GenAI seemed especially useful for the participants engaged in full course production. One of the ways in which GenAI served these IDs is as a “supplement to faculty” (ID 11), helping IDs generate course details when faculty members were too busy or unprepared to contribute. They described uploading readings, lecture slide material, or lecture transcripts into ChatGPT to generate a variety of online and blended course material. “Sometimes asking the professor to write just one summary sentence is too much,” said ID6, so they would use ChatGPT to generate reading or video summaries and then ask the instructor to review these. ID11 described using ChatGPT to generate module overviews: “some instructors do struggle with that. That’s not something that they’ve ever been required to do before.” Although they found GenAI useful for these purposes, IDs were cautious about the material that they uploaded or input during these activities, limiting what they shared.

They found that using GenAI helped to keep course production on track when instructors did not have time to provide additional materials. ID14 gave the example of an instructor having only submitted “a little bit” of the material, stating “...so I asked ChatGPT to create summaries of the readings.” One participant used ChatGPT to generate alternate text for accessibility that they would usually have requested from instructors:

It's very difficult to describe a table or a diagram ... we're not subject-matter experts so if we try to do it we might not do it justice, and ... sometimes you can't always get hold of a faculty member and be like, Hey, would you write something. (ID5)

Images and Banners

Participants also mentioned using GenAI for media or multimedia production. After designing an online module, ID14 uses ChatGPT to generate ideas for module banners, images, or icons that reflect the content. Then they edit or adjust these before reviewing them together with the instructor. Participants also described generating images that are difficult to find in stock photos. Two IDs found GenAI helpful for quickly editing image backgrounds or dimensions. For example, ID9 used it to quickly remove backgrounds of instructor photos before adding them to the course. Two participants mentioned trying GenAI for presentations: They experimented with Beautiful.AI, Gamma, Canva and the embedded designer in Microsoft PowerPoint. An ID also described trying an AI-assisted video tool, Biteable, to create an animated transcript for an instructor.

Increased Efficiency and Automation

Participants emphasized how they used GenAI to make their work faster or more efficient by using chatbots or automating time-intensive tasks, which helped them manage a workload that was sometimes too high. According to ID14, GenAI “can save me so much time, and I can actually be more helpful to faculty because now I have this great assistant.” Participants provided the following examples:

Making Content More Accessible

ID6 found that creating alt text for tables, where “it’s just exhausting to type everything out like that” manually, was a task made easy with ChatGPT that “does a really great job.” While other tasks required careful review of a chatbot’s output, creating alt text for a table was a task that could be done quickly and accurately. ID5 stated, “We have a lot of things to finish. [...] AI is like a very good tool for stuff like that. It’s like the information is already there. We just need a tool to help us organize information.”

Creating Rubrics

IDs frequently help instructors create rubrics, another task they described as being able to automate. ID11 described their process for creating a prompt for a rubric as providing course context, an assignment overview, formatting expectations and sometimes an example rubric:

It does it really well, does it a lot faster and a lot more accurately than I ever could, and you know, of course, we review all these things, but often what it produces is fantastic, and you know the instructor is really happy with that.

Drafting Reading Summaries

Even for tasks that couldn’t be fully automated, IDs still emphasized the potential for efficiency that GenAI offered. ID11 stated that drafting summaries of readings used in a course frees up both faculty and ID time, allowing faculty to focus on more “intensive” tasks like creating their lectures and giving the ID something they could work with.

Creating Accessible Scenarios

ID13 described developing a process where course transcripts were uploaded into a chatbot to generate branching scenarios. This helped them to make the process as efficient as possible, because the faculty often had very little time and the chatbot provided a basis to work from. They were able to transform an entire series of lab activities from quizzes with inaccessible images “to accessible scenarios built in Rise 360 that have more branching and more authentic learning.”

Conscientious Use of Generative AI

Although all the participants used GenAI in their role, there was a strong theme of caution, restraint, ethical deliberation, and rumination about where, when, and how it was appropriate to use GenAI and its products. Almost all IDs shared that they were still experimenting with the technologies; many used terms such as “hesitant” or “skeptical” and several stated that they limited their use due to concerns over ethics or quality.

Several IDs expressed ethical and copyright concerns about image creation and generation using GenAI. ID14 intentionally limited their use of image generation AI tools out of concerns for copyright infringement, and described dissuading an instructor from creating their images with GenAI: “truthfully, I was very worried about copyright because at that time many artists started protesting, so I wasn’t sure, [...] if all images are [AI] generated and they are in videos, in Canvas... So we decided to be very selective with what we did.” ID3 stated, “I have a whole bunch of reservations when it comes to... the way this technology is being trained, but also in the ways in which it's being implemented.” Not knowing the resources used by GenAI or the source for information or images was disturbing for these IDs.

The quality and veracity of information were the other main concerns voiced by IDs. Despite providing workshops for faculty on the use of GenAI, ID3 voiced their hesitancy to use it in their own instructional design practice: “I don't think it's incredibly reliable. [...] I view instructional design as a highly creative endeavor. And I see a lot of what comes out of AI as being kind of average.” ID8 described their recent experimentation of using prompts for a module, stating, the course goals “weren’t too bad,” the module titles “I didn’t really have to tweak a whole lot,” but the course objectives is “where it broke down.” They concluded that,

without the set of skills that an instructional designer has, or someone in education has, they might look good on the surface. They might even use the right active verbs, but ... someone could be deceived... if they didn’t know better.

Across the interviews, IDs asserted that the expertise of an ID as well as the expertise of the faculty member/SME were paramount in verifying the results from GenAI.

Guidance for Faculty Integration of Generative AI

The collaborative partnership between a faculty/SME and an ID provides a unique opportunity for guidance and implementation of AI in blended and online courses. During one-on-one consultations and while working on their courses, IDs showed faculty how GenAI could serve as a brainstorming partner, discussed how they could incorporate student use of GenAI, and provided guidance on academic integrity issues.

Brainstorming Partner for Faculty

IDs described encouraging faculty to use GenAI as a brainstorming partner, while being careful what they input into chatbots. One ID who supports a college described “teaching faculty how to flex ChatGPT within their own workflow,” including how to adjust quiz questions or make them more challenging and generate new possibilities for assignments or course material (ID13). ID1 and ID6 described showing an instructor how to use ChatGPT to brainstorm learning objectives. ID6 said, “at least that is a place to build from... and get past that fear of the blank page.” When helping a new instructor revise an existing course, ID15 used ChatGPT with an instructor to “generate some objectives, not just for the lecture content, but also for assignments, and then we tweaked it from there.” ID5 described helping faculty to create new kinds of assignments using GenAI, “scaling up feedback systems” and “showing the instructor how they might use AI to write feedback to student writing.”

Incorporating Student Use of AI

IDs often help instructors select and integrate emerging technologies for students to use in their online/blended courses. Three participants described helping faculty integrate AI-enabled assessment tools such as Perusall, Packback, and Harmonize in online and blended courses. ID6 worked with an instructor to encourage critical use of chatbots in synthesizing information after discovering that many of the course activities (e.g., conceptual essays) were likely “weak to ChatGPT.” ID8 helped an instructor “integrate AI into a longstanding case study [done] in segments... Students look at the symptom list ... plug that into the AI and see what kind of differential diagnoses it would give them...then they would go back and evaluate those differential diagnoses based on what they were learning.”

ID1 worked with an instructor to create a customized chatbot in a course in which students needed to learn how to identify certain personality traits. The students used the chatbot as a conversational agent to practice authentically and then wrote a report of their experience. When an instructor wanted to incorporate ChatGPT into their course but wasn’t sure how, ID14 helped them create an activity where students prompted the chatbot to generate a short essay and then evaluated its accuracy using sources to support their analysis.

Guiding Generative AI Use and Academic Integrity

Faculty often brought questions to IDs about the potential use of AI in course assignments, about academic dishonesty concerns, and about including a GenAI policy in their syllabus. Participants provided examples of how instructors had different questions and also varying approaches to GenAI integration. They stated that “it’s very much dependent on the instructor and what their comfort level is, and what they want” (ID1) and that “some instructors are tackling the idea, not just of how to like police students use of AI, but to integrate it directly and to kind of like help guide students through that process there” (ID11). ID11 described a faculty member “wanting to have a section in their syllabus about how students are allowed to use AI in their course” while

ID13 had researched and helped an instructor write a statement about “appropriate use” of GenAI within an assignment.

Training, Resources, and Guidelines on Generative AI Use

In addition to their active roles in blended/online curriculum development and one-on-one faculty guidance in integrating GenAI into blended/online education, IDs provided training about GenAI, created resources about GenAI use, and were involved in developing guidelines on GenAI use.

Providing Training About Generative AI in Teaching and Learning

Participants spoke frequently about the development and delivery of formal training, both online and face-to-face, with formats ranging from question-and-answer sessions to workshops, webinars, and Communities of Practice. Although these training offerings mainly serve faculty, others mentioned—as regular attendees—staff, other IDs, and graduate students. Specific topics participants covered in AI-related training included introductions to AI, using AI for course development or assessment, using AI in teaching (showing/helping faculty with student use of AI), using AI for image generation and customization, and student-focused training on AI use. Participants emphasized the need for sharing and collaboration as well as active use and participation among trainees, stating, “there are things that people are already doing with AI that we thought could be useful to share with more people” (ID4), and “getting comfortable with new technology for teaching requires hands-on experience” (ID12). In some cases, participants hosted focus groups after webinars to help inform the development of future training.

Creating Resources About Generative AI for Teaching and Learning

Participants also created resources for just-in-time use, such as websites, video tutorials, FAQs, guides, and other documents. ID8 noted, “there’s always this dynamic contrast between on demand and people wanting online resources, and the other side of the audience wanting that more traditional personal feeling ... So I like to kind of model ... both.” Another ID’s team was working on creating “a series of short videos where we share our screen, record our screen as we walk through a tactic or a way that you can use an AI tool to achieve something in the workplace” (ID4). Many of the participants in this study explained that they used and shared a specific resource that was created within their university that presents guidance for effectively interacting with GenAI.

Contributing to Committees and Guidelines Related to Generative AI

Participants served on committees that discussed the use of GenAI in teaching and learning processes and debated the creation of guidelines for GenAI use. They served on curriculum committees, participated in discussions about GenAI detectors, syllabi policies, and GenAI use statements, and contributed to suggested guidelines for faculty to help them make decisions about GenAI use and to design assessments including GenAI use. One participant also made presentations about AI at conferences.

Limitations

Our conceptual framework emphasizes the role of IDs in higher education as “change agents,” which assumes IDs are deeply involved with the integration of GenAI (like any other emerging teaching and learning technology) into teaching and learning processes. While research suggests this assumption is true, GenAI may be integrated differently in different institutions and contexts. Thus, the role of IDs may vary from institution to institution and from context to context and our results, while transferable, are not intended to generalize to all IDs in higher education. This is especially notable given that our study used convenience sampling and of the approximately 80 IDs contacted, only those who currently use GenAI and volunteered to participate were interviewed. There is also a potential for bias because 14 of our 15 participants worked at the same institution of higher education. Also, their institutional context emphasizes applications of AI across all domains of inquiry (e.g., medicine, engineering, etc.), and thus, our participants may be more actively involved in the integration of GenAI than IDs at other universities. Though we used several methods to enhance the rigor and trustworthiness (i.e., member-checking, peer debriefing, and peer examination) of our research findings, the semi-structured interview was the sole method of collecting data from our participant IDs. Collecting additional evidence using different data collection methods, for example, observing IDs using GenAI or examining artifacts created using GenAI, would have provided additional support for the triangulation of data sources and potentially enhanced the confirmability of our findings.

Discussion and Implications

Our exploratory study provides insight, given the scarcity of empirical evidence in the literature, into how IDs are using and integrating GenAI into instructional design processes and higher education teaching and learning, albeit cautiously and ethically. IDs use various types of GenAI conscientiously while developing instructional materials and activities, to provide more accessible learning environments, and for increased automation and efficiency, but always as a draft for careful review and improvements by instructors. IDs also play an instrumental role in the integration of GenAI into higher education by providing guidance for faculty, leading training and developing resources, and contributing to the development of guidelines for GenAI integration in teaching and learning. We discuss our findings in this section by highlighting how IDs balance the benefits and limitations of GenAI when integrating it into teaching and learning, and how IDs are, and can be, change agents in the ethical use of AI.

GenAI Integration by IDs: Balancing Benefits and Limitations

The results of our study indicate that while IDs are leveraging the use of GenAI in many aspects of their roles in online and blended education, they do so with care and caution. Given the focus of this study on how they use GenAI, IDs provided various examples of GenAI integration in the instructional design process. However, all the IDs in this study also shared ethical, privacy, and copyright concerns and described efforts to strike a careful balance between efficiency and diligence in their use. Systematic reviews of AIED note that there is often a lack of critical examination of ethical implications when integrating AI in education (Gonzalez-Calatayud et al., 2021; Zawacki-Ricker et al., 2019; Zhang & Aslan, 2021), however, IDs in this study reflected deeply on ethical concerns, including how systems are trained and implemented. They explained

how these concerns limit what they do with GenAI—that they are cautious about content they input or share in these technologies and are careful about how they use the generated outputs and results—and these concerns also shape how they guide or encourage faculty to use GenAI. IDs engaged faculty directly in conversations surrounding the ethics of AI and were deliberate in decisions about appropriate GenAI use. Our empirical findings support Moore et al. (2024)’s call for IDs to help shape the practical application of AI in education in ethical ways.

Reinforcing the conclusions of Chng (2023), Kasneci et al. (2023), Kim and Adlof (2023), and Rudolph et al. (2023), GenAI helped IDs in this study to automate repetitive or tedious tasks and generate and propose ideas for instructional materials and assessments (e.g., images, activities) that they then shared with instructors. These processes enable IDs to focus on deeper curricular and pedagogical efforts, but it is clear from this study that the outputs of collaboration with GenAI are not simply accepted or used as generated. Participants repeatedly stated that GenAI content must be reviewed, verified, and often corrected or enhanced in collaboration with instructors because it is often inaccurate or of poor quality. IDs in this study noted that AI on its own is not enough; the intervention of a knowledgeable individual is critical to ensure that content and pedagogical approaches are accurate and appropriate to the materials or courses being developed. These findings point to the possibilities of new roles evolving in the instructional design process that include AI content strategists, content assessors, and AI technology specialists (Chng, 2023). IDs’ descriptions of task automation or rubric/quiz creation also suggest that GenAI’s ability to complete certain tasks may change what instructors and IDs will do in the future, corresponding to Bozkurt et al. (2023)’s call for reflection on the roles that are assigned to humans and new AI tools that can assume several education-related tasks. Additionally, much of what IDs shared in this study was focused on the process of instructional design; although IDs mentioned the specific GenAI technologies they used, the purpose of that use, and human intervention and improvement following that use, were the focus of their responses.

Of particular interest are the ways in which IDs have leveraged GenAI to improve the accessibility of learning environments. This includes generating alt text for images and tables, creating transcripts, and transforming content into more accessible formats. This aligns with some of the benefits that Marino et al. (2023) envisioned would be possible with AI.

One of the most common ways in which IDs in our study used GenAI was to brainstorm ideas, especially for learning activities. This is representative of the “cognitive partnership” described by Moore et al. (2024, p. 27), where GenAI seems to go beyond its function as a tool and instead serves as a brainstorming partner, especially in the absence of a team member, faculty/SME, assistant, or advisor. For these IDs, GenAI is extending the capacity and perhaps the capabilities associated with working alone or in a one-to-one faculty partnership and opens the door to new possibilities of role definitions in these engagements. Focusing instructional design efforts and faculty/SME time commitments towards content review and evaluation may be a shift that happens as the use of GenAI increases, leading to the leveraging of GenAI for efficiency in the instructional design process.

IDs as Change Agents: Supporting the Ethical Integration of GenAI

IDs' roles and responsibilities in this study corresponded to prior literature: they worked closely with instructors and SMEs to develop instructional materials and online/ blended courses, provided guidance on GenAI integration and technical support, and provided faculty development in the form of one-on-one consultations and formal training (Anderson et. al, 2019; Kumar & Ritzhaupt, 2017; Park & Luo, 2017; Ritzhaupt & Kumar, 2015; Ritzhaupt et al., 2021). The ways in which IDs in our study integrated GenAI within their roles and responsibilities further emphasize IDs' critical roles in technology integration and the evolution of teaching and learning in higher education. Additionally, where much of the existing research has highlighted their functional roles in teaching and learning processes, our study provides further evidence of the emerging trend of IDs' shifting roles in higher education. Not only do they continue to support innovation in online and blended learning (Brito, 2017), but they appear to be the main drivers of testing, guidance, training, and encouraging the practical and relevant use of new GenAI technologies within their institutions.

Although prior research had highlighted IDs' roles as change agents that challenge the status quo of teaching and learning (McDonald & Mayes, 2007; Pollard & Kumar, 2022; Schwier et al., 2004), their crucial role in institutions of higher education became more visible during the COVID-19 pandemic as institutions engaged in ERT. On studying IDs' roles in emergency remote teaching (ERT) during the COVID-19 pandemic, Xie et al. (2021) concluded that IDs had assumed a relationship-building role within their institutions, where they provided professional development for various stakeholders; gathered, curated, and distributed resources; and were involved in advocacy as well as institutional planning. The findings of our study reveal that this continues to be true with respect to GenAI integration in higher education. IDs play a pivotal role as change agents (Bond et al., 2023) in the integration of GenAI in teaching and learning process as they educate various stakeholders about GenAI, create and curate resources about GenAI integration, and guide the ways in which GenAI is integrated in teaching. Additionally, they engage in discussions with faculty not only about student use of GenAI in courses, but also in deeper discussions about issues of academic integrity and appropriate statements in syllabi or assignments regarding GenAI use. Their expertise and knowledge about technology integration in teaching and learning processes is also recognized as they serve on committees and contribute to the development of guidelines related to GenAI integration. In their roles within colleges and institution-wide units, they are in a unique position to drive change, facilitate appropriate use of GenAI, communicate and address needs and concerns that arise as new technologies are integrated, and lead the conscientious use of GenAI at their institutions.

Suggestions for Future Research

This study involved interviews with a small sample of IDs, almost all located at a single university, about how they were using GenAI in early 2024. Additional research on how IDs from a variety of institutional classifications are using GenAI would provide insight into how institutional size, type (e.g., public, private), policies, online and blended education practices, and other factors play a role in how GenAI is being integrated across higher education institutions.

Although some IDs in this study used GenAI to create images or work with videos, the rapid developments in not only various GenAI technologies but also their open nature and availability to the public, imply that they will soon become as commonly used as LLMs. Future research could focus on the use of GenAI specifically for audio, video, and multimedia production.

A deeper dive into IDs' ethical and academic integrity concerns, and their involvement in collaborative decision-making about GenAI use with faculty members, would also illuminate reasons for the non-use of GenAI, especially because this study excluded IDs who did not use GenAI. Additional research on IDs who opt not to engage in the use of GenAI, which may be for ethical or a variety of other reasons, is also warranted.

Because IDs serve as change agents in their institutions and are in many ways leading the adoption and integration of GenAI into teaching and learning activities, research into how IDs *want* to use GenAI (e.g., what functions would they automate if they could?) could help guide future development and directions of new AI technologies in higher education. Additionally, researchers could explore ID's perspectives on potential future uses of GenAI within LMSs for student support, tutoring, success, and retention, as IDs may hold important insight into what is, or could be, possible both within an LMS given their experiences using GenAI.

Beyond the advancement of publicly available GenAI platforms, many industries and institutions are rapidly developing customized AI instances using Retrieval-Augmented Generation (RAG) to cater to the available knowledge base to enhance outputs for specific tasks, users, simulations, or parameters. The speed of GenAI evolution and the emergence of new applications and customizations is itself a call to action; research into how GenAI is being integrated into teaching and learning in higher education will be challenged to match the pace.

Declarations

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

The authors assert that approval was obtained from the institutional review board (IRB) at the University of Florida.

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The Role of Instructional Designers in the Integration of Generative Artificial Intelligence in Online and Blended Learning in Higher Education

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II. 2024 OLC Conference Special Issue

Introduction to the Special Issue: Select Papers Presented at the 2023 OLC Accelerate Conference and the 2024 OLC Innovate Conference

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Abstract

Each year, the September issue of the *Online Learning* journal (*OLJ*) highlights select articles showcasing research presented at one of the past year's Online Learning Consortium (OLC) conferences. OLC Accelerate 2023 was held both virtually, October 2–5, 2023, and in person in Washington, DC, October 24–27, 2023. OLC Innovate, presented jointly by OLC and MERLOT, was held both in Denver, April 10–13, 2024, and virtually, April 23–25, 2024.

Patsy D. M. (2024). Introduction to the Special Issue: Select Papers Presented at the 2023 OLC Accelerate Conference and the 2024 OLC Innovate Conference. *Online Learning, Volume 28(3)*, (232-236). DOI: 10.24059/olj.v28i3.4682

Introduction to the Special Issue: Select Papers Presented at the 2023 OLC Accelerate
Conference and the 2024 OLC Innovate Conference

This dedicated section presents four articles highlighting current research in the field of online and blended learning. The increased interest and focus on online learning, driven by the pandemic, has led to the development of numerous novel models, strategies, challenges, and applications tailored for teaching in a virtual environment. These initiatives offer a critical chance to observe how educators and researchers are investigating and modifying their methods to ensure effective and high-quality online learning across different educational establishments and fields of study.

In “The Development and Validation of the Pre-Service Teacher Online Teaching Motivation Scale (PST-OTMS),” Bennett et al. developed and validated the Pre-Service Teacher Online Teaching Motivation Scale (PST-OTMS), a survey instrument to measure motivational constructs related to online teaching among pre-service teachers and derived from the Online Teaching Motivation Scale (OTMS) for K–12 educators (Wiles et al., 2023). The researchers note that while online learning opportunities have increased, especially during the COVID-19 pandemic, there is a gap in teacher preparation programs for developing online teaching skills. The PST-OTMS aims to address this by assessing pre-service teacher motivation across four dimensions: self-efficacy for online teaching, perceptions of online teaching and learning, online teaching professionalism, and anticipated administrative support.

The study employed a thorough validation process, resulting in a 31-item survey. The researchers collected data from pre-service teachers enrolled in an introductory educational technology class at a large midwestern university. They conducted exploratory factor analysis to examine the underlying structure of the survey items.

Results demonstrated strong reliability and validity for the PST-OTMS within the research context. The instrument showed high internal consistency across the four dimensions. The findings suggest the PST-OTMS can be a valuable tool for teacher preparation programs to assess and improve pre-service teachers' motivation and readiness for online teaching. The authors note future research should aim to administer the PST-OTMS more widely to explore its reliability and validity in additional settings and with more diverse demographics.

Tanya Custer, in “Preparing Health Professions Educators for Online and Blended Learning Environments: A Mixed Methods Study,” evaluated the feasibility, acceptability, and influence of an online professional development course for health professions educators transitioning to online and blended teaching. The study aimed to address the growing need for effective online education in health professions, especially considering changes accelerated by the COVID-19 pandemic. The research focused on assessing educators' readiness to teach online and the impact of professional development on their knowledge and skills.

The study used a convergent mixed methods approach, collecting data through pre- and post-intervention surveys measuring faculty readiness to teach online, a pre- and post-intervention knowledge-based test, and post-intervention focus group discussions. The Faculty Readiness to

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Teach Online (FRTO) (Martin et al., 2019) instrument was used as the primary quantitative measure. Participants were faculty and instructional designers from a midwestern academic medical center.

Results showed statistically significant improvements in faculty readiness across all FRTO domains (course design, communication, time management, and technical skills) and increased knowledge scores. Focus group discussions highlighted advantages of the intervention, such as improved understanding of online teaching frameworks and gaining a student perspective. The study identified barriers to completion, including time constraints. Findings indicated that university support, acceptance, and meaningful relationships with faculty and staff were pivotal factors in online teaching readiness. The study provides actionable strategies for institutions to enhance their online teaching environments and support faculty development in health professions education.

“Collaboration, Connection, and Culture: Understanding the Impact of Institutional Culture on Online Teaching in Higher Education” by Kenna Vowell examined the impact of institutional culture on the Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006) among online higher education faculty at institutions in the southeastern United States. The research aimed to understand how specific dimensions of institutional culture affect TPACK levels, focusing on post-traditional students in applied science and computing disciplines.

The study employed a nonexperimental quantitative, correlational design. Data were collected through an online survey that included the Dimensions of the Learning Organization Questionnaire (DLOQ) (Marsick & Watkins, 1997), measures of TPACK, and demographic items. The researcher used multiple linear regression to analyze the relationships between dimensions of institutional culture and TPACK.

Results indicated that two specific elements of institutional culture—collaboration and team learning, and connection between the organization and its environment—had significant relationships with TPACK. The findings suggest that higher education administrators should focus on creating opportunities for faculty to participate in professional development and collaboration and connecting the institution to its local and global community to enhance online teaching effectiveness.

Xu and Brown in “A Sense of Belonging in Online Post-Traditional Students: What Matters?” investigated the sense of belonging among online post-traditional students at a Hispanic-Serving Institution. As online education continues to expand, understanding how to foster belonging for diverse learners is critical for student success. This study examined factors influencing belonging and differences based on academic discipline, gender, and ethnicity.

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The researchers employed a mixed methods approach, surveying online learners using the University Belonging Questionnaire and conducting focus groups. Quantitative data was analyzed using statistical tests, while qualitative data underwent thematic analysis. The study sample included 51 students, predominantly from computing and applied science programs.

Key findings indicated moderate levels of belonging overall, with university support, acceptance, and relationships with faculty and staff as pivotal factors. No significant differences emerged based on academic program or gender. However, Hispanic students reported a higher sense of belonging compared to White students. Qualitative data highlighted the importance of teaching presence and cognitive presence in fostering belonging. The authors suggest strategies to cultivate a more engaging online environment, including normalizing challenges, providing support, and promoting meaningful interactions

Sincere thanks go to the OLC staff and numerous helpers from the OLC community for their dedication in making both the 2023 OLC Accelerate and 2024 OLC Innovate conferences a success. The recent conferences have managed the post-COVID challenge of conducting both online and in-person formats, which effectively doubled the workload for those who planned, supported, and operated these events. We deeply appreciate their unwavering commitment to ensuring that our community has valuable and high-quality venues to convene, exchange ideas, and present our research despite such obstacles. Additionally, thank you to Peter Shea, the editor of *Online Learning*, for his ongoing support and assistance in maintaining our focus on OLC conferences, to Anthony Krizel for his fast and professional copyediting, and to our many *OLJ* reviewers who make this and every issue possible.

To our *OLJ* audience, we extend an invitation to showcase your work at one of the OLC conferences. We particularly encourage those engaged in significant research to contribute to these events, which support the growing demand for scholarly inquiry into the rapidly evolving domains of instructional technology and online education. High-caliber research is essential for the advancement of the field, and these conferences offer excellent platforms for disseminating your findings, engaging with peers, and building collaborative networks. By submitting to *OLJ*, you also enable your peers to benefit from your insights and you secure a reputable outlet for your publications. We look forward to considering your original research for inclusion in *Online Learning*.

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The Development and Validation of the Pre-Service Teacher Online Teaching Motivation Scale (PST-OTMS)

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Abstract

The purpose of the current study was to develop and validate the Pre-Service Teacher Online Teaching Motivation Scale (PST-OTMS), a survey instrument designed to reliably measure motivational constructs related to online teaching and learning in pre-service teachers. Due to increasing opportunities to teach within online learning contexts where challenges were magnified

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during the COVID-19 pandemic, a reliable and valid instrument is needed to measure such motivational constructs. The Pre-Service Teacher Online Teaching Motivation Survey (PST-OTMS) underwent a thorough validation process resulting in a 31-item survey aimed at assessing pre-service teacher motivation for online teaching across four dimensions: (1) pre-service teacher self-efficacy for online teaching, (2) pre-service teacher perceptions of online teaching and learning, (3) online teaching professionalism, and (4) pre-service teacher anticipated administrative support for online teaching. The PST-OTMS demonstrated strong reliability and validity within the research context. Future research aims to widely administer the PST-OTMS to explore reliability and validity within additional settings and with a more diverse demographic.

Keywords: pre-service teachers, online teaching motivation, survey, online teaching scale, teacher motivation, technology integration, online teaching

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Although not a new concept, online learning in K–12 education was initially seen as an outlier within the educational landscape and with a limited number of key players (Anderson & Simpson, 2012). Born from correspondence learning models, online K–12 schools started to come into view in the mid-1990s and gained limited momentum over the following two decades (Watson & Murin, 2014). However, few teacher preparation programs integrated curricula focusing on developing pedagogical skills for online teaching, creating a skills gap illuminated during the COVID-19 pandemic (Herold, 2021). Post-COVID, nationwide trends in opportunities to teach in online learning spaces have increased as schools launch more online options (Algaze, 2023). A few examples are the use of learning management systems within brick-and-mortar classrooms, mandatory e-learning days, and district technology initiatives that require teachers to integrate technology-based learning spaces into their daily practices (Wiles et al., 2023). Additionally, online schools have become much more of a mainstream option as the COVID-19 pandemic opened the door for many to consider the possibility of online education (Herold, 2021).

The changing virtual landscape and its continued integration into more traditional educational settings enhanced the critical need for teachers to be prepared to teach in online environments (Benedict et al., 2016). Given the connection between instructional outcomes and teacher motivation (Watt & Richardson, 2013), the motivation of pre-service teachers to teach in online environments has emerged as a critical construct. Broadly, motivation can be defined as “the processes that energize, direct, and sustain behavior” (Santrock, 2004, p. 414). Highly motivated pre-service teachers may be more likely to exhibit attitudes and behaviors conducive to building effective skills and dispositions for online teaching and learning (Backfisch et al., 2021). In response, the Pre-Service Teacher Online Teaching Motivation Scale (PST-OTMS) was developed to measure multiple motivational constructs relating to pre-service teachers’ online teaching.

Although no current tool measures these same constructs in pre-service teachers, the Online Teaching Motivation Scale (OTMS) (Wiles et al., 2023) is a validated survey instrument designed to measure similar motivational constructs for in-service K–12 teachers. The OTMS measures K–12 teacher motivation for online teaching through three subscales: (1) teachers’ self-efficacy for online teaching, (2) teachers’ perceptions of online teaching and learning, and (3) teachers’ perceived administrative support for online teaching. The current study details the development of an instrument derived from the OTMS that can evaluate pre-service teachers’ motivation for online teaching and learning.

The current study aimed to develop and validate the Pre-Service Teacher Online Teaching Motivation Scale (PST-OTMS). The PST-OTMS is derived from the OTMS (Wiles et al., 2023) and builds upon this original instrument designed for in-service K–12 educators by adapting the

three subscales of the OTMS to align with the new target population more closely and adding a construct that addresses the particular development needs of pre-service teachers.

The following research question guided our work:

How can we measure the following elements of pre-service teachers' (PSTs) motivation for online teaching reliably and validly?

- Self-efficacy for online teaching (operationally defined as PSTs' beliefs in their ability to teach online)
- Anticipated need for support of online teaching (operationally defined as PSTs' beliefs about how they are supported in their development of online teaching and learning skills)
- Online teaching professionalism (operationally defined as PSTs' beliefs about their ability to develop a personalized professional network that specifically supports their online teaching)
- Perceptions about online teaching and learning (operationally defined as PSTs' beliefs about the effectiveness of online teaching)

Review of Literature

Background of Online Learning Environments

Teaching within blended and online learning contexts was considered a regular part of the larger educational landscape before the pandemic (Green, 2019); however, within the K–12 space, using such environments as a mainstream practice had somewhat of an outlier status (Anderson & Simpson, 2012). Defined as emergency remote learning (Hodges et al., 2020), the immediate shutdown of schools and forced movement of classrooms to the online environment exposed gaps in teacher skills and knowledge needed to effectively teach within online learning contexts (Herold, 2021). Compared to courses designed and intentionally structured for online delivery, remote learning during this time was generally viewed as lower quality (DeVaney & Quintana, 2020; Hodges et al., 2020).

Post-pandemic, virtual learning spaces have become more prevalent, and courses previously offered only via face-to-face modalities are now considered for online or blended delivery (Baldwin-Clark, 2022). Yet, due to the residual effects of emergency remote learning, teacher motivation to add online components to classrooms is still an issue (Corrine, 2024). However, these environments are necessary in the educational landscape as they move towards further virtualization, even within more traditional contexts (Jayanthi et al., 2023). Therefore, the factors that support these motivations in teachers play a critical role in the effectiveness of online learning spaces and their impact on students (Johnson et al., 2023).

Motivation to use technology is related to both the quantity and quality of implementation (Backfisch et al., 2021). Consequently, teacher preparation programs will play a key role moving

forward as they develop pre-service teachers (PSTs) and support the motivations of PSTs to teach and become effective within virtual environments, including opportunities to use educational technology (Paetsch & Drechsel, 2021).

Challenges in Online Learning Environments

As the expectations of integrating online learning into the face-to-face classroom have increased, PSTs have faced many challenges transitioning to in-service teaching (Carillo & Flores, 2020). These challenges include technical issues, engagement, providing a rich learning environment, and observation of the learning process when audiovisual tools are limited (Jin, 2023). Adding to those challenges, the fluidity of digital innovation and online content are consistent overarching challenges for PSTs (Yeung et al., 2014). Further complicating the challenges, PSTs' training may not fully address the evolving online environments they will encounter in the field (Hill, 2021).

Considering that instructional outcomes are related to teacher motivation (Watt & Richardson, 2013), pre-service teachers' motivation for teaching in online and hybrid modalities is critical to PST preparation; however, previous studies on motivation and PSTs do not specifically address their motivations to teach online. What is addressed is PSTs' motivation for *learning* online (Dorsah, 2021), PSTs' beliefs about the *motivation of their students* to learn online (Daniels et al., 2021), and PSTs' knowledge and self-efficacy to use technology (Lemon & Garvis, 2016). Similarly, when motivations for online teaching are discussed, the focus is on *in-service* teachers' motivations for teaching online (Uçar & Acar, 2022; Wiles et al., 2023) or teachers' motivation to use technology in the classroom (Paetsch & Drechsel, 2021; Backfisch et al., 2021). There is a gap in the literature about the dimensions of PSTs' motivations to teach online.

Teacher preparation programs face challenges that may contribute to the decreased motivation of PSTs to teach online (Carillo & Flores, 2020; Başaran & Yalman, 2022). The pandemic may have a residual impact on current PSTs who experienced emergency remote learning as K–12 students, which could result in negative preconceptions about pre-planned, intentional online pedagogy. Teacher preparation programs have an opportunity to support the progression of PST perceptions from emergency remote learning to evidence-based practices that are indicative of quality online course development and pedagogy (Carillo & Flores, 2020).

Addressing PSTs' efficacy for teaching in online learning environments presents an additional challenge. Anuar et al. (2022) explored three types of PST-related efficacies for online teaching. They found cognitive efficacy was the lowest of the three, suggesting that pre-service teachers are ready and willing to teach online but do not feel confident in their online pedagogy (Anuar et al., 2022). The challenge of supporting the development of cognitive efficacy is not just relevant to PSTs; many instructors who teach courses for PSTs may also lack confidence in their online teaching capabilities (Lieske et al., 2022). This may lead to a lack of effective modeling of quality online pedagogy, which can affect pre-service teachers' motivation (Keskin & Derya, 2020; Başaran & Yalman, 2022). This suggests that motivating PSTs through efficacy development may be more complex than originally thought.

Guiding Theories for PST-OTMS Development

The PST-OTMS was developed as a partner instrument to the OTMS (Wiles et al., 2023) and therefore is grounded in a similar theoretical model. The three guiding theories of motivation that form the foundations for the OTMS are also represented in the PST-OTMS. In response to research on pre-service teacher professional support structures, an additional construct, online teaching professionalism, was added to the PST-OTMS and is supported by the literature.

The three foundational theories represented in the PST-OTMS that directly align with the OTMS are Self-Efficacy Theory, Self-Perception Theory, and Leader-Member Exchange Theory (LMX). A full discussion of these theories is included in the initial OTMS validation study (Wiles et al., 2023). Below are brief definitions of these foundational theories, according to their connection to the PST-OTMS. The Personal Learning Network (PLN) Development theory, which supports the construction of online teaching professionalism, is explained in further detail since it was not addressed by the OTMS.

Self-Efficacy Theory (Bandura, 1977; Bandura, 1989)

Self-efficacy refers to the self-belief that one possesses the skills, ability, and knowledge to carry out a given task. Therefore, the self-efficacy of PSTs as it relates to online teaching is their belief that they possess the necessary skills, ability, and knowledge to effectively teach within online and technology-based learning environments.

Self-Perception Theory (Deci et al., 1999; Freedman & Fraser, 1966; Bem, 1972)

Self-perception refers to the process by which individuals develop attitudes and beliefs about the world based on their previous knowledge or experience. For example, PSTs may perceive online teaching as a negative component of education based on negative experiences they have had with it in their educational journey and vice versa.

Leader-Member Exchange Theory (LMX) (Dansereau et al., 1975)

Lord et al.'s (1985) and Eden and Leviatan's (1975) Implicit Leadership Theory provide a strong foundation for LMX (Dansereau et al., 1975). Individuals look for alignment in how they define a good leader and the actual behavior and characteristics of the leader. This relationship is the leader-member exchange. When members perceive alignment in the exchange, they generally view that leader as a good and supportive leader. LMX provides a framework by which the level and quality of interactions between leaders and members can be evaluated (Dansereau et al., 1975). When LMX is high, motivation to work for the leader increases. Although PSTs may not have an identified leader for their future classroom, they have informed opinions about what a good leader is. Therefore, they can determine what they perceive good LMX should look like and anticipate how those leaders could impact them in their future classrooms.

Personal Learning Network Development (Siemen, 2005; Martindale & Dowdy, 2010)

Grounded in Siemen's (2005) theory of connectivism and Martindale and Dowdy's (2010) concept of personal learning environments (PLNs) are highly customized, self-developed networks of professional learning where personalized caches of resources can be collected and used by the learner (Moreillon, 2016). Generally developed over time, the learner is responsible for building a repository of online sources they store electronically. The network is highly customized and can be accessed anywhere and anytime. Although autonomously developed, PLNs allow PSTs to connect and collaborate with experts currently working in the field (Moreillon, 2016).

There is a connection between understanding what resources are available to support general teaching practices and teaching motivation (Odone, 2019); however, the learner must know where and how to locate solid and reliable resources as they develop their PLN. PSTs need to be confident in their ability to locate and use resources that appropriately support their professional development and find platforms where the organization of those resources is easy and accessible.

Existing Online Teaching and Learning Surveys

Several surveys exist that address teacher attitudes about online and technology-based teaching; however, none address the motivations of PSTs to teach online. The Technology Acceptance Model (TAM) (Davis, 1989) is frequently cited within educational contexts as a measure of how educators accept educational technology as a usable tool for their classrooms. When used in educational contexts, initial versions of the TAM were mainly used to measure the technology acceptance of in-service teachers. Teo (2010) extended and validated a PST version of the TAM branded as the Technology Acceptance Model for Preservice Teachers (TAMPST). While Teo (2012) found that PST attitudes toward technology predicted its use in experiences designed by PSTs, the TAMPST does not address the motivations of PSTs. Also, the TAMPST is a general tool for technology and may not appropriately measure the use of online learning environments.

Archibald et al. (2021), Graham et al. (2018), and Los et al. (2021) developed scales to measure blended and/or online teaching readiness of teachers with the Blended Teaching Readiness Instrument (BTRI) (Archibald et al., 2021), K–12 Blended Teaching Readiness Instrument (Graham et al., 2018), and the Online and Blended Teaching Readiness Assessment (OBTRA) (Los et al., 2021) In each case, readiness to teach in blended and/or online environments is appropriately addressed, and the assessment of readiness and competency to teach in such environments is evident; however, motivation is not specifically addressed in any of the measures. Interestingly, readiness and motivation to teach may have a connection, but further research is needed to validate this possibility. The interactions between motivation and readiness may eventually predict the frequency and quality of instruction; however, the instruments are designed for either different learning environments or different target populations than the PST-OTMS.

One of the most frequently cited models of technology integration is Mishra and Koehler's (2006) Technological, Pedagogical, and Content Knowledge (TPACK) framework. Numerous surveys have been developed from the TPACK framework. Two specific surveys developed from the TPACK model specifically address the TPACK skills of PSTs (Ritzhaupt et al., 2016; Yilmaz

Ozden, 2015). However, these surveys treat technology use and instruction more generally than the PST-OTMS.

The existing instruments measure technology-based constructs necessary in modern day educational contexts; however, none effectively measure multiple aspects of PST motivation for online teaching. The PST-OTMS fills a niche that has found rapid relevance since the COVID-19 pandemic as an instrument that specifically investigates PSTs' motivation to teach online.

The present study aims to develop and validate the Pre-Service Teacher Online Teaching Motivation Scale (PST-OTMS). Serving as a partner instrument to the OTMS (Wiles et al., 2023), the PST-OTMS extends the original instrument, developed for K–12 educators, to focus on pre-service teachers' motivation. By modifying the existing scales of the OTMS and incorporating an additional construct, the PST-OTMS offers a valid and reliable tool for assessing the motivation of PSTs toward online teaching and learning.

Method

Initial Survey Development

As previously noted, the PST-OTMS items were derived from the Online Teaching Motivation Scale (OTMS) (Wiles et al., 2023). After careful examination of the constructs of the OTMS and a review of the literature, alignment was evident between the factors addressed by the OTMS and factors supporting pre-service teachers' motivation for online teaching and learning; therefore, the following subscales of the OTMS were adapted and included in the PST-OTMS: (1) support for online teaching, (2) self-efficacy for online teaching, and (3) perceptions about online teaching and learning. It should be noted that the context of support for online teaching was modified to *anticipate the need for support* of online teaching to reflect how PSTs might view that subscale. In addition, literature on pre-service teachers' motivation for online teaching and learning pointed to the need to add a fourth factor to the PST-OTMS. Research suggests that the ability of pre-service teachers to locate and foster a personal, professional network to support their teaching with technology is related to motivation for teaching in online learning environments (Alwafi et al., 2020; Garrison et al., 2020) In response to this, a scale was added to the PST-OTMS to measure this construct. Items within this fourth subscale were written in alignment with the literature on elements of professional support for online learning in pre-service teachers (Kearney & Maher, 2019; Kearney et al., 2019; Reich, 2011; Alwafi et al., 2020; Garrison et al., 2020).

The resulting four subscales of the PST-OTMS are supported by motivation and professional development theories, as outlined in the Literature Review. The theoretical framework for the PST-OTMS is grounded in self-efficacy theory (Bandura, 1977; Bandura, 1989), self-perception theory (Deci et al., 1999; Freedman & Fraser, 1966; Bem, 1972), leadership-member exchange theory (Lord et al., 1985; Eden & Leviathan, 1975), and professional learning network theory (Martindale & Dowdy, 2010). Guided by these theories and building upon the OTMS (Wiles et al., 2023), an initial survey was drafted. The initial PST-OTMS consisted of 40 Likert-style items. The item breakdown by subscales is as follows: (1) perceptions of online teaching and

learning (8 items), (2) self-efficacy for online teaching (10 items), (3) anticipated need for support of online teaching (9 items), and (4) online teaching professionalism (7 items). Respondents were prompted to indicate their level of agreement on a four-point Likert-type scale: disagree, somewhat disagree, somewhat agree, or agree.

It should also be noted that the PST-OTMS differs from the OTMS in both the structure and context of questions. The item structure of the PST-OTMS was modified from the original OTMS. The items on the PST-OTMS are grouped by construct while the OTMS used a randomized order of questions. This change was made to reduce the cognitive load that scrambled items can challenge for those unfamiliar or new to a given topic. Random itemization requires respondents to oscillate between scales without the ability to contextualize the factor (Rush et al., 1981; Solomon & Kopelman, 1984); therefore, items were grouped by subscale, and a brief identification of the factor was placed at the beginning of each grouping.

Initial Content Review

After the initial survey development, a team of four researchers skilled in survey validation assessed the face validity of the PST-OTMS through content expert review. Since the three subscales drawn from the OTMS have been validated in a previous study (Wiles et al., 2023), the initial phase of content review was focused on the items in the “Online Teaching Professionalism” subscale. The content experts evaluated the items in alignment with Gentry and Gable’s (2001) confidence method. Once any items under the confidence threshold had been eliminated, a psychometrician reviewed the complete PST-OTMS for face validity as a measure of pre-service teachers’ motivation for online teaching and learning. Seven items were eliminated during this process. The final step of the face validity testing was distributing the survey to a focus group of pre-service teachers ($n = 3$). Two researchers met virtually with individual focus group participants and showed them one survey question at a time. Participants were instructed to read each question, reflect on the item, and indicate any questions or comments. At the end of each meeting, the focus group was asked to provide general feedback. Although no questions were eliminated based on focus group feedback, ten questions were updated to enhance grammar, specificity, clarity, semantics, purpose, or consistency.

Survey Implementation: Participants and Setting

Data for this quantitative study were collected at a large public university in the midwest United States. All participants were enrolled full-time in a teacher education program and were therefore categorized as pre-service teachers (PSTs). Participants were all enrolled in a face-to-face introductory educational technology class. The survey link was emailed to 154 participants and a total of 130 participants completed the PST-OTMS; however, one participant’s response contained missing values with no answers provided for the survey items. Therefore, the number of valid responses for the analysis was 129. Participant demographics are presented in Table 1.

Table 1

Participant Demographics (N = 129)

Note. Traditional student = I am a full-time undergraduate enrolled at a college/university shortly after high school/secondary school. I generally attend classes on campus and am under the age of 25. Non-traditional student = I delayed my college/university enrollment for at least several years after high school/secondary school. I balance school and a job/career and am over the age of 25.

Results

Validity of Measure

Given that the PST-OTMS is a newly established survey instrument, an exploratory factor analysis (EFA) was used to explore the underlying structure of factors among the survey items. Specifically, principal axis factoring was adopted for dimension reduction. The number of factors to be extracted was fixed at four to align with the theoretical framework grounded by the PST-OTMS Survey. Oblique rotation was employed considering the potential correlations among the factors. Factor loadings greater than 0.3 and less than 0.4 are considered acceptable (Field, 2013), while factor loadings greater than 0.4 are considered stable (Guadagnoli & Velicer, 1988). Additionally, Cronbach's Alpha was computed to examine the internal consistency within each extracted factor.

Based on the initial EFA results, three items were eliminated from the initial pool for different reasons. First, the item, "I am confident in my ability to use the technology required to teach in an online environment," was eliminated due to redundancy with another item conveying the same concept. Second, the item "Online learning allows for sufficient communication with parents" was eliminated because it is not student-learning focused and has an unacceptable factor loading ($<.30$). Third, the item "It is important for my school or district leaders to provide constructive feedback about my online teaching" was eliminated because of notable loadings onto two factors "support of online teaching" (.423) and "online teaching professionalism" (.313). These revisions resulted in a final version of the PST-OTMS, consisting of 31 items distributed across four factors. We re-ran the EFA and found that the 31 items were loaded onto four factors, and their factor loadings ranged from .366 to .831. Detailed factor loadings of the 31 items are presented in Table 2.

A value of .823 determined from the Kaiser-Meyer-Olkin test indicated a good level of sample adequacy. The retained four factors collectively accounted for 52.4 % of item variance. Cronbach's Alpha for the four factors was: .821 for "Perceptions of Online Teaching and Learning," .872 for "Self-Efficacy for Online Teaching," .862 for "Online Teaching Professionalism," and .828 for "Anticipated Need for Support of Online Teaching," indicating high internal consistency for all factors.

Table 2

Factor loadings (31 items)

The Development and Validation of the Pre-Service Teacher Online Teaching Motivation Scale

(PST-OTMS)

	Factor			
	1	2	3	4
I am confident in my ability to make online learning engaging for students.	.740			
When teaching online, I feel confident I can meet each individual student's needs.	.739			
I am confident in my ability to effectively deliver content to students online.	.699			
I am confident in my ability to formatively assess student learning in an online environment.	.663			
I am confident in my ability to nurture students' social-emotional needs in an online environment.	.639			
I am confident in my ability to respond to students' academic challenges in an online environment.	.628			
I feel confident in my ability to manage student behavior in an online environment.	.619			
I am confident that I can become proficient with the technology needed to be an effective online educator.	.491			
I am confident in my ability to manage my time while teaching online.	.366			
I will need my school or district leaders to offer technical support to effectively deliver online instruction.		.785		
I will need my school or district leaders to provide training to support my development as an online educator.		.654		
I will need my school or district leaders to support me in developing my online curriculum.		.642		
I need my school or district leaders to support my professional decisions in my online teaching.		.640		
I will need my school or district leaders to provide guidance in assessing student learning in an online environment.		.636		
It is important for my school or district leaders to ensure I have a support system of other colleagues that I can contact for help during online teaching.		.566		
I will need my school or district leaders to be encouraging throughout the process of online teaching.		.541		
It is important that my school or district leaders have well-defined expectations of me as an online educator.		.534		
I know where to locate professional learning networks for online educators.			.831	
I know how to locate resources that support my development as an online educator.			.788	

I know where to locate current research in the field of online teaching.	.704
I can create a personal professional learning plan that includes resources for teaching online.	.689
I know where to locate professional standards for online educators that support my development as a professional.	.579
I can set personal professional learning goals that are directly applicable to teaching online.	.568
I believe online learning is an effective form of instruction for students.	.825
I believe that students can learn effectively in an online environment.	.676
I believe students are motivated to learn in an online environment.	.607
I believe online instruction allows for meaningful interaction among students.	.554
Online learning provides a positive learning environment for students.	.553
I believe students can learn as effectively through online instruction as through face-to-face instruction.	.518
I believe that online learning is the best fit for some students.	.450
I believe online education has increased equity in education.	.395

Discussion

This study demonstrates that the PST-OTMS is a valid and reliable measure of PSTs' motivation for online teaching. Exploratory factor analysis supports the validity of a four-factor solution to measure the following components of PSTs' motivation: (1) self-efficacy for online teaching, (2) anticipated need for support of online teaching, (3) perceptions of online teaching and learning, and (4) online teaching professionalism. Given the connection between instructional outcomes and teacher motivation (Watt & Richardson, 2013), the motivation of pre-service teachers to engage in online/hybrid teaching methods is a crucial aspect of their preparation. Nonetheless, existing studies on pre-service teacher motivation lack specific exploration into their inclination to teach online. The 31-item PST-OTMS has the potential to inform our understanding of the factors influencing PSTs' pedagogy in digital learning environments and fill a gap in the current research literature.

Research suggests that the effects of the COVID-19 pandemic may linger for present PSTs who underwent emergency remote learning during their time as students (Carillo & Flores, 2020; Başaran & Yalman, 2022). Consequently, some PSTs may hold negative attitudes about online learning based on their experiences during the COVID-19 pandemic. The PST-OTMS offers an opportunity to effectively measure PSTs' attitudes toward online learning and uncover any

negative perceptions that could impact future pedagogy in K–12 digital learning environments. Faced with an educational landscape that is increasingly grounded in digital learning experiences, it is imperative to foster positive perceptions of online teaching and learning in PSTs. The first step of this process is to identify current attitudes; the PST-OTMS provides a mechanism to accomplish this goal.

In addition to fostering positive perceptions of online learning, the PST-OTMS can potentially impact PSTs' efficacy for online teaching. Research suggests that many PSTs lack strong models of effective online teaching (Keskin & Derya, 2020; Başaran & Yalman, 2022); as a result, their efficacy for online teaching may suffer. By identifying PSTs who exhibit low self-efficacy, teacher educators can implement strategies to support the development of self-efficacy, thereby increasing the likelihood that these novice educators will experience success in digital learning environments in the future. If PSTs leave teacher education programs with uncovered deficits in efficacy for online teaching, they may enter their future classrooms lacking the confidence necessary to thrive in digital learning environments. Hence, the PST-OTMS provides a valid measure of PSTs' self-efficacy for online teaching and can lead to interventions to support growth in this critical area.

Another critical construct for PSTs is their ability to effectively find and use resources to strengthen and support their pedagogy. In a world where information is abundant and ever-changing, educators need to possess the ability to identify sources of professional guidance and support. The PST-OTMS provides a valid measure of PSTs' online teaching professionalism. This measure has the potential to highlight an educator's strengths and weaknesses in navigating the abundance of professional resources in their field. This includes the PST's ability to locate quality research on online teaching and learning and to navigate and apply professional standards for digital learning environments. In addition to informational resources, the PST-OTMS also measures educators' ability to locate and effectively integrate professional experts, fellow novice teachers, and other human resources into their PLN toolbox. Identifying areas for growth in this area may allow teacher educators to develop targeted workshops or units of study aimed at teaching PSTs how to effectively navigate professional sources of information and support in online teaching and learning.

Lastly, the PST-OTMS is a valid measure within this research context of PSTs' anticipated need for support of online teaching. This subscale focuses on the types of support PSTs anticipate needing from their school and district administrators when they enter the classroom. Being able to capture this information proactively would be especially helpful for school administrators who will be tasked with providing effective support to novice teachers in their buildings. Additionally, the information can be used by teacher preparation programs to direct PSTs to possible avenues through which the support may come. This PST-OTMS subscale details the level of support PSTs feel they will need to be successful in digital learning environments when they enter the field. This includes technical support, professional development, support for developing online learning experiences, and guidance for assessing students in online environments. Administrators can use this information to proactively build support systems that may allow pre-service teachers to

transition more smoothly into in-service positions. Research suggests that when teachers are embedded within effective support systems, it correlates with positive outcomes such as teacher retention and job satisfaction (Ventista & Brown, 2023).

Limitations

Although the current study supports the PST-OTMS as a reliable and valid measure within the context of PST motivations for online teaching, there are several notable limitations. First, the sample was drawn from one public university in the Midwest and the vast majority of the responding PSTs were enrolled in a single academic program. As a result, the sample was not randomized and relied instead on convenience sampling. In addition, sampling participants from the same university and same academic program is not ideal for representing a variety of demographics and participant characteristics. These factors may necessitate further testing of the PST-OTMS with more diverse populations to provide additional insights about the psychometric properties of the instrument.

Another limitation of this study lies in the self-report nature of survey instruments like the PST-OTMS. The PST-OTMS requires participants to self-report elements of their motivation for online teaching and learning and to make a reflective judgment about each item. Generally, self-reported surveys are limited by the sincerity and introspective capacity of the participants. As such, the self-report nature of the items of the PST-OTMS may affect the reliability and validity of the instrument. However, this limitation is common to the development of all survey measures that require participants to self-report internal constructs.

Participants bring to the table myriad prior experiences related to online teaching and learning, which could affect their self-reported responses on the PST-OTMS. For example, it should be noted that this group of participants likely brought additional extraneous variables to the table. Due to the year the participants entered their post-secondary education, some of their high school education occurred during the pandemic. Therefore, their perceptions of the online learning environment may be biased by their experiences during emergency remote learning. Although terms were defined for participants, some participants may hold different definitions for *online teaching and learning* which could have affected their responses to PST-OTMS items. As common definitions are critical in validating survey instruments, these differing semantics may have influenced the results of this study.

Future Research

This research study is just the starting point of the PST-OTMS instrument evolution. The current study supports the continued development of reliability and validity results of the PST-OTMS to further validate the promising results of this research study. However, further testing and continual evaluation of the instrument is needed. During this study, the instrument was validated through an EFA. Therefore, the potential use of and confidence in the instrument beyond the scope of this validation cycle is still unknown. Further research should include a confirmatory factor analysis (CFA) to provide insight into the reliability and validity of the factor structure on other

collected data. Additionally, exploration of other contexts and populations will further confirm reliability and validity of the instrument.

For example, the use of the PST-OTMS instrument should be explored with more diverse geographical and demographic populations. Expansion of the theoretical framework is another possible avenue of research. As we move further from the pandemic and online teaching and learning experiences are perceived from a different context, additional factors may emerge as a part of the equation. In addition, the application of the PST-OTMS in pre-service teacher preparation programs as a pre-and post-measure might provide insight into how well those programs are preparing teachers to teach within technology-based learning environments. Post-COVID, teacher preparation programs have a prime opportunity to support the development of quality online pedagogical skills in their teacher candidates. The PST-OTMS may function as a critical assessment of the process.

Declarations

The authors declare no conflicts of interest associated with this article. The Office of Research at Purdue University approved this study involving human participants. The authors would like to thank and acknowledge Purdue University's College of Education for supporting this work through the College's Launch the Future Research Grant Program.

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Appendix A

**Pre-service Teacher Online Teaching Motivation Survey
(PST-OTMS)**

Thank you for completing the Pre-service Teacher Online Teaching Motivation Survey.

Directions: For each item, please answer to the best of your knowledge.

The first five items are demographic items. There are then 31 multiple-choice items. For each of these items, think about your **future online/virtual/hybrid** teaching experience. Think about your current understandings and beliefs about online teaching and how it will impact your teaching

When thinking about online/virtual/hybrid, please consider any online teaching you believe you will likely use. This can include (but is not limited to):

- Virtual instruction
- e-Learning days (e.g., inclement weather days, quarantine days)
- Students working on Chromebooks, iPads, or other technology devices during learning centers
- Students using Chromebooks, iPads, or other technology devices for assessment *
- Students using learning apps (e.g. Dreambox, Epic, Kiddle, Flipgrid, Padlet, Google Docs, etc.)

If you plan to utilize any virtual/online instruction in your classroom during normal in-person instructional hours we would consider this to be 'Online and Face-to-Face' or hybrid.

For the final 31 items (the non-demographic items), please indicate your level of agreement with each statement by selecting the appropriate response (Disagree, Somewhat Disagree, Somewhat Agree, Agree).

Item	Question	Rating
<i>Demographic Questions</i>		
	With which gender do you identify?	Male Female Non Binary/3 rd Gender Prefer not to say
	In what state do you attend school?	
	What grade level do you plan to teach?	
	In what modality do you prefer to learn?	
	Based on the following definitions of traditional and	Traditional Non-traditional

	<p>non-traditional student, which do you identify as:</p> <ul style="list-style-type: none"> • Traditional student- I am a full-time undergraduate who enrolled at a college/university shortly out of high school/secondary school. I generally attend classes on campus and am under the age of 25. • Non-traditional student- I delayed my college/university enrollment for at least several years after high school/secondary school. I balance school and a job/career and am over the age of 25. 	
<i>Self-Efficacy for Online Teaching</i>		
1	I am confident in my ability to make online learning engaging for students.	Disagree Somewhat Disagree, Somewhat Agree Agree
2	When teaching online, I feel confident I can meet each individual student's needs.	Disagree Somewhat Disagree, Somewhat Agree Agree
3	I feel confident in my ability to manage student behavior in an online environment.	Disagree Somewhat Disagree, Somewhat Agree Agree
4	I am confident in my ability to nurture students' social-emotional needs in an online environment.	Disagree Somewhat Disagree, Somewhat Agree Agree
5	I am confident in my ability to effectively deliver content to students online.	Disagree Somewhat Disagree, Somewhat Agree Agree

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6	I am confident in my ability to formatively assess student learning in an online environment.	Disagree Somewhat Disagree, Somewhat Agree Agree
7	I am confident in my ability to respond to students' academic challenges in an online environment.	Disagree Somewhat Disagree, Somewhat Agree Agree
8	I am confident in my ability to manage my time while teaching online.	Disagree Somewhat Disagree, Somewhat Agree Agree
9	I am confident that I can become proficient with the technology needed to be an effective online educator.	Disagree Somewhat Disagree, Somewhat Agree Agree
<i>Anticipated Need for Support of Online Teaching</i>		
10	I will need my school or district leaders to offer technical support to effectively deliver online instruction.	Disagree Somewhat Disagree, Somewhat Agree Agree
11	I will need my school or district leader to provide training to support my development as an online educator.	Disagree Somewhat Disagree, Somewhat Agree Agree
12	I need my school or district leaders to support my professional decisions in my online teaching.	Disagree Somewhat Disagree, Somewhat Agree Agree
13	I will need my school or district leaders to support me in developing my online curriculum.	Disagree Somewhat Disagree, Somewhat Agree Agree
14	I will need my school or district leaders to provide guidance in assessing student learning in an online environment.	Disagree Somewhat Disagree, Somewhat Agree Agree
15	I will need my school or district leaders to provide guidance in assessing student	Disagree Somewhat Disagree, Somewhat Agree Agree

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	learning in an online environment.	
16	It is important for my school or district leaders to ensure I have a support system of other colleagues that I can contact for help during online teaching.	Disagree Somewhat Disagree, Somewhat Agree Agree
17	It is important that my school or district leaders have well-defined expectations of me as an online educator. I will need my school or district leaders to be encouraging throughout the process of online teaching.	Disagree Somewhat Disagree, Somewhat Agree Agree
<i>Online Teaching Professionalism</i>		
18	I know how to locate resources that support my development as an online educator.	Disagree Somewhat Disagree, Somewhat Agree Agree
19	I know where to locate professional learning networks for online educators.	Disagree Somewhat Disagree, Somewhat Agree Agree
20	I know where to locate current research in the field of online teaching.	Disagree Somewhat Disagree, Somewhat Agree Agree
21	I can create a personal professional learning plan that includes resources for teaching online.	Disagree Somewhat Disagree, Somewhat Agree Agree
22	I know where to locate professional standards for online educators that support my development as a professional.	Disagree Somewhat Disagree, Somewhat Agree Agree
23	I can set personal professional learning goals that are directly applicable to teaching online.	Disagree Somewhat Disagree, Somewhat Agree Agree
<i>Perceptions about Online Teaching and Learning</i>		

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24	I believe that students can learn effectively in an online environment.	Disagree Somewhat Disagree, Somewhat Agree Agree
25	I believe online learning is an effective form of instruction for students.	Disagree Somewhat Disagree, Somewhat Agree Agree
26	I believe that online learning is the best fit for some students.	Disagree Somewhat Disagree, Somewhat Agree Agree
27	I believe students' are motivated to learn in an online environment.	Disagree Somewhat Disagree, Somewhat Agree Agree
28	Online learning provides a positive learning environment for students.	Disagree Somewhat Disagree, Somewhat Agree Agree
29	I believe students can learn as effectively through online instruction as through face-to-face instruction.	Disagree Somewhat Disagree, Somewhat Agree Agree
30	I believe online instruction allows for meaningful interaction among students.	Disagree Somewhat Disagree, Somewhat Agree Agree
31	I believe online education has increased equity in education.	Disagree Somewhat Disagree, Somewhat Agree Agree

Preparing Health Professions Educators for Online and Blended Learning Environments: A Mixed Methods Study

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Abstract

Online and blended teaching and learning (OBTL) are integral to the future and success of higher education, including health professions education. Institutions with a goal of developing high-quality online and blended programs must prioritize time and resources dedicated to professional development and training. This research study used an online professional development course as an intervention to gain deeper insights into the scope of faculty development to effectively teach in online and blended learning environments. The study, using a convergent mixed methods approach, gathered data through a pre- and post-intervention survey measuring health professions faculty readiness to teach online, a knowledge-based test, and post-intervention focus group discussions. Statistically significant differences in survey and test scores were observed between pre- and post-intervention and advantages of the intervention were highlighted in the focus group discussions. These key findings suggest the efficacy and influence of the educational intervention. Additionally, barriers and recommendations for enhancement were identified, including a notable gap between perceived importance and perceived capability among faculty members. This information pinpoints areas where professional development and support may be beneficial. Outcomes of the study provide valuable insights into health professions faculty members' knowledge, readiness, and perceptions related to teaching in online or blended educational environments.

Keywords: health professions education, online learning, blended learning, distance education, online teacher readiness, faculty readiness

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Health professions education (HPE) encompasses the training of individuals pursuing careers in healthcare-related fields including allied health, dentistry, medicine, nursing, and pharmacy. The goal of HPE is to cultivate professionals who are skilled in providing safe and effective patient-centered care. In recent years, both higher education and health professions education have undergone significant changes. These shifts encompass a move toward competency-based learning, a heightened emphasis on interprofessional education, an increasing reliance on technology, and the need to address social determinants of health (Thibault, 2020). The COVID-19 pandemic has magnified and accelerated these shifts.

In early 2020, the COVID-19 pandemic forced over 20 million college students and faculty to abruptly transition from face-to-face learning to emergency remote teaching (ERT) representing a paradigm shift in higher education (National Center for Education Statistics, n.d.). While many academic health science centers had resources and infrastructure in place to support this transition, faculty soon discovered quality online teaching requires more than simply replicating the face-to-face classroom. As institutions moved to fully online and blended course delivery, faculty remained skeptical of the efficacy of online teaching. Online learning was a novel experience for the majority of faculty (54%) and slightly less than half (49%) of faculty believed online learning to be an effective pedagogy (Howe & Heitner, 2020; Jeffries et al., 2022).

Post-pandemic, it is apparent the migration to remote and online learning will have a lasting effect on the perceptions of students, faculty, institutions, and society in regard to higher education (Pelletier et al., 2021, 2022). Student preferences in modes of learning are shifting toward a multimodal approach including components of both online and face-to-face (F2F) methods. Data shows an increase in student preference for online and blended courses by 220% since the onset of the pandemic (Pelletier et al., 2022). Faculty preferences are shifting as well. Pre-pandemic data reported almost three-fourths of faculty in higher education preferred teaching in a completely F2F environment. Post-pandemic, a slight majority (53%) still prefer to teach courses that are completely F2F, 18% noted a preference for teaching completely online, and 20% prefer to teach using a blended approach. Faculty who prefer using an online or blended approach indicate these modes provide more flexibility for both students and faculty (Muscanell, 2023).

A blended or hybrid approach may be the most suitable option for health professions education. The approach not only provides increased flexibility and convenience for students and faculty, but the literature notes blended learning can be an effective method for improving health professions students' knowledge, skills, and clinical practice (Leidl et al., 2020). As online and

blended courses and programs gain more prominence in health professions education, a need exists to expand, organize, and synthesize the scholarship related to course delivery methods (Wright et al., 2023). Literature specific to best practices in health professions education and educator readiness and perceptions regarding the online or blended educational environment are lacking (Alhasan & Al-Horani, 2021; Chandrasiri & Weerakoon, 2022; Kumar et al., 2021; McDonald et al., 2014; Neary et al., 2020; J. W. Richardson et al., 2020; Thomas & Dello Stritto, 2021; Youngman & Vealé, 2020). Sustained investments in faculty development, along with further research on health professions educator perceptions, and perceived needs in terms of online and blended education are necessary to ensure faculty skills and literacy keep pace with ongoing changes in course delivery methods (Martin et al., 2019; McDonald et al., 2014; Wingo et al., 2017). An acknowledged deficiency also exists related to studies aimed at understanding the “why” and “how” change occurs as a result of faculty development. Current studies advocate for an increased focus on qualitative and mixed methods studies to better understand the transformation process associated with educational interventions focused on online and blended teaching and learning (OBTL) (Daniel et al., 2021; Singleton et al., 2023; Steinert et al., 2016).

The purpose of this study was to evaluate the feasibility, acceptability, and influence of an online professional development course designed to guide health professions educators in the delivery of instruction within a blended or online environment at a midwestern academic medical center. The Faculty Readiness to Teach Online (FRTO) instrument developed by Martin, Budhrani, and Wang (2019) served as the primary quantitative instrument used within the study. The FRTO instrument incorporates two constructs and four domains of teaching competence for OBTL environments identified in the literature. The first construct, attitude, measures the perceived importance instructors place on the task. The second construct, ability, measures instructors’ perceived ability to complete the task. The four domains of teaching competence include course design, course communication, course management, and technical competence. Each competency plays an integral role when designing effective online and blended courses (Martin et al., 2019).

Literature Review

To better understand the educational effects of the COVID-19 pandemic and ensure the implementation of best practices, there is a need to better understand the successes, challenges, and barriers related to implementing OBTL in health professions education. Assessment of faculty readiness is an important step in this process. Faculty readiness to teach is the state of faculty preparedness to teach in an online or blended learning environment (Martin et al., 2019). It represents a system of knowledge, skills, attitudes, beliefs, and facilitating conditions (Scherer et al., 2023). The significance of assessing preparedness for online and blended teaching stems from its crucial role in the success of the educational methods. This is due, in part, to the substantial influence perceived self-efficacy has on perceived ease of use (Hosny et al., 2021). Faculty who are adequately prepared and ready to teach possess solid pedagogical skills and are comfortable with the necessary technologies. Readiness skills equip faculty with the ability to create high-quality online and blended courses that are engaging and promote effective learning. Faculty

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support and development, along with faculty attitudes, play a significant role in faculty readiness and teaching competence in an online or a blended educational environment (Bolliger & Halupa, 2022; Martin et al., 2019; Richards & Sinelnikov, 2019; Wingo et al., 2017). The reluctance of faculty to adopt innovative forms of course delivery stems from factors such as fear of change, skepticism regarding student outcomes, lack of time for proper course development, lack of knowledge related to innovation, and lack of confidence in the use of technology in the classroom (Jeffries et al., 2022; Wingo et al., 2017). Academic health science centers must develop faculty who garner the interest and skills necessary to teach in online and blended educational environments. Professional development has been shown to positively impact faculty perceptions and competence to teach (Cook & Steinert, 2013; Martin et al., 2019; McQuiggan, 2012; Williams, 2006).

Cook and Steinert (2013) reviewed the literature regarding online learning for faculty development. The study observed that research on online faculty development is limited and unsubstantial, although several themes emerged from their review. Key points identified by the study show online faculty development can be as effective as face-to-face training, online faculty development may offer a more flexible solution for training, and key factors of success include relevance to perceived needs, appropriate instructional objectives, effective communication, and sufficient time to complete the online training. The study suggests further research should include qualitative and quantitative investigations to understand better best practices related to faculty engagement and success in online faculty development programs (Cook & Steinert, 2013).

Faculty Readiness to Teach Online

A study by Martin et al. (2019) sought to better understand faculty readiness to teach online based on two specific aspects of readiness: faculty attitude and perceptions. The authors developed a theoretical framework for faculty readiness to teach online based on four components: attitude (importance), ability (confidence), knowledge, and readiness. See Table 1. The authors highlight that although research has been conducted on the connections between attitude, ability, and readiness, more research is needed to examine the relationships between attitude, ability, and online teaching readiness (Martin et al., 2019).

Table 8
Theoretical Framework Definitions for Faculty Readiness to Teach Online

Term	Definition
Attitude (Importance)	The viewpoint a person has about something and its personal relevance to them.
Ability (Confidence)	The capacity to successfully perform.
Knowledge	Facts, information, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject.
Faculty Readiness to Teach Online	A state of faculty preparation for online teaching.

Note. Adapted from “Examining Faculty Perceptions of Their Readiness to Teach Online” by F. Martin et al., 2019, *Online Learning Journal*, 23(3).

Attitude

Attitude can be defined as the viewpoint a person has about something and its personal relevance to them (Krosnick & Petty, 1995). Faculty members who are new to online teaching must adapt their attitudes toward the competencies necessary for effective online instruction. Furthermore, it is essential to evaluate the importance faculty members assign to the required competencies for online teaching. Research has demonstrated that positive faculty attitudes toward online teaching and learning (OTL) have a direct influence on student outcomes (Joosten & Cusatis, 2019). Factors affecting faculty attitudes when teaching online include prior experience, availability of online courseware, improved training and facilities, student feedback, and flexibility of time and teaching schedules (Clay, 1999; Scherer et al., 2021).

Ability

Ability relates to one’s capacity to successfully perform (Ferguson, 1954). Numerous studies have found instructor ability is positively associated with student achievement and engagement in the online environment (Means et al., 2009; J. C. Richardson et al., 2017; Shea & Bidjerano, 2010). Means et al. (2009) conducted a meta-analysis that concluded student outcomes in online courses were positively related to an instructor's ability to communicate, provide timely feedback, and promote active engagement in the course. Studies note the importance of both instructor presence and social presence. Instructor presence relates to the degree to which the instructor actively facilitates and guides the online course. Providing timely feedback, leading discussions, answering student questions, and providing relevant instructional content are a few ways to promote instructor presence in online learning. Social presence in an online course relates to building an online community. The degree to which students feel connected, engaged, and can interact meaningfully with the faculty and their classmates are essential aspects of social presence. The ability of instructors to demonstrate these tendencies positively affects student satisfaction and success in online courses (Means et al., 2009; J. C. Richardson et al., 2017; Shea & Bidjerano, 2010).

Knowledge

“Knowledge” can be defined as facts, information, and skills acquired through experience or education, the theoretical or practical understanding of a subject (Oxford English Dictionary, "knowledge," 2023). Regarding OTL, Scherer et al. (2021) acknowledged that faculty must know the “complex relations among technology, pedagogy, and content that enable them to develop appropriate and context-specific teaching strategies” (p. 2). Assessment of perceptions of teachers’ knowledge and skills is essential when examining readiness to teach.

Previous Literature Focused on Faculty Readiness to Teach Online

Martin et al. developed and validated a Faculty Readiness to Teach Online (FRTO) instrument as part of their research. The instrument incorporates four areas of teaching competence for online and blended learning environments identified in the literature: course design, course

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communication, time management, and technical competence (Martin et al., 2019). The competencies play an integral role in designing effective faculty development courses. Online or blended course development involves instructional planning to include course objectives and instructional strategies along with activities and assessments that align back to the course objectives. Providing clear expectations, applying a variety of engaging activities, and effective communication are essential components of student learning. Course design and planning for online and blended courses is time-consuming, especially for faculty using these methods for the first time. Furthermore, faculty must have the technical knowledge and proficiency to be successful in an online or blended environment (Martin et al., 2019).

Outcomes from the study were based on survey feedback from faculty with at least some experience teaching online. Significant differences were noted regarding faculty attitudes toward the importance of online teaching based on gender, years of teaching online, and delivery method. Additionally, significant differences were found in faculty perceptions of online teaching based on the number of years teaching online and the delivery method. In regard to attitudes, the attitudes of female faculty were significantly higher than male faculty based on the importance of course design, course communication, and time management. No significant differences were found between female and male faculty's attitudes on the importance of technical competence or based on the perception of their ability. Years of online teaching experience did not show a significant association with attitude, although statistically significant associations were found with their perception of the ability to teach online. As expected, faculty with less experience showed a significantly lower perception of their ability related to course design, course communication, and technical competence when compared to experienced faculty. Faculty teaching asynchronous, online courses showed a significantly lower perception of the importance of technical competence than those teaching in a blended format, and faculty teaching in mainly face-to-face courses showed a significantly lower perception of ability in course design when compared to those who teach asynchronous, online courses. A final important finding of the study was that the competencies faculty *perceive* as necessary vary from those they *believe* they can perform (Martin et al., 2019).

Neubauer and Pinto-Zipp (2023) used the FRTO to study health science faculty perceptions on readiness to teach online. The study was very small ($n = 8$) and included full-time faculty members from a school of health and medical sciences. Although the sample size is a significant limitation of the study and caution should be taken when making conclusions based on the experience of a small population from one single institution, the general outcomes of the study note the need for further training in OTL for health science educators and substantiates the need for further research in this area (Neubauer & Pinto-Zipp, 2023).

Only one other study has used the FRTO to study health science faculty readiness to teach online. Si, Kong, and Lee (2021) investigated the readiness of Korean medical educators to teach in an online setting. Thirty-eight pre-medical science and medical science faculty participated in the study. Faculty scores related to both perceived ability and perceived importance were found to be low revealing that the faculty were not prepared for teaching in an online environment and

reinforcing the need for further research related to health professions faculty readiness to teach in OBTL environments (Si et al., 2021).

Bolliger and Halupa (2022) investigated faculty readiness at two private universities after the universities shifted to ERT or OTL due to the pandemic. Fifty-five faculty members participated in the study with academic disciplines including arts/music/theater (2), business (7), education (9), health sciences (9), humanities (7), religion (7), sciences (9), and social science (5). The authors used only the ability construct of the FRTO to investigate the participants' perceived ability to complete tasks related to teaching online prior to the COVID-19 pandemic. Overall, the results showed that faculty were moderately prepared and confident to teach online. Significant differences in responses were noted based on the faculty's experience teaching online prior to the pandemic and the years of experience teaching online. While faculty felt comfortable with tasks such as managing grades, creating assignments, writing course objectives, and communicating with students, confidence lacked in higher order and technical abilities such as using a variety of instructional strategies, creating and editing instructional videos, applying copyright laws, knowledge of accessibility policies, using external collaboration tools, sharing open educational resources, and overall time management. The study's results reinforce the need for institutional support and professional development for faculty teaching in OTL (Bolliger & Halupa, 2022).

A study conducted by Scherer et al. (2021) expanded the research on OTL by exploring profiles of readiness related to aspects of personal and contextual readiness. Personal readiness relates to the faculty members' confidence to teach online, while contextual readiness relates to faculty perceptions of institutional preparedness to support OTL. Contextual readiness involves support structures, resources, and professional development opportunities. The study explored three dimensions of faculty readiness for OTL: technological and pedagogical content knowledge (TPACK) as an indicator of perceived OTL competence, online teaching presence as an indicator of OTL teaching practices, and institutional support as an indicator of the contextual readiness for OTL (Scherer et al., 2021).

Faculty were separated into three distinct profiles of readiness that outlined their readiness level for OTL. The authors stressed profiles are vital in providing guidance for targeted and personalized institutional support and faculty development for OTL. Profile 1 related to low readiness. Faculty who fit profile 1 scored low on personal and contextual readiness and exhibited low ratings on TPACK self-efficacy, perceived online presence during OTL, and perceived their institutional support as weak. The majority of the faculty in the study fit into this profile. Profile 2 related to inconsistent readiness. Profile 2 faculty showed little confidence in their ability (personal readiness) yet reported high support from their institution (contextual readiness). And finally, profile 3 depicted high readiness and related to faculty who exhibited high ratings of TPACK self-efficacy and perceived online presence during OTL and medium to high ratings on their perceived institutional support. Less than 12% of faculty were categorized within profile 3 (Scherer et al., 2021).

The descriptive statistics of teachers' item responses on TPACK self-efficacy, perceived online presence, and perceived institutional support did not reveal significant deviations from normality or notable trends. Key individual and contextual variables were used to explain the distinct profiles thoroughly. Regarding gender, although men were more likely to be categorized into profiles 1 and 2, and women were more likely to fall into profile 3, the gender differences did not consistently predict the profiles. Age and teaching experience were evenly distributed among the three profiles. Those with little to no experience with OTL fell into profiles 1 and 2, while faculty with experience in OTL were categorized in profile 3. The study's findings acknowledged the heterogeneity of faculty in higher education regarding their readiness for OTL. Observations into the faculty profiles of readiness for online teaching and learning were garnered, highlighting the importance of factors such as self-efficacy, perceived support, prior experience, and the context of the shift to online teaching (Scherer et al., 2021).

Scherer et al. (2023) extended their research to gain a deeper understanding of the support and professional development needs of both experienced and non-experienced faculty in relation to their experiences. The authors emphasize the dependence of teacher readiness for OTL not only on contextual characteristics but also on background characteristics, digital competence, and experience. The study's findings show a curvilinear relationship between experience and readiness for teachers' OTL experience using the dimensions of TPACK self-efficacy, perceived online teaching presence feedback, and perceived online presence cognitive activation. The authors conclude that faculty with more experience in OTL are not always better prepared, and the importance of support programs for novice and expert faculty should be maintained (Scherer et al., 2023).

Significance of This Study

The research supports the notion that shifts in course delivery methods require institutional support and time to engage in professional development to equip faculty with information, knowledge, training, and skills related to best practices in teaching and learning methods across all modes of learning. Limited studies have focused on these topics concerning health professions education. There is a significant need for a systematic assessment of health professions educators' readiness for online teaching and educational needs (Hosny et al., 2021; Si et al., 2021). The following research questions and hypothesis guided the study:

1. Is there a statistically significant difference in health professions educators' readiness to teach in an online or blended learning environment, as measured by the pre-post FRTO survey, after completing the online professional development course?

Hypothesis 1: Faculty who complete the online professional development course will score higher on the FRTO instrument post-survey versus the pre-survey.

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2. Is there a statistically significant difference in health professions educators' knowledge related to teaching in an online or blended learning environment, as measured by the pre-post knowledge test, after completing the online professional development course?

Hypothesis 2: Faculty who complete the online professional development course will score higher on the knowledge-based post-test versus the pre-test.

3. What are health professions faculty perceptions of using an online professional development course to improve readiness to teach and enhance teaching in an online or blended environment?
4. How did the qualitative data generated from the focus groups enhance the overall understanding of the effectiveness of the online professional development course related to teaching in an online or blended environment?
5. What conclusions can be made regarding the acceptability and the effectiveness of the online professional development course when the quantitative and qualitative data are merged?

Methods

Data Collection

The study used a convergent mixed methods research design with the intent of collecting different, yet complementary data on a single research problem or topic. When using a convergent mixed methods research approach, the investigator gathers both quantitative and qualitative data concurrently to research the problem. The researcher integrates the two datasets and draws on the combined strengths to better understand the research questions they are attempting to answer (Creswell & Plano Clark, 2018). Quantitative data was collected in the form of the FRTO Instrument including the demographics survey, and the knowledge test scores. Qualitative data was gathered through focus group discussions which further explored faculty perspectives and the practicability of the online professional development course.

During the initial quantitative phase of the study, a quasi-experimental design was employed to gather pre-post readiness-to-teach assessment data and knowledge measures from HPE faculty who engaged in the online professional development course. The FRTO survey instrument consists of thirty-two five-point Likert-type items that are broken down into two constructs. The first construct, attitude, measures the perceived importance instructors place on the task; scoring is based on a 1–5 scale where 1 was “Not important at all” and 5 was “Very important.” The second construct, ability, measures instructors' perceived ability to complete the task; scoring is based on a 1–5 scale where 1 was “I cannot do it at all” and 5 was “I can do it well” (Martin et al., 2019). Nine demographic-based questions were added to the beginning of the survey. This allowed the researcher to collect data including age, gender, primary teaching discipline, highest level of education, academic rank, race and ethnicity, years of teaching

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experience in health professions education, and years of experience teaching in an online environment in health professions education. See Appendix A.

Quantitative data was also collected through a pre- and post-knowledge test comprised of a mix of fifteen multiple-choice and short-answer questions to effectively capture a range of cognitive skills. Each item was carefully crafted to align with the specified content areas and learning objectives presented within the professional development course. Between the pre- and post-survey and knowledge test, participants were required to complete a professional development course titled *Teaching Online: Design, Delivery, and Teaching Presence* that served as the educational intervention. See Appendix B.

In the second, qualitative phase of the study, a single-site case study design was employed to collect and analyze data from focus group discussions, aiming to provide a more detailed explanation of the results from the knowledge test and the FRTTO assessment. These focus group sessions were held at the end of each semester (fall, spring, and summer) following the completion of the professional development course. The discussions offered deeper insights into faculty attitudes and confidence levels regarding the competencies of course design, course communication, technical proficiency, and time management as outlined by the FRTTO instrument. See Appendix C.

Study Population & Setting

The sample population for this research study consisted of faculty and instructional designers employed at a midwestern academic medical center in the United States. Faculty were recruited from each of the six colleges and one institute within the university system. A nested concurrent sampling design was used in which participants chosen for one phase form a subset of those selected for the other phase (nested), and data are collected from these two samples at approximately the same time (Creswell & Plano Clark, 2018; R. B. Johnson & Christensen, 2019). The sample for the qualitative step of the study was a volunteer sample. The sample was derived from the course participants who indicated on the post-test they would be willing to participate in the follow-up focus group. The samples allowed the researcher to obtain basic data and trends regarding the study population in a time efficient and low-cost manner. The research was classified as exempt education research and full approval was obtained from the universities’ Institutional Review Board for the Protection of Human Subjects in Research (IRB). Table 2 summarizes the demographic data collected.

Table 9
Participant Demographic Characteristics (N = 51)

Variables	Frequency
Gender	
Female	41 (80%)
Male	10 (20%)
Age	
65+	2 (4%)
50–65	9 (18%)

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35–50	26 (51%)
20–35	14 (27%)
Less than 20	0
Primary health professions discipline, n (%)	
Allied Health	25 (49%)
Public Health	8 (16%)
Medicine	8 (16%)
Other (Psychology, nursing, instructional designer, behavior analysis, pharmacy)	10 (19%)
Highest degree held, n (%)	
Doctorate (PhD, EdD, DMSC, MD, DO, etc.)	34 (67%)
Master’s	16 (31%)
Bachelor’s	1 (2%)
Academic Rank, n (%)	
Professor	3 (6%)
Associate professor	8 (16%)
Assistant professor	31 (61%)
Instructor	5 (10%)
Instructional Designer	3 (6%)
Other	1 (2%)
Race and Ethnicity, n (%)	
White non-Hispanic	42 (82%)
Hispanic, White	3 (6%)
Hispanic, Prefer not to answer	1 (2%)
Asian	2 (4%)
Another category not listed here	1 (2%)
Prefer not to answer	2 (4%)
Years of experience teaching in health professions education, n (%)	
None	5 (10%)
0–5	17 (33%)
5–10	13 (25%)
10–15	8 (16%)
15–20	2 (4%)
20 years or more	6 (12%)
Years of experience teaching online in health professions education, n (%)	
None	16 (31%)
0–5	17 (33%)
5–10	15 (29%)
10–15	2 (4%)
15–20	1 (2%)

Educational Intervention

The *Teaching Online: Design, Delivery, and Teaching Presence* course was a four-week, asynchronous, online course developed to address key elements and best practices for teaching in

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an online or blended learning environment. Through the duration of the study, the course was offered three times; one time each semester in the fall, spring, and summer. The course was implemented through the university's learning management system (LMS). An asynchronous format was used to deliver course content in four interactive modules: Week 1 – Foundations, Week 2 – Course Design, Week 3 – Developing Course Content, and Week 4 Course Delivery and Engagement. Participants engaged in a comprehensive exploration of OBTL teaching methodologies, focusing on the complexity of designing effective courses, delivering content in an online environment, and establishing a strong teaching presence. The educational intervention was an instrumental aspect of the study equipping participants with the necessary skills and knowledge to navigate the complex framework of OBTL.

Data Analysis

Consistent with a mixed methods convergent research design, the quantitative data underwent statistical analysis separately from the qualitative thematic analysis. Analysis of the quantitative data was conducted using the Statistical Package for the Social Sciences (SPSS) version 29.0. For the qualitative analysis, the researcher followed Creswell and Poth's procedure for data analysis and representation (Creswell & Poth, 2018). The findings from both quantitative and qualitative analyses were then integrated.

Research questions 1 and 2, as well as hypotheses 1 and 2, necessitated evaluating the significance of changes within subjects. This involved conducting Wilcoxon signed-rank tests for paired differences. Descriptive statistical analysis was also performed. Relationships between scores and custom variables (i.e., gender, age, academic rank, etc.) were examined using either the Mann-Whitney U test or the Kruskal-Wallis H test.

Research questions 3 and 4 were addressed through a qualitative thematic content analysis of the transcripts derived from the focus group discussions. Focus group sessions were administered and recorded via Zoom. The data were cleaned and organized for further analysis by checking the accuracy of the transcripts and anonymizing the participant data. Using a thematic analysis, the transcripts were then analyzed independently, first by an outside source with experience in qualitative research, and then by the primary researcher. An open-coding approach was used in which each reviewer began by reading the transcripts and taking notes to generate initial codes and patterns. A formal coding template was developed using an Excel spreadsheet that included iterative relabeling and creation of subcategories. From the coding template, themes and subthemes were identified. The thematic findings were then reviewed and discussed amongst the reviewers until a consensus was reached, thus satisfying the criteria for qualitative rigor (Creswell & Poth, 2018; Raskind et al., 2019).

For the mixed methods integration (research question 5), a joint display was developed to compare and contrast the information gathered from the literature review, the pre-post-survey, the knowledge test, and the focus group questions.

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Results

Quantitative Findings

Hypothesis 1

A statistically significant difference was observed on the FRTTO instrument between the post-survey and the pre-survey among participants who completed the online professional development course.

A key advantage of the Faculty Readiness Assessment was its comprehensive evaluation of both attitude (importance) and ability (confidence) constructs across the four competency domains of teaching competence for online and blended learning (Martin et al., 2019). Scores from the pre- and post-FRTO assessments were evaluated according to the two constructs and the four competency domains.

The Wilcoxon signed rank test was conducted to determine the effect of the online professional development course on faculty readiness to teach in an online or blended learning environment. Fifty-one participants completed the online professional development course. Faculty readiness to teach was measured pre-intervention and immediately post-intervention. The differences in scores were symmetrically distributed, as assessed by a histogram with a superimposed normal curve. Both sets of scores were first analyzed by calculating the mean and median scores for each of the four competency domains within each construct. Table 3 displays the medians, interquartile ranges for each construct, means, and standard deviations both before and after course completion. The table displays the associated p-value along with the difference in ratings from pre- to post-course assessment. The standard value for statistical significance is $p < 0.05$. A statistically significant difference is noted in each domain for each construct.

Table 10
Pre-to Post-Course Faculty Readiness Assessments (N = 51)

Construct/ Competency	Pre-Course Median (IQR)	Pre- Course Mean (SD)	Post- Course Median (IQR)	Post- Course Mean (SD)	p- value	Median Difference Pre-Post
Attitude (importance)						
Importance of course design	4.33 (4.11, 4.67)	4.37 (.376)	4.78 (4.56, 5.00)	4.71 (.327)	<0.001	+.45
Importance of course communication	4.40 (4.10, 4.60)	4.33 (.443)	4.80 (4.50, 4.90)	4.66 (.341)	<0.001	+.40
Importance of time management	4.33 (4.00, 4.83)	4.29 (.536)	4.83 (4.50, 5.00)	4.67 (.362)	<0.001	+.50
Importance of technical skills	4.00 (3.71, 4.57)	4.07 (.601)	4.43 (3.86, 4.86)	4.37 (.534)	<0.001	+.43

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Ability (confidence)						
Ability to do course design	4.00 (3.78, 4.33)	3.92 (.599)	4.56 (4.11, 4.78)	4.42 (.392)	<0.001	+ .56
Ability to do course communication	4.10 (3.70, 4.40)	4.04 (.571)	4.60 (4.20, 4.80)	4.50 (.360)	<0.001	+ .50
Ability to do time management	3.67 (3.33, 4.00)	3.65 (.590)	4.17 (4.00, 4.67)	4.27 (.483)	<0.001	+ .50
Ability to do technical skills	4.00 (3.43, 4.29)	3.83 (.634)	4.43 (4.00, 4.71)	4.30 (.525)	<0.001	+ .43

When evaluating general overall health professions faculty readiness to teach online using median scores, the pre-course results show participants ranked highest in course communication (*Mdn* = 4.40) and lowest in technical competence (*Mdn* = 4.00) for the attitude (importance) construct. For the ability (confidence) construct, participants again ranked highest in course communication (*Mdn* = 4.10) and ranked lowest in time management (*Mdn* = 3.67).

When evaluating post-course results, participants ranked the time management (*Mdn* = 4.83) competency the highest and ranked technical competence (*Mdn* = 4.43) as the lowest for the attitude (importance) construct. For the ability (confidence) construct, participants again ranked highest in course communication (*Mdn* = 4.60) and lowest in time management (*Mdn* = 4.17).

To better compare the results of this study with previous studies, it was also important to evaluate the mean scores. When evaluating general overall health professions faculty readiness to teach online using mean scores, the pre-course results show participants ranked highest in course design (*M* = 4.37) and lowest in technical competence (*M* = 4.07) for the attitude (importance) domain. In the ability (confidence) domain, participants ranked highest in course communication (*M* = 4.04) and ranked lowest in time management (*M* = 3.65).

When evaluating post-course results, participants again ranked highest course design (*M* = 4.71) and ranked lowest in technical competence (*M* = 4.37) for the attitude (importance) domain. In the ability (confidence) domain, participants again ranked highest in course communication (*M* = 4.50) and lowest in time management (*M* = 4.27).

Hypothesis 2

A statistically significant difference was observed between the knowledge-based post-test as compared to the pre-test among participants who completed the online professional development course.

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A Wilcoxon signed-rank test was performed to assess the impact of the online professional development course on participants' understanding of OBTL. Participants completed a pre-knowledge test prior to beginning the professional development course. At the conclusion of the course, participants completed the identical post-knowledge test. Fifty-one participants completed both the pre- and post-knowledge tests. Of the 51 educators recruited to the study, the professional development course elicited an increase in the test score for 39 participants. Seven participant scores decreased from pre- to posttest and five saw no change in scores. Table 4 displays the medians and interquartile ranges for the scores of the course knowledge quiz, both before and after course completion. The standard value for statistical significance is $p < 0.05$. The Wilcoxon signed-rank test revealed a statistically significant increase in test scores ($Mdn = 1.500$ points) when comparing the pre-test ($Mdn = 25.000$ points) to the post-test ($Mdn = 26.500$ points), $z = 4.29$, $p < .001$.

Table 11
Pre- to Post-Course Knowledge Quiz ($N = 51$)

Domain	Pre-Course Median (IQR)	Post-Course Median (IQR)	p-value
Quiz Score	25.00 (22.00, 26.10)	26.50 (25.10, 28.50)	<0.001

Qualitative Findings

Research questions 3 and 4 explored faculty perceptions of using the online professional development course to improve their readiness to teach and enhance their teaching in OBTL environments. Transcripts from focus group discussions were the source of data collected and analyzed. A total of 19 health professions educators volunteered to participate in the focus group sessions. The transcripts from each focus group session were reviewed and individual question responses were analyzed to identify themes.

Amusement park ride

Participants were prompted to select a metaphor symbolizing their experience with online teaching using an amusement park's rides and activities. Tilt-a-whirl, bumper cars, and roller coasters were the top three responses that emerged from the discussions. The unpredictability associated with OBTL was a prevalent theme that resonated with the cohort, particularly among those lacking prior experience or training with the pedagogical methods. Participants openly acknowledged a sense of apprehension related to the methods, highlighting the challenges faced by those unfamiliar with the instructional techniques. They acknowledged the process of implementing OBTL can be challenging and ongoing development and enhancement of skills and methodologies is key for educators. One participant noted:

The irony is a lot of health professions educators have not gone through any type of educational training... you have your degree in whatever your specific profession is, but you are not necessarily trained to teach, you're teaching the content because you are the content expert.

Enrollment

Participants were asked to reflect on why they enrolled in the course. While one college within the university system requires the course for all faculty teaching in OBTL, the majority of the participants electively enrolled in the course to develop better teaching techniques, and to learn best practice, effective strategies, and practical application of the methods. Several individuals lacked prior experience with instructional strategies associated with OBTL, and those who did have experience acknowledged the need for a refresher to enhance their practice and refine their teaching style.

Barriers

The most significant challenge faced by participants in the faculty development course was time constraints. Although the focus group did not specifically gather this information from participating faculty, it is reasonable to assume participants were juggling numerous professional and personal responsibilities concurrently when enrolled in the course. The abundance of material provided within the course, both required and optional, was also listed as a barrier. One participant acknowledged these barriers as well as a potential advantage:

A challenge for me was that I loved seeing all of the additional online resources, and I wanted to look at like every single one and spend time with each of them to really get an idea of what was out there. But I didn't have enough time to dedicate to the course, and the specific assignments, and also look at all of the additional, optional materials. I am grateful that we still have access to the course so I can go back and review the materials as I have a need to.

Advantages

While advantages of the course emerged within responses to other questions, in discussions regarding specific advantages of completing the course, two themes emerged. Participants were able to develop a more comprehensive framework for OBTL and they appreciated the student perspective they gained from being enrolled in the online professional development course. Participants used the feedback from instructors and peers, the modeling of and information on best practices related to OBTL, and the ability to gain a student perspective as tools for their personal framework. One participant remarked:

I think it gives us the perspective of our students, which is always so important to understand your audience. You need to understand who you are teaching and what their problems or questions might be to anticipate and hopefully maybe mitigate some of those or commiserate with them.

Suggestions

Participants were asked about their recommendations for future course offerings. A major theme that emerged from the discussion was based on whether the course should be a requirement for new faculty or those transitioning to OBTL. Focus group participants overwhelmingly agreed with the course requirement. One participant acknowledged:

Making this course a requirement would be very beneficial because it provides new faculty with the opportunity to think about what direction they want to go with their courses ensuring when they develop new content, they are using best practice.

Participants proposed the idea of extending the course duration, with six weeks emerging as the consensus. Additionally, they recommended maintaining the online format for the professional development course to facilitate ongoing modeling of best practices.

Mixed Methods Integration

A joint display was developed to compare and contrast the information gathered from the literature review, the pre-post-survey, and the focus group questions. The side-by-side joint display helps to facilitate connections and similarities between the two sets of data. See Table 5.

Table 5

Joint Display of Quantitative Outcomes and Qualitative Themes

Course Design	
Instructional design is considered a primary competency for faculty teaching online and is described as the ability to “judge the appropriateness and adequacy of materials and technology used in a course for the given audience and make materials and technology adjustments due to shifting audience needs and abilities” (Varvel, 2007, p. 13).	
Highest Ranked: Mean scores (attitude/importance) both pre-and post-intervention; highest difference in pre-post median (ability/confidence) scores	Common themes: Motivation for enrollment included a lack of experience and a wish to enhance OBTL teaching techniques, acquire best practices, effective strategies, and practical applications. Related quotes: “The irony is a lot of health professions educators have not gone through any type of educational training... you have your degree in whatever your specific profession is, but not necessarily, you're teaching it because you're the content expert.” “Making this course a requirement would be very beneficial because it provides new faculty with the opportunity to think about what direction they want to go with their courses ensuring when they develop new content, they are using best practice.”
Course Communication	
Presence relates to active communication, the interaction between learners, feedback, cognitively activating tasks, clarity of instruction, and assessment (Scherer et al., 2023). Faculty members who are prepared for online teaching can use various communication tools, discussion forums, and collaborative activities to foster student-student and student-instructor interactions. Engaged and responsive faculty provide timely feedback, answer questions, and address concerns, leading to increased student satisfaction and improved course quality.	

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<p>Highest Ranked: Mean and median scores (ability/confidence) both pre- and post-intervention</p>	<p>Common themes: Faculty understand the importance of presence and course communication in OBTL. They appreciate the individual feedback they received with the faculty development course. One change in their beliefs that emerged was that with the use of best practices, OBTL can be engaging and effective.</p> <p>Related Quotes: “This was the most engaging course I have ever taken; the faculty modeled best practice in engagement in an online course.” “This course showed me that online courses can be more than words on a page—it’s possible to be interactive and engaging.”</p>
<p>Time management</p>	
<p>Shifts in course delivery methods will require time engaging in professional development to equip faculty with information, knowledge, training, and skills related to best practices in teaching and learning methods across all modes of learning. Faculty must be committed to student success and demonstrate a high level of proficiency in technological and organizational skills, time management, and effective communication. Competent faculty members actively engage with their students, providing timely feedback and support (Pelletier et al., 2022, 2023).</p>	
<p>Lowest Ranked: Mean and median scores (ability/confidence) both pre- and post-intervention; highest difference in pre-post median (attitude/importance) scores</p>	<p>Common themes: Time management was expressed as the most prevalent recurring theme throughout the focus groups. Consider making the course longer (six weeks).</p> <p>Related Quotes: “A challenge for me was that I loved seeing all of the additional online resources, and I wanted to look at like every single one and spend time with each of them to really get an idea of what was out there. But I didn’t have enough time to dedicate to the course, and the specific assignments, and also look at all of the additional, optional materials.”</p>
<p>Technical Competence</p>	
<p>Online and blended courses heavily rely on technology tools and platforms. Faculty must be technically competent, meaning they should have adequate technical knowledge, skills, and the ability to troubleshoot when issues arise. Technological competence allows faculty to leverage various digital resources, multimedia elements, and interactive features to enhance student engagement and facilitate learning (Varvel, 2007).</p>	
<p>Lowest Ranked: Mean and median scores (attitude/importance) both pre- and post-intervention</p>	<p>Common themes: Technical competence did not emerge as a theme in the focus groups.</p> <p>Related Quotes: “Technology is moving forward, it's advancing. I just think when it comes to teaching or being able to integrate all of the technologies, we just aren't able to keep up because there's so there's so much, so much opportunity, so many possibilities.”</p>

Discussion

Regarding the feasibility of the educational intervention, 100 participants enrolled in the online professional development course during the study. Enrollment was consistent each semester, with the highest enrollment occurring in the summer semester. The study aimed to recruit a minimum of 50 participants over three semesters, with 66 consenting to participate. Approximately one-third of registered participants withdrew before or during the course, resulting in 51 individuals completing all components, yielding a 77% completion rate. Despite high initial interest, challenges such as attrition and allotted time to complete the course were noted. Reasons for withdrawal included changes in workload, lack of awareness of time commitment, and challenges for adjunct faculty/preceptors in gaining access to the LMS. The completion rates among consenting participants affirm the feasibility of the educational intervention, with qualitative findings providing further insights into cohort success.

Quantitative Findings Discussion

The quantitative findings of the faculty readiness assessment indicate a substantial portion of the participants increased their readiness across all ratings in both domains from the pre- to the post-course assessment. Statistically significant results were identified for all ratings when comparing pre-faculty readiness to post-faculty readiness.

The pre-course assessment of health professions faculty readiness for OBTL, as indicated by the median scores for the FRTO offers valuable insights into specific areas of strength and potential areas of improvement when developing and implementing faculty development initiatives. Within the attitude (importance) construct, participants demonstrated notably high perceived importance for the significance of all competencies. Course communication reflected the highest median score followed by course design, and time management which scored identically. The lowest, yet still highly ranked median score was noted for technical competence. When comparing the ability (confidence) construct, participants reported the most confidence in their ability to perform course communication, followed by course design, and technical competence which scored identically. The lowest mean score resulted from the time management competencies. Median scores for the ability (confidence) construct ranked lower than the median scores for the attitude (importance) construct. These results highlight that while faculty acknowledge the importance of each of the competencies, targeted educational interventions to enhance faculty's confidence in their ability to perform the competencies was needed. The results also identified faculty strengths in both the importance of and the confidence they perceived in the areas of course design and course communication. Strengths in these competencies can serve as a foundation to build upon as faculty development programs are created to address the specific needs of health professions educators.

The post-assessment of health professions faculty readiness for OBTL not only signifies the statistically significant differences in pre- to post-course assessment median scores, but also offers

valuable perspective into the effectiveness of the educational intervention related to the four individual competencies within each construct. Within the attitude (importance) construct, as indicated by the median scores from the FRTQ, participants again demonstrated notably high perceived importance for the significance of all competencies and each competency rating was significantly higher than the pre-assessment. The order rank for each competency with the attitude (importance) construct changed from pre- to post-course assessment. Participants ranked time management as the most important, followed by course communication, course design, and finally technical competence.

When evaluating the ability (confidence) construct, each competency rating on the post-course assessment was significantly higher than the pre-assessment. The order rank for each competency with ability (confidence) construct did not change from pre- to post-course assessment. Course communication was ranked the highest followed by course design, technical competence, and, finally, time management. There was a larger gap between the rankings of course design and technical competence that were ranked identically in the pre-assessment for this construct.

The quantitative results of the knowledge test showed most participants improved their scores from pre- to the post-test with statistically significant gains. These findings confirm the success of the educational intervention and provide guidance for refining future interventions.

Qualitative Findings Discussion

Themes and shared patterns emerged from the qualitative data collected during the focus group discussions, reflecting the experiences and perceptions of participants. When asked to choose a metaphor which reflected their experience with online teaching, the most common responses from participants included tilt-a-whirl, bumper cars, and roller-coaster. Participants used words such as ups and downs, unpredictability, apprehension, and continually improving when describing their experiences with OBTL. This is not surprising based on the fact that 11 of 19 focus group participants had less than five years teaching in health professions education, and 13 of 19 participants had less than five years' experience with OBTL teaching. It is also important to consider the timeframe of the study, less than three years post-pandemic. The challenges and reflections encountered by faculty members amidst the pandemic, particularly concerning the abrupt shift to emergency remote teaching, were apparent in the responses received.

Throughout the course, participants encountered challenges related to time management, the perceived short duration of the course, and the overwhelming abundance of resources. However, advantages were also identified. Participants expressed the course facilitated the development of a better framework for OBTL, and their individual learning was enriched through the receipt of timely and pertinent feedback. Participants' beliefs and assumptions about OBTL shifted positively as they recognized its potential for high levels of engagement and as the effectiveness of the teaching methods was better understood and acknowledged. Suggestions for future offerings included adding the course as a requirement for new faculty and/or faculty new to OBTL, increasing the duration of the course to six weeks, and keeping the online format to better model best practice. Overall, participants agreed on the importance and future viability of OBTL,

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particularly in the context of its ability to increase accessibility and affordability for learning opportunities for a wide student population.

One surprising finding in the qualitative outcomes was the little to no mention of technical competence in the focus group discussions. While participants were not directly asked about technical competence, the topic of technology was only briefly mentioned in two of the three focus groups. In these instances, the discussions primarily revolved around the advancements in technology and the inability of faculty to continually keep pace with the advancements. This observation shows this to be a potentially overlooked aspect of the study, suggesting a need for further exploration into the use of technology and technical competence as it relates to OBTL.

Merged Data

Upon examining the joint displays merging the datasets, the statistically significant difference in the pre- and post-intervention, coupled with the advantages highlighted in the focus group discussions, suggest the effectiveness and benefits of the educational intervention. Barriers and suggestions for improvement were also found. A significant finding in this research study, consistent with prior studies, was the difference in the mean and median scores between the competencies faculty perceive as most important as compared to the competencies they felt capable of performing. This suggests a notable gap between perceived importance and perceived capability among faculty members, highlighting areas where professional development and support may be beneficial.

Course Design Domain

Course design is a key competency related to OBTL, encompassing elements including pedagogy, content development, instructional facilitation, and assessment strategies. Faculty development impacts course design and organization (Joosten & Cusatis, 2019; Martin et al., 2019; Varvel, 2007). Module 2 of the faculty development course covered essential aspects of course design, including pedagogy, content and instructional activity development, facilitation, and assessment.

The study found that participants initially valued course design and showed a significant increase in regard to the importance and their confidence in designing online or blended courses after the intervention. Their knowledge of the content also improved. Focus group discussions confirmed these findings, highlighting participants' desire to master OBTL best practices and frameworks, reinforcing the intervention's effectiveness.

Course Communication Domain

Presence and effective communication are critical to OBTL success (Joosten & Cusatis, 2019; Martin et al., 2019; Varvel, 2007). Communication encompasses not only the quality of interaction between faculty and students but also the quality of interactions among students and their engagement with the course content. Module 4 focused on course delivery and engagement. The faculty development course modeled best practices, with directors providing timely feedback, engaging in discussions, answering questions, facilitating peer review, and offering relevant

content. The use of best practices was acknowledged in the focus groups and confirmed through a significant increase in the perceived importance, ability, and knowledge of course communication from pre- to post-course assessments.

Time Management Domain

Health professions educators juggle numerous responsibilities, including teaching, clinical duties, research, administrative tasks, professional development, continuing education, and personal obligations that can strain workload management and work-life balance. Time management was a key challenge reported in the study, a known barrier in OBTL. Faculty often resist adopting new delivery methods due to limited time for both faculty development and training. Effective course delivery requires time for professional development to master best practices in teaching across all learning modes.

Module 3 focused on course content development and time management. Pre-course assessments indicated faculty recognized the importance of time management but lacked confidence in their OBTL-related time management skills. The intervention significantly improved their perceptions and confidence, as shown by higher post-intervention scores although focus group discussions highlighted ongoing challenges with time management, the course's short duration, and the abundance of resources, underscoring the need for continued support in this area.

Technical Competence Domain

Technology plays a vital role in health professions education, enhancing teaching, learning, communication, and resource access. Faculty must be technically proficient to ensure effective teaching (N. Johnson et al., 2022; Leidl et al., 2020). However, integrating technology poses challenges in training faculty and students. Module 3 covered course content development and using technology in OBTL. Various technology tools were used throughout the course. Additionally, participants were provided with an extensive list of technology tools with links and tutorials on their use.

Quantitative analysis showed technical skills were considered the least important competency both pre- and post-intervention. Minimal gains in confidence were observed post-intervention. Focus group discussions rarely mentioned technology, highlighting the challenge of keeping up with evolving tools but not discussing its impact in depth. This underscores the need for targeted interventions to enhance attitudes and confidence in technical skills, suggesting the professional development course was insufficient in this area.

Study Limitations

The research study noted several limitations that warrant consideration. The sample size is small and drawn from a single university setting, which may not fully represent the diverse population of health professions faculty teaching in online or blended learning environments. While participants were recruited from various colleges and an institute within the university system, the majority were from a single college. Although efforts were made to recruit participants from different disciplines, expanding the sample size and diversity would strengthen the study.

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Additionally, a mixed methods study design requires significant time, planning, and expertise to implement. Due to scheduling and time constraints, there was variation in the length of time between the educational intervention and the focus group discussions. This may have had an effect on participant recollection and perceptions. Furthermore, reliance on self-reported surveys and focus group discussions introduces potential biases, influenced by participant and researcher's reporting tendencies and interpretations. To mitigate these biases, standardized

procedures to include the use of multiple independent coders to analyze the qualitative data and triangulation methods to corroborate the findings were used to reduce the impact of biases. Throughout the process, the researcher also continually reflected on their assumptions, biases, and interpretations to help to minimize the influence their biases.

Finally, as noted by the creators, the list of competencies included in the FRTTO assessment is not exhaustive. Assessing the important components related to faculty readiness is a continual process. Modifications to the FRTTO instrument based on a more recent revision study were published as the current dissertation study was in progress (Kim & Martin, 2023). Future studies would benefit from using the revised version of the FRTTO instrument.

Conclusion

As one of the first studies to investigate faculty development and preparedness for delivering online and blended courses in health professions education, the results of this research carry substantial implications for health professions education. The findings offer valuable insights to inform the development of future professional development interventions and guide further research in this area. The study identifies a gap in technical competence and suggests focused interventions to improve attitudes and confidence in this skill set. Future faculty development initiatives should explore the integration of technology and digital pedagogies to enhance teaching effectiveness in online and blended learning environments, including the potential benefits of emerging technologies such as virtual reality and artificial intelligence. Additionally, further research is recommended to examine the influence of institutional support structures on teaching quality and student outcomes in online teaching and learning. By addressing these areas, scholars can advance our understanding of faculty development in online and blended learning contexts and contribute to the enhancement of instructional practices in health professions education.

Health professions educators' attitudes and self-perceived abilities regarding the importance of competencies in online and blended teaching significantly influence their approach when using the educational delivery methods. By examining faculty readiness related to teaching competencies in OBTL, along with the influence of the online professional development course, this dissertation research study provides insights into how faculty can be educated and supported to enhance online and blended teaching and learning in health professions education. As defined in the literature, it is imperative to incorporate the elements of course design, course communication, technical proficiency, and time management when designing and implementing professional development programs for OBTL. Outcomes from the FRTTO instrument allow for the ability to gauge special attention toward competencies faculty rate as less important and where they perceive lower levels of ability. The outcomes of this study have implications for both health professions faculty

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currently engaged in or preparing for OBTL as well as for institutions and administrators responsible for offering support to health professions faculty related to OBTL.

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Ethical Approval

This study was approved by the Institutional Review Board (IRB) at the University of Nebraska Medical Center, Omaha, Nebraska, United States (IRB#0571-22-EX).

Disclosure Statement

The author reported no potential conflict of interest.

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Appendix A

Pre-Post Faculty Readiness to Teach Online Survey

Thank you for taking the time to complete this brief survey. The intent of this survey is to gather your perceptions on online teaching & learning. Your feedback will help to guide the development of future resources & training for UNMC faculty & students.

Demographic Information

1. Please specify the primary discipline in which you teach.
 - a. Allied Health
 - b. Dentistry

Study

- c. Medicine
- d. Nursing
- e. Pharmacy
- f. Public Health
- g. Graduate Student
2. Please specify the highest degree you hold.
 - a. Doctorate (PhD, EdD, DMSC, MD, DO, etc.)
 - b. Master's
 - c. Bachelor's
 - d. Certificate/Associate's
3. Please specify your academic rank.
 - a. Professor
 - b. Associate Professor
 - c. Assistant Professor
 - d. Instructor
 - e. Graduate Student
4. Please specify your age.
 - a. 65+
 - b. 50–65
 - c. 35–50
 - d. 20–35
 - e. Less than 20
 - f. Prefer not to answer
5. To which gender identity do you most identify?
 - a. Female
 - b. Male
 - c. Transgender Female
 - d. Transgender Male
 - e. Gender Variant/Non-Conforming
 - f. Prefer not to answer
 - g. Gender Identity not listed
6. Are you of Hispanic, Latino, or of Spanish origin?
 - a. Yes
 - b. No
7. Please specify your race.
 - a. American Indian or Alaska Native
 - b. Asian
 - c. Black or African American
 - d. Native Hawaiian or Other Pacific Islander
 - e. White
 - f. Another category not listed here
 - g. Prefer not to answer
8. How many years of experience do you have in teaching in health professions education?
 - a. I have no experience teaching in health professions education.
 - b. 0–5 years
 - c. 5–10 years

Study

- d. 10–15 years
 - e. 15–20 years
 - f. 20 years or more
9. How many years of experience do you have in teaching in an online environment in health professions education?
- a. I have no experience teaching in an online environment in health professions education.
 - b. 0–5 years
 - c. 5–10 years
 - d. 10–15 years
 - e. 15–20 years
 - f. 20 years or more

Rate how **important these competencies are for online teaching** in your opinion. Use the following scale to answer these questions accordingly.

1	2	3	4	5
Not Important at all	Not Important	Somewhat Important	Important	Very Important

Course Design

- 10. Create an online course orientation (e.g., introduction section, getting started, etc.)
- 11. Write measurable learning objectives
- 12. Design learning activities that provide students opportunities for interaction (e.g., discussion forums, wikis).
- 13. Organize instructional materials into modules or units.
- 14. Create instructional videos (e.g., lecture video, demonstrations, video tutorials)
- 15. Use different teaching methods in the online environment (e.g., brainstorming, collaborative activities, discussions, presentations)
- 16. Create online quizzes and tests
- 17. Create online assignments
- 18. Manage grades online

Course Communication

- 19. Send announcements / email reminders to course participants
- 20. Create and moderate discussion forums
- 21. Use email to communicate with the learners
- 22. Respond to student questions promptly (e.g., 24 to 48 hours)
- 23. Provide feedback on assignments (e.g., 7 days from submission)
- 24. Use synchronous web conferencing tools (e.g., Adobe Connect, Webex, Blackboard Collaborate, Skype)

Study

- 25. Communicate expectations about student behavior (e.g., netiquette)
- 26. Communicate compliance regarding academic integrity policies
- 27. Apply copyright law and Fair Use guidelines when using copyrighted materials
- 28. Apply accessibility policies to accommodate student needs

Time Management

- 29. Schedule time to design the course prior to delivery (e.g., a semester before delivery)
- 30. Schedule weekly hours to facilitate the online course
- 31. Use features in Learning Management System in order to manage time (e.g., online grading, rubrics, speed grader, calendar)
- 32. Use facilitation strategies to manage time spent on course (e.g., discussion board moderators, collective feedback, grading scales)
- 33. Spend weekly hours to grade assignments
- 34. Allocate time to learn about new strategies or tools

Technical

- 35. Complete basic computer operations (e.g., creating and editing documents, managing files and folders)
- 36. Navigate within the course in the Learning Management System (e.g., Moodle, Canvas, Blackboard etc.)
- 37. Use course roster in the Learning Management System to set up teams/groups
- 38. Use online collaborative tools (e.g., Google Drive, Dropbox)
- 39. Create and edit videos (e.g., iMovie, Movie Maker, Kaltura)
- 40. Share open educational resources (e.g., learning websites, web resources, games, and simulations)
- 41. Access online help desk/resources for assistance

Now, please rate **how well you are able to accomplish the following competencies**. Use the following scale to answer these questions accordingly.

1	2	2	3	4
I cannot do it at all	I cannot do it	Maybe I can do it	I can do it	I can do it well

Course Design

- 42. Create an online course orientation (e.g., introduction, getting started)
- 43. Write measurable learning objectives
- 44. Design learning activities that provide students opportunities for interaction (e.g., discussion forums, wikis).

Study

45. Organize instructional materials into modules or units.
46. Create instructional videos (e.g., lecture video, demonstrations, video tutorials)
47. Use different teaching methods in the online environment (e.g., brainstorming, collaborative activities, discussions, presentations)
48. Create online quizzes and tests
49. Create online assignments
50. Manage grades online

Course Communication

51. Send announcements / email reminders to course participants
52. Create and moderate discussion forums
53. Use email to communicate with the learners
54. Respond to student questions promptly (e.g., 24 to 48 hours)
55. Provide feedback on assignments (e.g., 7 days from submission)
56. Use synchronous web conferencing tools (e.g., Adobe Connect, Webex, Blackboard Collaborate, Skype)
57. Communicate expectations about student behavior (e.g., netiquette)
58. Communicate compliance regarding academic integrity policies
59. Apply copyright law and Fair Use guidelines when using copyrighted materials
60. Apply accessibility policies to accommodate student needs

Time Management

61. Schedule time to design the course prior to delivery (e.g., a semester before delivery)
62. Schedule weekly hours to facilitate the online course
63. Use features in Learning Management System in order to manage time (e.g., online grading, rubrics, speed grader, calendar)
64. Use facilitation strategies to manage time spent on course (e.g., discussion board moderators, collective feedback, grading scales)
65. Spend weekly hours to grade assignments
66. Allocate time to learn about new strategies or tools

Technical

67. Complete basic computer operations (e.g., creating and editing documents, managing files and folders)
68. Navigate within the course in the Learning Management System (e.g., Moodle, Canvas, Blackboard etc.)
69. Use course roster in the Learning Management System to set up teams/groups
70. Use online collaborative tools (e.g., Google Drive, Dropbox)
71. Create and edit videos (e.g., iMovie, Movie Maker, Kaltura)
72. Share open educational resources (e.g., learning websites, web resources, games, and simulations)
73. Access online help desk/resources for assistance

Study

74. Which types of support helped you while preparing to teach online? (Check all that apply)
- Professional development workshops / training / webinars
 - One-on-one consultation with instructional designers
 - Seeking advice from online learning experts
 - Faculty / peer mentoring
 - Accessing web resources or tutorials for teaching online
 - Using instructional videos or other documentation (handbook) on the learning platform
 - Online helpdesk or support
 - Student teaching assistants
 - Other
75. Please explain which types of support helped you while preparing to teach online. (short answer)
76. What type of support would you have liked to have while preparing to teach online? (short answer)

Martin, F., Budhrani, K., & Wang, C. (2019). Examining Faculty Perception of their Readiness to Teach Online, *Online Learning Journal*, 23(3), 97–119.

**This survey was adapted from the reference above. Permission to use survey was granted by Dr. Martin via email June 14, 202

Appendix B

Pre-Post Teaching Online Knowledge Test

- Define Distance Education using your own words. (short answer).
Answer example: Institution-based, formal education where the learning group is separated, and where interactive telecommunications systems are used to connect learners, resources, & instructors (Simonson & Schlosser, 2009)
- Which of the following describes a teaching environment where face-to-face and online teaching are a cohesive experience with both online and on-campus sessions intertwined into a single course?
 - Distance education
 - Blended/hybrid*
 - Remote
 - Synchronous
- Learners who are experienced, self-directed, motivated, and ready to learn are described as:
 - Online learners
 - Hybrid learners
 - Adult learners*
 - Pedagogical learners

Study

4. Skills necessary to be a successful online learner include which of the following (select all that apply):
 - a. Communication skills*
 - b. Engagement*
 - c. No technology skills
 - d. Little patience
 - e. Organization*
 - f. Persistence*
 - g. Initiative*
5. Which of the following is NOT considered one of the seven principles of good practice in undergraduate education (Chickering & Gamson, 1987):
 - a. Encourages little contact between students and faculty*
 - b. Develops reciprocity and cooperation among students.
 - c. Encourages active learning.
 - d. Gives prompt feedback.
 - e. Emphasizes time on task.
 - f. Communicates high expectations.
 - g. Respects diverse talents and ways of learning.
6. Kolb defined this type of learning as the process of "learning through reflection on doing" where students develop skills, knowledge, and values from direct experiences.
 - a. Transformative learning
 - b. Multimedia learning
 - c. Andragogy
 - d. Experiential learning*
7. A framework to improve and optimize teaching and learning for all people based on scientific insights into how humans learn is the definition for which of the following:
 - a. Learning accommodations
 - b. Learning accessibility
 - c. Universal design for learning (UDL)*
 - d. Inclusive classroom
8. Which of the following is NOT considered one of the categories related to the Bloom's Taxonomy Framework?
 - a. Knowledge
 - b. Application
 - c. Discussion*
 - d. Synthesis
 - e. Evaluation
9. Which of the following would be considered a poorly written learning objective?
 - a. Students will discuss the elements of writing learning objectives.

Study

- b. Students will write five learning objectives.
 - c. Students will evaluate five learning objectives.
 - d. Students will know five learning objects and be able to apply them to their teaching.*
10. The ADDIE instructional design model stands for:
- a. Analyze, Design, Develop, Implement, Evaluate
 - b. Analyze, Discuss, Develop, Implement, Evaluate
 - c. Apply, Design, Develop, Implement, Evaluate*
 - d. Analyze, Discuss, Develop, Inquire, Evaluate
11. Examples of formative assessment include all of the following EXCEPT:
- a. Concept map
 - b. Discussion boards
 - c. Early feedback on student draft assignments
 - d. End of the semester final exams*
12. Which of the following are advantages of using an analytic rubric for your online course? (check all that apply)
- a. Rubrics provide students with clear expectations for the assignment*
 - b. Rubrics lead to fewer student questions regarding online assignments allowing more time for student engagement in the assignment*
 - c. Rubrics assist faculty in grading online assignments objectively*
 - d. Rubrics assist in providing students with general feedback criteria*
13. Creating teaching presence in an online course is as simple as (check all that apply):
- a. Providing students with thoughtful introduction of yourself*
 - b. Creating a get to know you survey*
 - c. Copying last year's course & opening it without updating
 - d. Using the discussion board to build connections*
 - e. Providing timely feedback*
14. Which of the following is TRUE regarding time management when teaching an online course?
- a. Teaching an online or blended course requires considerably less time than teaching a face-to-face course.
 - b. There is no reason to block off time in your calendar for online interactions and grading when teaching an online course.
 - c. When teaching an online course, all content should be original content each time the course is offered; recycling content is considered bad practice.
 - d. Faculty should have a goal of replying to 5–10 percent of the class each week on the discussion board; tracking your participation helps to manage your online presence.*

Study

15. The design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educational worthwhile learning outcomes is the definition for which of the following:
- Direct instruction
 - Online teaching
 - Teaching presence*
 - Facilitation of discourse

Appendix C
Focus Group Questions

Focus Group Questions

Q1a.	Consider your experiences with online teaching. Using an amusement park's rides and activities, choose a metaphor that reflects your online teaching. Teaching is. . . or I am.
Q1b.	Has this metaphor changed as a result of the faculty development program?
Q2.	Why did you enroll in the Teaching Online Course?
Q3.	Did you experience any barriers related to your ability to complete the course?
Q4.	Thinking about the Teaching Online course, list the specific advantages of completing the course.
Q5.	List the specific limitations and/or disadvantages that you have you experienced with the use of the approach.
Q6.	Did your prior beliefs or assumptions about teaching and learning change based on your experience in the course?
Q7.	If yes, how did you prior beliefs or assumptions about teaching and learning change?
Q8.	If you think about the future of online learning in health professions education? How would you describe it?
Q9.	What suggestions do you have for the next offering?
Q10.	Do you have any other comments or concerns about the use of this approach or the study in general?

Note. Adapted from “Faculty development for online teaching as a catalyst for change,” C.A. McQuiggan, 2012, *Journal of Asynchronous Learning Networks*, 16(2), 27–6

**Collaboration, Connection, and Culture:
Understanding the Impact of Institutional Culture on
Online Teaching in Higher Education**

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Abstract

Teaching and learning online is an increasingly important aspect of higher education, especially post-COVID-19. Previous studies have demonstrated the importance of Technological Pedagogical Content Knowledge (TPACK) for effective online teaching. However, the contextual factors impacting TPACK have not been adequately explored. The purpose of this quantitative study was to determine if the contextual factor of institutional culture impacts TPACK among online higher education faculty at institutions in the southeastern United States as well as to what extent specific dimensions of institutional culture affect TPACK levels. Data were collected using an anonymous online survey that was shared with potential participants through email and social media. Data were analyzed using a multiple linear regression model to determine significance between the independent variables, the seven dimensions of institutional culture, and the dependent variable, TPACK. Results indicated that significance was found between two individual elements of institutional culture and TPACK: (1) collaboration and team learning and (2) connection between the organization and its environment. These findings indicate that higher education administrators should focus efforts on creating opportunities for faculty to engage in professional development and move beyond siloed work to collaborative projects. Administrators should also ensure that the institution is connected to the local, regional, and global community through aligned institutional goals with the needs of the community and establishing opportunities for faculty to connect globally. Future research should focus on exploring the relationship between specific aspects of institutional culture that may impact quality online teaching.

Keywords: institutional culture, online teaching, faculty, administrators, TPACK

Vowell, K. S. (2024). Collaboration, connection, and culture: Understanding the impact of institutional culture on online teaching in higher education. *Online Learning Volume, 28*(3), (299-315). DOI: 10.24059/olj.v28i3.4561

As online education continues to increase in today's academic environment (Lee & Tsai, 2010; Northcote et al., 2015; Roman et al., 2010), teaching looks much different than it did when all students sat at desks in a lecture hall. Online instructors must not only have a general knowledge about how to teach, but they must also have knowledge of the various technologies available to them, how to use them, and which are most appropriate for use in specific contexts, in

addition to juggling many more roles than the traditional, face-to-face instructor (Mishra & Koehler, 2006; Martin et al., 2021). The technological pedagogical content knowledge (TPACK) framework examines the interplay of each type of knowledge necessary for effective teaching in an online environment (Mishra & Koehler, 2006). The contexts surrounding the teaching environment also influence how effectively instructors are able to synthesize technological, pedagogical, and content knowledge (Brianza et al., 2022; Mishra, 2019). A context that has not been adequately explored as it impacts TPACK is institutional culture (Brianza et al., 2022). Institutional culture is socially constructed and refers to the shared values and beliefs of the stakeholders of the institution (Tierney & Lanford, 2018; Khan et al., 2020). The purpose of this study was to determine if the contextual factor of institutional culture impacts TPACK among higher education faculty at institutions in the southeastern United States as well as to what extent specific dimensions of institutional culture affect TPACK levels.

Literature Review

The following sections focus on literature examining the development of TPACK and its evolution in the last twenty years. Institutional culture is also discussed related to why it is an important contextual factor in higher education.

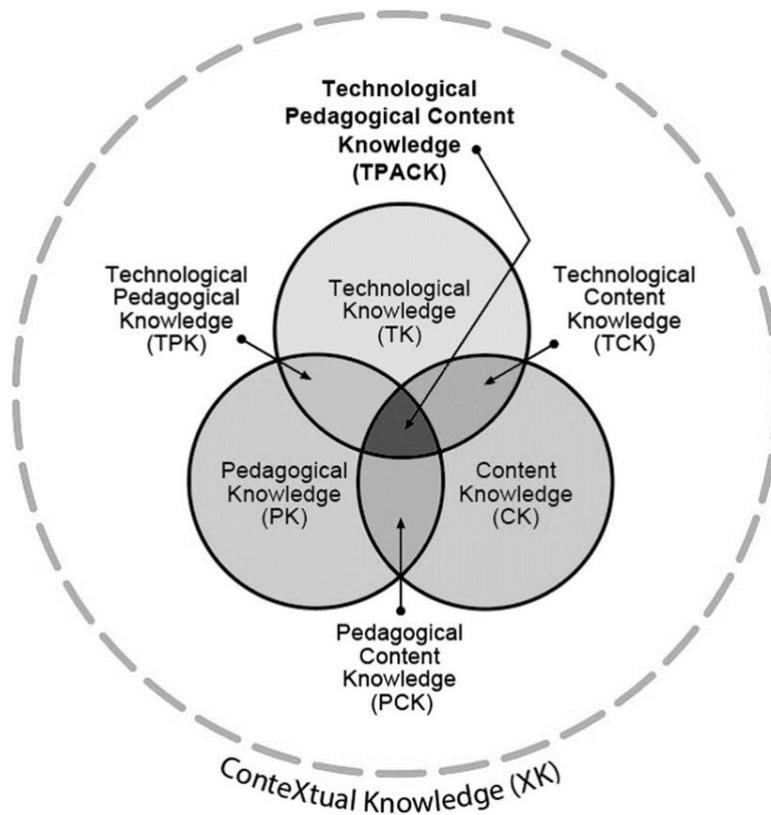
TPACK: A Theoretical Framework for Online Teacher Effectiveness

As the technological age ushered in a wave of changes for teachers, the need grew for frameworks that included technology as a factor influencing effective teaching. The technological, pedagogical, content knowledge (TPCK) framework was created as a way to understand how different types of teacher knowledge work together for effective integration of technology (Mishra et al., 2011). According to this framework, a teacher must be well-versed in all three types of knowledge (technology, pedagogy, and content) and be able to integrate that knowledge seamlessly in order to “develop appropriate, context-specific strategies and representations” (Mishra & Koehler, 2006, p. 1029). Pedagogical knowledge refers to “teachers’ deep knowledge about the processes and practices or methods of teaching and learning” (Koehler et al., 2013, p. 15). In the 1980s, Shulman (1986) proposed that content knowledge and knowledge of pedagogy should not be viewed separately and created the idea of pedagogical content knowledge (PCK). PCK emphasized the interplay of both content knowledge and pedagogy with the belief that “for teachers to be successful, they would have to confront both issues simultaneously” (Mishra & Koehler, 2006, p. 1021). Mishra and Koehler (2006) built upon PCK to create TPCK by considering the important role of technology in learning that is present in the twenty-first century. According to TPCK, a lack of knowledge in any area, or failure to consider their intersection, could lead to ineffective teaching, lower teaching efficacy, and decreased learning for students. The authors of the framework desired it to guide research in the area of teacher knowledge surrounding use of technology and the application of that knowledge (Mishra & Koehler, 2006), which is of particular interest in this study.

Since its introduction, TPCK has been used to evaluate technology integration in almost every educational setting and used as the central framework in over 1,200 journal articles and book chapters, over 300 dissertations and at least 28 books (Mishra, 2019). In 2008, the TPCK acronym was changed to TPACK (Technology, Pedagogy, and Content Knowledge) to facilitate easier

understanding and pronunciation (Mishra, 2008), and will be referred to as such for the remainder of this paper. A fourth type of knowledge was clarified in 2019, officially adding contextual knowledge to the TPACK framework (Mishra, 2019). Contextual knowledge exists in the space surrounding TPACK and emphasizes the importance of teachers understanding the contexts that impact TPACK. Contextual knowledge (XK) allows the “organizational and situational constraints that teachers work within” (Mishra, 2019, p. 77) to be considered. The interplay of the different knowledge types within TPACK can be seen in Figure 1.

Figure 1
The TPACK Framework and Its Knowledge Components



Note. This image was created to illustrate the intersections within TPACK. From “Considering Contextual Knowledge: The TPACK Diagram Gets an Upgrade” (Mishra, 2019, p. 77).

Contextual Knowledge

Though TPACK is one of the most used frameworks to examine teaching with technology, contextual knowledge remains a domain that merits further exploration (Brianza et al., 2022, 2024; Mishra & Warr, 2021). Education contexts vary, ranging from micro-level factors like the layout of a classroom to meso and macro factors like specific institutional settings and society as a whole (Porrás-Hernández & Salinas-Amescua, 2013). Most recently, researchers have defined contexts surrounding TPACK as five spaces within which education functions—artifacts, processes, experiences, systems, and culture (Mishra & Warr, 2021). These spaces offer a concrete way to

think about spaces for design within educational contexts as well as an opportunity to explore how these spaces may be changed to improve teaching. The fourth and fifth spaces, systems and culture, encompass elements that teachers may have limited control over but the “knowledge of these broader systemic and cultural factors may be critical for educator success” (Mishra & Warr, 2021, p. 2). Though teachers themselves may not be able to control these factors, they are still influenced by them, especially in higher education settings where institutional culture has an especially large impact (Tierney & Lanford, 2018).

Institutional Culture

Previous studies have shown a relationship between TPACK levels and elements of institutional culture (Kaschuluk, 2019; Rienties et al., 2013; Voithofer et al., 2019), but specific research has yet to be conducted on what aspects of institutional culture impact TPACK among online instructors at higher education institutions. In the United States, there are several types of higher education institutions and each one has its own structure that creates a unique culture. Regardless of type, however, the institutional culture of each college or university encompasses the shared values and beliefs of the stakeholders of the institution and is socially constructed (Tierney & Lanford, 2018). Each state has their own policies regarding accreditation of higher education institutions, and different accrediting agencies and college boards have unique rules and regulations. The interplay of federal and state policies, governing board regulations, and accreditation requirements is complex and unique to each individual institution (Fish, 2007). Due to this complexity, the institutions of focus for this study will be non-profit, doctoral-granting research institutions in the United States.

At the organizational level, research institutions are often an anomaly in that two different organizational models exist within the organization at the same time (Manning, 2017). Administrators in higher education generally operate under a bureaucratic system while faculty function under the collegium. The bureaucratic system is characterized by a formal, hierarchical structure in which people and systems are organized for maximum efficiency (Baldrige, 1971). In higher education administration, there are clear channels of communication as well as rules and regulations governing all decision-making processes. The collegial model, however, emphasizes cooperation between all organizational members in order to accomplish goals and make decisions. In this model, which is generally accepted by faculty, leaders do not necessarily have power over followers as all members are considered equal. Faculty culture is largely influenced by the collegial model and shared governance and holds tradition in high regard (Manning, 2017). These structures create contextual factors that influence online teaching in various ways.

Measuring Institutional Culture

Institutional culture encompasses many aspects, but for the purposes of this study, the interest is in how the institutional culture “promotes continuous learning for sustainable improvement in teaching and learning” (Ponnuswamy & Manohar, 2014, p. 25). Marsick and Watkins (1994) referred to this as the learning organization culture. The learning organization encompasses a culture that empowers people while fostering collaboration and team learning, encouraging open dialogue, and recognizing the interplay of individuals, the organization, and the external environment (Marsick & Watkins, 1994). An institutional culture that promotes the

learning organization emphasizes continuous learning that is strategically built in to daily work and recognizes the importance of rewarding employees for learning. A barrier to this type of culture can be “an inability to recognize and change existing mental models” (Marsick & Watkins, 1994, p. 356). Mental models refer to deeply held, value-based frameworks that are used by people to make sense of experiences. Faculty who are resistant to change may be locked into specific types of mental models that can inhibit the learning organization. In an effort to measure aspects of the learning organization, Marsick and Watkins (2003) developed a scale to measure “important shifts in an organization’s climate, culture, systems, and structures that influence whether individuals learn” (p. 133). The Dimensions of the Learning Organization Questionnaire (DLOQ) focuses on seven dimensions of institutional culture: (1) create continuous learning opportunities, (2) promote inquiry and dialogue, (3) encourage collaboration and team learning, (4) create systems to capture and share learning, (5) empower people toward a collective vision, (6) connect the organization to its environment, and (7) provide strategic leadership for learning. The first four dimensions encompass characteristics at the individual level while the last three are representative of the structural level (Marsick & Watkins, 2003). The DLOQ has been used extensively across a variety of contexts, including higher education (Watkins & O’Neil, 2013). It is widely considered a reliable and valid measure of learning organization culture, which makes it ideal for measuring the dimensions of institutional culture in this study.

Research Questions

1. To what extent is the contextual factor of institutional culture related to TPACK in higher education faculty?
2. To what extent are specific dimensions of institutional culture related to TPACK among higher education faculty?

Methods

The purpose of this study was to determine if the contextual factor of institutional culture impacts TPACK among higher education faculty at institutions in the southeastern United States as well as to what extent specific dimensions of institutional culture affect TPACK levels. Exploring these factors is important because, if significant, these findings can inform decisions surrounding how to improve TPACK in higher education contexts.

Research Design and General Methods

To collect data for this study, a nonexperimental quantitative, correlational study design was used to determine how the contextual factor of institutional culture impacts TPACK as well as to what extent specific dimensions of institutional culture impact TPACK among higher education faculty. A correlational study design was optimal for this study because there was no attempt made to establish causation between the development of TPACK and contextual factors. The primary goal of using this design was to determine to what extent contextual factors are correlated to TPACK levels. The independent variables in this study were the dimensions of organizational culture as measured by an amended version of the DLOQ. The DLOQ measures seven distinct

dimensions of the learning organization, as laid out by Marsick and Watkins (1997). These dimensions include (1) creation of continuous learning opportunities, (2) promotion of inquiry and dialogue, (3) encouragement of collaboration and team learning, (4) empowerment of people toward a collective vision, (5) connection of the organization to its environment, (6) establishment of systems to capture and share learning, and (7) providing strategic leadership for learning.

The dependent variable was faculty's self-assessed TPACK. This scale included the seven dimensions of TPACK as outlined by Mishra & Koehler (2006). The seven dimensions are (1) technology knowledge (TK), (2) content knowledge (CK), (3) pedagogy knowledge (PK), (4) pedagogical content knowledge (PCK), (5) technological content knowledge (TCK), (6) technological pedagogical knowledge (TPK), and (7) technological pedagogical content knowledge (TPACK). Only the seventh dimension, TPACK, was measured as the dependent variable because this dimension is the comprehensive measure of TPACK levels and combines all the previous dimensions. The culmination of TPACK is defined by the seventh dimension and was the principal variable of interest in this study. Data were collected through an online survey distributed via email using Qualtrics survey software. The survey comprised three sections: (1) the DLOQ, (2) TPACK, and (3) demographic factors.

Instruments Used

As previously mentioned, the survey instrument consisted of three sections. The first section was comprised of the 21 questions from the DLOQ. The DLOQ was created to measure the seven dimensions of the learning organization, as defined by Watkins and Marsick (1997). The authors developed the items through both expert and student panels to ensure readability, then used Cronbach's coefficient alpha reliabilities and factor analyses to revise or eliminate poorly worded or weak loading items (Watkins & O'Neil, 2013). After several studies were conducted using this instrument, validation was completed using a cumulative database of responses from multiple studies and organizations (N = 836). Reliability analyses, exploratory and confirmatory factor analyses, and structural equation modeling were used to test construct validity, and results indicated high levels of reliability (.80 to .87) (Yang et al., 2004). The DLOQ remains widely used across many different fields and in a variety of organizational settings including for-profit corporations, non-profit organizations, the government, and both K-12 and higher education (Watkins & O'Neil, 2013). The DLOQ was chosen because these dimensions capture individual perceptions of organizational norms and expectations, which allows for a holistic picture of perceptions of institutional culture.

The second section comprised 24 questions focused on measuring TPACK. Archambault and Crippen (2009) developed a survey that uses TPACK as "a guiding framework for skills that online teachers should know and be able to do" (p. 75). The instrument underwent an expert review to ensure all the items were complete and relevant. The survey was then piloted by K-12 teachers in an online virtual school, the intended population. Subscales used to measure pedagogy, content, and technology were found to show sufficient levels of reliability ($\alpha = .738, .911, \text{ and } .928$). The third section focused on demographic factors. Basic demographic data like race, ethnicity, gender, age, and education level were obtained, as well as data pertaining specifically to higher education like the name of the institution, faculty rank, years teaching online, and the education field of specialization.

Data Collection Procedures

Before data collection began, the study received Institutional Review Board approval. The survey was hosted with Qualtrics survey software. An email with an anonymous link to the survey was sent out to individuals who met participant qualifications at doctoral research institutions in the Southeastern Conference, as well as via listserv to all faculty and staff at Mississippi State University in the fall semester of 2023. Graphics containing information about the survey and the anonymous link were also shared on social media networks in order to recruit participants that were not captured through email. The survey opened with a Statement of Consent. Participants read this statement and indicated their consent to the data collection by continuing with the survey. The survey items related to TPACK and the DLOQ were measured using a Likert scale with 1 = “Strongly Disagree,” 2 = “Disagree,” 3 = “Somewhat Disagree,” 4 = “Neither Agree nor Disagree,” 5 = “Somewhat Agree,” 6 = “Agree,” and 7 = “Strongly Agree.” Upon completion of the survey, participants were directed to a different link to enter their information for a chance to win a \$25 Amazon gift card.

Data Analysis Procedures

Data were analyzed using a multiple linear regression model. This type of analysis was appropriate because there were multiple independent variables that needed to be controlled for (Sriram, 2017). The Technology Pedagogical Content subscale produced a continuous measure of the dependent variable, TPACK. To get a comprehensive score for TPACK, the scores for the four questions that pertained to TPACK were added together to produce a TPACK total score. The subscales representing the seven dimensions of the DLOQ produced continuous measures of the independent variables—(1) create continuous learning opportunities, (2) promote inquiry and dialogue, (3) encourage collaboration and team learning, (4) create systems to capture and share learning, (5) empower people toward a collective vision, (6) connect the organization to its environment, and (7) provide strategic leadership for learning (Marsick & Watkins, 2003). Total scores were calculated for each dimension by adding the scores from each question that measured that dimension. Demographic information collected via the survey, including gender, race, ethnicity, age, highest level of education, faculty rank, type of class taught, field, years teaching online, and years teaching total, was included as covariates.

To answer the first research question, “To what extent is the contextual factor of institutional culture related to TPACK in higher education faculty?” an F-test was conducted to test for significance in the overall model. The results were considered statistically significant if the p-value was less than or equal to 0.05. A statistically significant test was indicative of a meaningful relationship between institutional culture and TPACK among faculty at doctoral research institutions, broadly. The R² value was used to measure the effect size between the independent variables and the dependent variable. This value indicated to what degree of variance the dependent variable could be explained by the independent variables through a percentage. For example, an R² value of 0.35 would show that the dimensions of the DLOQ account for 35% of TPACK.

To answer the second research question “To what extent are specific dimensions of institutional culture related to TPACK among higher education faculty?” the seven dimensions of the DLOQ were examined individually as they related to TPACK. Individual effects from the multiple linear regression model were examined. Regression coefficients served as measures of the effect of each of the individual variables; more specifically, a regression coefficient was produced for each dimension of the DLOQ and indicated the magnitude of relationship between that specific dimensions and TPACK, after controlling for all other variables included in the model. Together, the multiple linear regression model results and individual regression coefficients were used to determine if institutional culture was related to TPACK, and if so, which specific dimensions of institutional culture impacted TPACK. These results allow institutions to focus on the elements of institutional culture that could make the most transformational change when it comes to TPACK and online teaching and learning.

Results

This study aimed to determine if a correlation exists between the contextual factor of institutional culture and overall TPACK among online higher education faculty in the Southeastern Conference, as well as to what extent individual dimensions of institutional culture impact TPACK. This section details the results of the data analysis as well as the descriptive statistics of the sample.

Descriptive Statistics

The target population for this study was faculty at non-profit doctoral-granting higher education institutions in the Southeastern Conference who have taught at least one class online since 2021. Purposive sampling was used to identify participants who fit the qualifications and emails were sent out with the anonymous survey link. A graphic was also shared on social media to recruit participants who may not have been on the email listservs. There were 149 total responses recorded. Of the total responses, there were 39 missing cases; therefore, they will be excluded from these statistics. The final total sample size was 110 (N = 110). Frequency statistics showed that there was an even distribution of gender within the sample with 44 (40%) participants indicating they were men, 43 (39.1%) indicating they were women, and 2 (1.3 = 8%) preferred not to say. Responses recorded for race indicated 7 (6.4%) of participants were Asian, 6 (5.5%) were Black or African American, 73 (66.4%) were white, 1 (0.9%) was other, and 23 (20.9%) were missing items. There was one participant who indicated they were of Hispanic or Latino or Spanish origin and 85 (77.3%) indicated they were not of Hispanic or Latino or Spanish origin. The highest percentage of the sample (25.2%) indicated they were between 31 and 60 years old.

Data were also collected for academic measures including highest education level, rank, primary delivery method of online courses, class level primarily taught, field of expertise, years teaching online, years teaching total, institution of primary employment, and whether or not professional development/training is required to teach online. For highest education level, 7 (6.4%) participants had a bachelor’s degree, 15 (13.6%) had a master’s degree, 2 (1.8%) had a specialist degree, and 64 (58.2%) had a doctoral degree. When asked to indicate faculty rank, 36 (32.7%) chose tenure track/tenured, 8 (7.3%) chose tenure track/untentured, 6 (5.5%) chose staff who teaches a class, 14 (12.7%) chose instructor/lecturer (full-time employee), 8 (7.3%) chose adjunct

instructor (part-time employee), and 17 (15.5%) chose other. Participants denoted that 48 (43.6%) of them taught asynchronous online courses, 10 (9.1%) taught synchronous online courses, and 19 (17.3%) taught hybrid courses. The class level primarily taught was shown to be 38 (34.5%) undergraduate, 16 (14.5%) graduate, 8 (7.3%) split-level, and 20 (18.2%) both undergraduate and graduate. Arts and Sciences was the primary field with 22 (20.0%) participants, followed by Other Field with 14 (12.7%), Agriculture and Life Sciences with 13 (11.8%), Engineering with 12 (10.9%), Education with 9 (8.2%), Business with 6 (5.5%), Professional and Continuing Studies with 4 (3.6%), and Architecture, Art, and Design with 3 (2.7%). Responses for Years Teaching Online and Years Teaching Total are shown in Table 1.

Table 1
Years Teaching Online and Years Teaching Total, In Percentages

	0–2 Years	3–5 Years	6–10 Years	11–15 Years	More than 15 Years
Years Teaching Online	20%	20%	14.5%	14.5%	6.4%
Years Teaching Total	9.1%	9.1%	15.5%	12.7%	30%

Note. N = 110

Finally, 45 (40.9%) participants indicated professional development/training was not required to teach at their institution and 37 (33.6%) indicated that it was required.

Multiple Linear Regression Analysis

Data were analyzed using multiple linear regression. This type of analysis was appropriate because multiple independent variables were being tested. The dependent variable was overall TPACK and the independent variables were the seven dimensions of the DLOQ—(1) create continuous learning opportunities, (2) promote inquiry and dialogue, (3) encourage collaboration and team learning, (4) create systems to capture and share learning, (5) empower people toward a collective vision, (6) connect the organization to its environment, and (7) provide strategic leadership for learning (Marsick & Watkins, 2003). Demographic factors were also included as covariates. The first research question—“To what extent is the contextual factor of institutional culture related to TPACK in higher education faculty?”—was analyzed through an F-test to test for significance in the overall model. The result was a p-value of .546, which was not considered significant. This means that a meaningful relationship was not found between overall institutional culture and TPACK among online faculty at doctoral research institutions in the Southeastern Conference. The R2 value was .678, which indicated that the dimensions of the DLOQ accounted for 68% of TPACK. Though there was not significance found in the overall model, there was significance found during analysis for the second research question.

The second research question—“To what extent are specific dimensions of institutional culture related to TPACK among higher education faculty?”—was measured through an examination of the seven dimensions of the DLOQ individually. The demographic factors described previously were also included as covariates. Before including these items in the

regression, dummy codes were created for each demographic item with more than two groups in order to provide a more meaningful analysis of the results. The reference categories that were excluded from the analysis were as follows: man, white, 41–50 age group, specialist’s degree, tenure-track-tenured, hybrid classes, split-level, Arts and Sciences, 3–5 years teaching online, 6–10 years teaching total, and Mississippi State University. The following categories were excluded because there was not enough data to be analyzed: non-binary/another gender, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, two or more races, 81–90 age group, 91–100 age group, adjunct faculty, and Medical Sciences. The regression coefficients for each dimension, as well as covariates, can be seen in Table 3.

Table 3
Results of Regression Analysis for the Seven Dimensions of the DLOQ

	Unstandard- ized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
Create Continuous Learning Opportunities	-.503	.586	-.492	-.859	.401
Promote Inquiry and Dialogue	.901	.485	1.063	1.856	.079
Encourage Collaboration and Team Learning	-1.253	.371	-1.486	-3.376	.003*
Create systems to Capture and Share Learning	-.394	.287	-.487	-1.372	.186
Empower People Toward a Collective Vision	.387	.262	.505	1.478	.156
Provide Strategic Leadership for Learning	-.134	.350	-.172	-.381	.707
Connect the Organization to its Environment	1.224	.495	1.391	2.472	.023*

Note. * $p > .05$

As shown in the table, two dimensions of the DLOQ, (3) encourage collaboration and team learning and (6) connect the organization to its environment, showed statistical significance suggesting that those specific dimensions impact overall TPACK. Analysis from the model suggested there is not a relationship between overall institutional culture and TPACK. However, there was shown to be a possible relationship between the individual dimensions of “Encourage Collaboration and Team Learning” and “Connect the Organization to its Environment” and TPACK, even after controlling for demographic factors. None of the covariates were shown to be significant when included as independent variables.

Discussion of Findings

The analysis of data pertaining to the first research question—“To what extent is the contextual factor of institutional culture related to TPACK in higher education faculty?”—suggested that there is no relationship between overall institutional culture and TPACK. This finding is in contrast with results obtained by Rienties et al. (2013) that suggest institutional culture does play a role in TPACK. However, the study by Rienties et al. (2013) took place in the Netherlands before COVID-19 so the context related to the present study is not comparable. The findings are consistent with Kaschuluk (2019) who, when examining TPACK among K–12 teachers in the United States, also found that overall culture was not related to TPACK, but there is a possible relationship between TPACK and individual domains of culture.

Although overall institutional culture was not found to have a significant effect on TPACK, there were individual domains of the DLOQ that were significant, which is consistent with previous studies (Kaschuluk, 2019; Voithofer et al., 2019). The first domain that was found to be significant with TPACK was “encourage collaboration and team learning.” Kaschuluk (2019) also found this specific domain to be significant, which may confirm the validity of this finding. This domain is described by Marsick and Watkins (2003) as follows: “Work is designed to use groups to access different modes of thinking; groups are expected to learn together and work together; collaboration is valued by the culture and rewarded” (p. 139). Group learning is important because it facilitates transfer of knowledge and skills, enables members to gain new perspectives, and leads to reframing. Reframing allows group members to experiment and use trial and error to construct new knowledge by combining perspectives (Marsick & Watkins, 1994). The results of this study suggest that collaboration and team learning is strongly correlated with TPACK levels. A restriction of collaboration and team learning may negatively impact TPACK. This means that when institutions restrict employees’ freedom to question common practices or do not reward collaboration towards team projects (O’Neil, 2003), they could also diminish TPACK among their faculty.

The second domain that was found to be significant was “connect the organization to its environment.” Marsick and Watkins (2003) describe this domain as “People are helped to see the effect of their work on the entire enterprise; people scan the environment and use information to adjust work practices; the organization is linked to its communities” (p. 139). Development of this domain takes place at the societal level (Kim et al., 2015) and involves faculty feeling they can positively contribute to the institution as a whole. This domain was not found to be significant in any other similar study, which suggests it could be specifically important for higher education. It

could also indicate that, post-COVID-19, people value connection to their environment and institution more highly than before. A lack of connection to the organization and the environment may negatively affect TPACK. According to these findings, institutions that do not support a global perspective, have limited involvement in the local community, and conduct work in silos (O'Neil, 2003), may see diminished TPACK levels among their faculty.

Findings Related to Institutional Culture

As mentioned previously, overall institutional culture was not found to be significant with overall TPACK, but specific dimensions of institutional culture were found to be significant. This is somewhat surprising and merits further discussion, especially considering the study by Kaschuluk (2019) yielded similar results. The DLOQ is a measurement that has been used in a variety of fields, including higher education, but it was not developed specifically for education. The research that led to the development of the DLOQ was largely focused on corporate organizations (Marsick & Watkins, 1994). Perhaps, given these findings and the complex organizational structure of educational institutions, institutional culture should be measured as a multidimensional construct. The DLOQ may still be good fit to measure institutional culture in education, but the specific dimensions may yield more constructive results than the totality of the measure. This study may also show that the DLOQ is not the best measure to measure institutional culture in higher education. This measure was chosen because its previously established validity and reliability (Marsick, 2013), its specific focus on the institution as a learning organization, and its previous use to measure institutional culture related to TPACK (Kaschuluk, 2019). However, there are other measures, like the Institutional Teaching Culture Perception Surveys (ITCPS; Shaw et al., 2021) developed specifically for higher education, that may give more clarity to institutional culture in education settings.

Limitations

There were several limitations that could have impacted the results of this study. The first set of limitations relates to the sample. This study was open to online faculty who have taught since 2021 at a non-profit doctoral degree granting institution in the Southeastern Conference. Though faculty were contacted at every university in the conference, only faculty from Mississippi State University, the University of Mississippi, and the University of Kentucky responded. Participants at Mississippi State University were the overwhelming majority, which limits the ability to generalize about institutional culture across large doctoral granting institutions in the southeast. Additionally, the total sample size was 110 respondents. Though the goal was to have at least 100 participants, a larger sample size would have enabled a better understanding of the variables and relationships and, although there was an equal distribution of men and women who participated, the vast majority of the sample indicated they were white. This limits the ability to understand how TPACK might change according to race. Another limitation was that TPACK was self-reported in this survey. Measuring TPACK through performance assessments would yield an unbiased assessment of true TPACK.

Recommendations for Institutional Leaders

This study yielded several significant findings that may give institutions practical ways they can change institutional culture to improve TPACK among their online faculty. Because the study suggested that collaboration and team learning is important for TPACK development, administrators at higher education institutions should strive to create opportunities for faculty to share ideas, gain new perspectives, and create new knowledge. This can be accomplished through establishing rich communities of practice and professional development opportunities and encouraging or incentivizing faculty to participate in these opportunities. Though this study did not find significance surrounding whether or not training and professional development was required, optional or incentivized training could still prove worthwhile given that previous research has confirmed training and professional development to have a positive impact on teacher effectiveness and attitudes about teaching (Knight et al., 2007; Roman et al., 2010; Steinert et al., 2006). The findings of this study suggest administrators should invest in opportunities for faculty to collaborate, which could include providing funding for conferences, holding events focused on networking, and encouraging faculty to move beyond siloed projects.

Another significant finding from this study was that connection to the institution and its environment may play a role in TPACK development. This finding is novel among related research on TPACK and institutional culture and sheds light on the importance of the environmental context. Administrators should consider establishing opportunities for faculty to connect to society through virtual global teams and working to diminish cultural barriers within the institution. They should also work together with the local community to address local issues and align institutional goals with the needs of the community while encouraging faculty to contribute to these efforts. Providing workforce diversity training is another way to establish a connection to the external educational context and challenge faculty to understand and work from a global perspective. Additionally, connecting to the institution and its environment relates directly to the service aspect of faculty work, a piece that is often overlooked during the promotion and tenure process. By providing more recognition and placing more importance on service during the promotion and tenure process, administrators may help to develop a rich and connected culture.

Recommendations for Future Research

The results of this study provide promising implications for understanding how specific dimensions of institutional culture may impact TPACK among online higher education faculty. Significance was found between the dimensions of collaboration and team learning and connecting the organization to its environment and TPACK levels. Because this study was the first to focus on these variables among online higher education faculty since COVID-19, further research is needed to confirm these findings. Future studies should strive to recruit a sample that is larger than the sample included in this study so that results may be generalizable to the population. Additionally, the sample should include participants from a more diverse racial background in order to provide a more complete picture of the perspectives of the population. Studies conducted in the future should also try to measure TPACK through performance assessments, instead of a self-reported survey, in order to decrease bias that comes from the nature of self-reported results. Future research might also explore institutional culture using a different measure than the DLOQ. A scale specifically developed for higher education could provide more clarity on institutional culture in this context.

Conclusion

Overall, the findings from this study give administrators, faculty, and future researchers a baseline for measuring the impact of institutional culture on TPACK following the COVID-19 pandemic. In order to be relevant and effective in this new era of education, higher education institutions should carefully consider their current efforts and policies surrounding teaching and learning online and how the culture at their learning organizations might impact TPACK. Because improving TPACK levels among higher education faculty could be vital to improving effective teaching online, this study paves the way for institutions to make real strides in the area of teaching and learning, thereby improving the experience for both students and faculty, and building new ways for everyone, regardless of location or status, to earn a life-changing education.

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A Sense of Belonging in Online Post-Traditional Students: What Matters?

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Abstract

Online education has grown and continues to expand, driven by innovative information and communication technologies that facilitate effective interactions both within and outside the online classroom. Post-traditional students with diverse and complex identities face unique challenges in establishing connections within online learning environments despite advancements in communication technology. However, further research on this demographic is needed to understand their sense of belonging and the factors influencing it. This research focuses on the sense of belonging of online post-traditional students as a critical factor for promoting and consolidating online learning experiences and as a factor associated with measures of student success.

In this pilot study, we surveyed a sample of online learners using a mixed-methods approach to examine whether students feel accepted and valued and whether identities such as academic discipline, gender, and ethnicity are influential. Our findings indicate that post-traditional learners report moderate levels of belonging, with university support, acceptance, and meaningful relationships with faculty and staff being pivotal factors. Significant differences among students in different academic programs or gender groups did not emerge. However, Hispanic students reported a higher sense of belonging, perhaps facilitated by the university's designation as a Hispanic-Serving Institution (HSI). This study provides actionable strategies to cultivate a more engaging and supportive online learning environment by pinpointing the critical and negligible factors affecting a sense of belonging.

Keywords: post-traditional students, sense of belonging, student identity, fostering connections, Community of Inquiry

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Online education has grown rapidly, offering unprecedented accessibility and flexibility to a diverse population of learners. However, despite technological advances that have provided innovative communication methods among students, faculty, and peers, the absence of in-person interaction remains a challenge (Cilliers et al., 2022; Stover et al., 2024; Zhang & He, 2022). Our college offers a variety of online programs in applied science and computing disciplines and predominantly caters to post-traditional transfer students. Students completing their initial years at a community college, where in-person interactions may be prevalent, can struggle after transferring to an online program for their junior and senior years due to the reduced opportunities for in-person interactions. Additionally, a significant portion of our student body, nearly 60%, are first-generation college attendees. As discussed by DeRossett et al. (2021), this demographic may face additional social and academic challenges, including lower academic performance and a higher likelihood of adverse outcomes in online settings, particularly students from disadvantaged backgrounds (Figlio et al., 2013; Kaupp, 2012). Given that these challenges exist for our students, fostering a sense of belonging within the campus community is critical for supporting their success (Strayhorn, 2018).

This study explored the sense of belonging among online post-traditional students, focusing on their feelings of acceptance, value, and respect within their academic community. We contend that a sense of belonging impacts student engagement, retention, and success. It is a vital component of students' academic and personal growth, influencing their capacity for self-directed learning and their ability to complete degree programs. Strayhorn (2018) suggests that various factors can influence students' sense of belonging. These include enrolling in the "right" academic major and aspects of the campus environment, such as inclusiveness of gender and gender identity, minority status, age, and physical and cognitive ability. Meaningful interactions with faculty and peers, social support from peers, and perceived classroom comfort also play a role in influencing a sense of belonging. Additionally, external factors such as politically charged international, national, and local events, activist movements, and political divisiveness concerning systemic racism and xenophobia can impact a student's sense of belonging even in online classroom environments.

The literature suggests that a sense of belonging in online environments can be influenced by the quality of social, cognitive, and teaching presence (Garrison, 2016). Social presence (SP) is the ability of students to project their individuality in the online community, thereby fostering meaningful interactions. Cognitive presence (CP) is the extent to which learners can construct and confirm meaning through sustained reflection and discourse. Teaching presence (TP) refers to designing, facilitating, and directing cognitive and social processes to achieve meaningful learning outcomes. As instructors and students actively participate in online learning, SP, CP, and TP evolve dynamically in their learning community. Each presence plays a crucial role in shaping students' online learning experiences and overall sense of belonging.

With online post-traditional students comprising nearly 60% of undergraduate enrollments (American Council on Education, 2023), understanding what enhances their sense of belonging is essential. Our study focused on students in Applied Computing, Computer Science, Human Services, and Family Studies & Human Development from among our college's programs. These students were surveyed to assess their sense of belonging and to address the following research questions:

R1: Do our online post-traditional students report a sense of belonging? How do their academic disciplines, gender, and ethnicity affect their sense of belonging?

R2: How do social, cognitive, and teaching presence impact the sense of belonging of online post-traditional students? How do their connections with faculty and peers influence this sense of belonging?

This paper details our methodology, findings, and the implications of our study for enhancing the online educational experience. By understanding and addressing the unique challenges faced by post-traditional students, we aim to provide actionable strategies to foster a more inclusive and supportive online learning environment that promotes academic success and personal growth.

Literature Review

Sense of Belonging in Higher Education

The proliferation of online education has extended access to diverse post-traditional learners (Jaggars & Xu, 2016). However, challenges persist, particularly concerning student retention, persistence, and completion rates of online learners compared to traditional face-to-face learners. As discussed by Mowreader (2024), enrollment in exclusively online degree programs negatively influenced bachelor's degree completion across all student subgroups by race and ethnicity. Central to addressing these challenges is the concept of a sense of belonging, which is linked to motivation (Baumeister & Leary, 1995), academic achievement (Walton & Cohen, 2007), persistence (Pittman & Richmond, 2008), and lower attrition rates in campus-based learning (Peacock & Cowan, 2019). Sense of belonging contains various components, but fundamentally, it reflects the feeling that one fits in, belongs to, or is a member of the academic community (Good et al., 2012). Studying a sense of belonging allows researchers to measure how college students' experiences shape their affiliation with their learning environment (Hurtado & Carter, 1997).

A significant issue that "sense of belonging" researchers have aimed to address at the postsecondary level is the development of valid and reliable scales to measure the sense of belonging construct. Slaten et al. (2018) developed the University Belonging Questionnaire (UBQ), validated as a reliable scale with three factors: university affiliation (UA), university support and acceptance (USA), and faculty and staff relations (FSR). Good et al. (2012) developed a Math Sense of Belonging Scale (MSBS) to predict variance in college students' intent to pursue math in the future. The MSBS has a factor structure for a sense of belonging composed of five factors: Membership, Acceptance, Affect, Desire to Fade, and Trust. Mooney and Becker (2021) adapted MSBS to measure the sense of belonging pre- and post-onset of the COVID-19 pandemic, investigating the impact of transitioning to online/hybrid learning on students' belonging experiences.

Community of Inquiry

Learning is an experience that shapes identity and, as discussed by Farnsworth et al. (2016), cannot be separated from identity development. Therefore, educational practices incorporating students' various identities, including their culture, social, and academic backgrounds, should be considered to enhance students' learning experiences and outcomes (Smith, 2004). A sense of belonging is not merely a passive experience but is actively fostered by learning environments that encourage reflective discourse and deep learning. This concept within the Community of Inquiry theoretical framework (CoI) proposed by Garrison et al. (1999) highlights the roles of social presence (SP), cognitive presence (CP), and teaching presence (TP) as a foundation for meaningful e-learning experiences (Garrison, 2016). As emphasized by Wempe and Collins (2024), creating a learning environment of engagement, collaboration, and a sense of community reduces the feeling of isolation and dissatisfaction with student learning experiences. Interventions designed to help students feel they belong can mitigate the effects of stereotype threat and improve academic performance and persistence (Walton & Cohen, 2011).

Identifying and understanding the factors in learning environments and experiences is critical for improving retention and academic success. Many factors can influence belonging, including students' identities and experiences, learning environment, people (faculty, staff, and peers), and academic discipline (Mooney & Becker, 2021). Swail's Geometric Model of Student Persistence and Achievement (Swail, 2003) also underscores academic, social, and institutional factors critical to student experiences. The CoI theoretical framework pinpoints the elements SP, CP, and TP that constitute meaningful learning experiences and suggests that the three elements interact synergistically within communities (Garrison et al., 2010). Further refining the CoI framework, Peacock and Cowan (2019) introduced elements focusing on nurturing online learners' sense of belonging through tailored instructional strategies. The importance of TP in achieving high levels of CP has been recognized by Garrison et al. (2001) and Rourke and Kanuka (2009). Practicing SP in an engaging, responsive, respectful, challenging, and supportive online environment is also critical (Garrison et al., 1999). Recently, Meech and Koehler (2024) investigated relationships between CoI (Garrison, 2016) and servant leadership theory (Buchen, 1998). They recognized and proposed the servant leadership theory to clarify the construct of online instructor leadership to facilitate SP, CP, and TP in online learning environments.

Faculty and Peer Interactions, Diversity, and Inclusion

Previous research has emphasized the importance of faculty-student and peer relationships in cultivating a sense of belonging. Students who perceive their faculty and peers as accessible and supportive are more likely to experience a stronger connection to their educational community (Rovai, 2003; Umbach & Wawrzynski, 2005). Hoffman et al. (2002) identified critical dimensions of belonging, including empathetic faculty understanding and perceived peer support, influencing students' educational satisfaction and persistence. Interpersonal aspects of online course design, such as those identified by Jagers and Xu (2016), are critical in fostering a sense of belonging and can directly influence student performance.

Thriving learning communities can support diverse student populations by fostering a sense of belonging. However, how a sense of belonging is embodied across different student demographics

may vary. Johnson et al. (2007) explored how racial and ethnic identities impact students' sense of belonging, noting that students with positive racial and ethnic identities report higher levels of belonging and overall well-being. This finding is particularly relevant in discussions about inclusivity at predominantly white institutions, where Latino students, for example, often report a lower sense of belonging (Strayhorn, 2018). Investigating the intersectionality of gender and minority status revealed complicated and nuanced trends in students' sense of belonging (Mooney & Becker, 2021). These trends and the potential disparities underscore the need for educational practices that support diverse student populations—for example, those at Hispanic-serving institutions (Maestas et al., 2007), where financial stability, inclusive campus climate, and faculty engagement play pivotal roles in enhancing students' sense of belonging.

Research Methods

Our research methodology followed an Institutional Review Board (IRB) approved protocol (STUDY00000062), using a mixed-methods approach to explore factors contributing to the sense of belonging among online post-traditional students. The mixed-methods approach allowed quantitative data, which offers measurable insights, and qualitative data, which provides rich, contextual information, to be collected and analyzed. This combination allowed us to quantify the level of belonging and underlying factors and explore the student narratives contributing to their experiences.

Survey Instrument

The survey instrument included five quantitative questions that asked students to indicate their level of agreement in feeling a sense of belonging in their classes, feeling that they matter, and feeling connected to other students, faculty, and staff. Additionally, we employed two validated instruments to compose our survey. The first and primary instrument we employed was the University Belonging Questionnaire (UBQ). Researchers validated the UBQ through exploratory and confirmatory factor analyses. Additional analyses demonstrated the instrument's convergent and incremental validity (Slaten et al., 2018). The UBQ questions in our survey allowed students to identify perceptions of a sense of belonging based on university affiliation (UA), university support and acceptance (USA), and faculty and staff relations (FSR) of their university experience. The secondary instrument was the Math Sense of Belonging Scale (MSBS), validated by exploratory and confirmatory factor analyses and internal consistency tests (Good et al., 2012). The MSBS survey questions contained 14 items, of which 7 were positively framed and 7 were negatively framed. The critical aspects assessed by the MSBS questions were feelings of acceptance and perceived value, inclusion, support, and encouragement.

In addition to the quantitative questions to measure the sense of belonging, the survey included ten questions related to student demographic information pertinent to our students, four open questions about their experiences, one regarding satisfaction, two about peer interactions, three about persistence in their studies, one each on recommending courses to others and perceived identity valuation. The survey consisted of 64 questions, 46 of which focused on the sense of belonging (4 open questions included), using a combination of qualitative and quantitative questioning. Employing validated instruments and collecting demographic information, we aimed to assess students' sense of belonging from multiple dimensions. Correlation analyses aimed to determine

comprehensive and reliable measures of a sense of belonging among our online post-traditional students.

Data Collection and Analysis

The student survey was administered via Qualtrics online, and students who were active in Applied Computing, Computer Science, Human Services, and Family Studies & Human Development programs were invited to participate in the research study. This subset of programs intentionally included both applied science and computing disciplines.

At the end of the survey participation period, responses were downloaded in an Excel file from Qualtrics. As participants were not required to answer all survey questions, Python programming was used to parse and clean the Excel data by filtering out the unfinished responses. The processed data was then analyzed and visualized. Each quantitative question in the survey used a 5-point Likert scale such as 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. When calculating an integrated score based on a group of quantitative questions, we transformed the Likert scale of each question's response into its corresponding ordinal value. For example, if a response was "agree," we transformed it to 4; if it was "disagree," the scale was transformed to 2. Based on the ordinal values associated with students' responses to the quantitative questions, we grouped them to compute the integrated scores representing variables related to the sense of belonging.

In statistical analyses, integrated scores were treated as numeric values. Spearman's Rho correlation test was applied to explore correlations between non-continuous variables. For continuous variables, Pearson's correlation was applied. Demographic data was used to categorize students according to academic discipline, gender, and ethnicity. Paired t-tests were used to compare the mean values between comparable measures for a group of responses, and Mann-Whitney U tests were used to compare measured values between two groups. If a comparison involved more than two groups, Welch's ANOVA test followed by pairwise Mann-Whitney U tests were used. A test result was considered statistically significant if the p-value was < 0.05 . After identifying a statistically significant difference between two groups, Cohen-d was calculated to quantify and determine the practical difference.

Numeric Metrics of Sense of Belonging

Three integrated measures were developed to analyze the quantitative survey data and evaluate students' sense of belonging. The first measure, the Direct Score, was determined by calculating average scores from five quantitative questions in the survey: levels of agreement in feeling a sense of belonging in their classes, feeling that they matter, feeling connected to other students, feeling connected to faculty, and feeling connected to staff. A Direct Score ranges from 1 to 5, with a higher score indicating a stronger sense of belonging. The second measure (UBQ) was calculated as the sum of three aggregated measures based on the subgroups of UBQ: university affiliation (UA), university support and acceptance (USA), and faculty and staff relations (FSR). Each integrated score representing UA, USA, or FSR was calculated as the average student responses to UBQ questions, resulting in a score range between 1 and 5. Thus, a UBQ score ranges between 3 and 15. The third measure, an Alternative Score, was calculated from the sum of positively framed

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question scores minus the sum of negatively framed question scores from the MSBS survey questions. Since each response to a positive or negative question has an ordinal value between 1 and 5, the Alternative Score ranged between -28 and 28. For all three measures, the higher scores indicate a stronger sense of belonging reported by students.

Qualitative Data Analysis

A provisional coding method was used to initiate analysis of the qualitative data from students' responses to four open-ended survey questions. These questions asked students to share their most positive experiences, their most negative experiences, an experience where they felt a real sense of belonging or connection to the college, and an experience where they felt a sense of disconnection or being an outsider to the college. Two researchers reviewed the data to identify preliminary codes (Saldana, 2021). Codes and coding categories were discussed to resolve any discrepancies and ensure consistency in the coding scheme between reviewers. Systematic data coding was based on Garrison's CoI elements (Garrison, 2016) and Swail's Geometric Model of Student Persistence and Achievement (Swail, 2003). Reviewers iteratively reviewed and updated the list of categories, incorporating new themes as they emerged. For example, themes of University Support and Acceptance and University Affiliation were included in response to analyzing UBQ (second measure). To verify the reliability of the coding process, collaborative coding sessions ensured consistency of the coding results. Table 1 presents the final coding list with factor elements and their corresponding categories. Factor categories include Social Presence (SP), Cognitive Presence (CP), Teaching Presence (TP), University Support and Acceptance (USA), and University Affiliation (UA). Column two of the table displays the coding elements for each category.

Table 1

Coding Elements and Categories

Category	Elements
Social Presence (SP)	Personal/affective Open communication Group cohesion Financial issues Location issues Maturity Attitude towards learning Cultural values Peer interaction/connections

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Cognitive Presence (CP)	Academic rigor Quality of learning Aptitude Content knowledge Critical thinking ability Study skills Learning skills Time management Academic-related extracurricular activities
Teaching Presence (TP)	Design and organization Facilitating learning Direct instruction/connection Program Curriculum Teaching platform
University Support and Acceptance (USA)	Financial aid/scholarship Student service Academic services Recruitment and admission Staff Connection
University Affiliation (UA)	Proud as a U student Media about the college

Research Design for R1 and R2

This study aimed to address two critical questions by analyzing survey data. Below, we detail the research design and methodology used to approach and address the questions.

R1: Do our online post-traditional students report a sense of belonging? How do their academic disciplines, gender, and ethnicity affect their sense of belonging?

The survey responses calculated three sense of belonging scores (Direct, UBQ, and Alternative) for each completed response. Cronbach’s alpha values were computed to ascertain the reliability of the three scores and the overall survey items. The mean, median, standard deviation and distributions of measure values were calculated to evaluate the scores. Pearson's correlation was used to find correlations between the three scores. Multiple measures were used to capture any nuances of students' sense of belonging and to provide a more comprehensive understanding of this complex construct. Critical factors were identified based on the categories of the UBQ survey questions, which measured students’ sense of belonging based on their perceptions of UA, USA, and FSR, each with an integrated score for each student response. Then Pearson's correlation was applied to explore how the three factors related to the three measures of sense of belonging. Drawing from the findings of other studies (Mooney & Becker, 2021; Perez, 2020), academic disciplines, ethnicity, and gender were used to group the participating students for analysis. Differences between groups were analyzed using Mann-Whitney U tests, Welch’s ANOVA tests, and Cohen’s d measures, which were conducted between groups to quantify significant differences.

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R2: How do social, cognitive, and teaching presence impact the sense of belonging of online post-traditional students? How do their connections with faculty and peers influence this sense of belonging.

Provisional coding was conducted to analyze the qualitative data from students' responses to the four open-ended survey questions regarding students' experiences (positive, negative, belonging, and disconnection). With the coding categories identified using Garrison's CoI elements (Garrison, 2016) and Swail's Geometric Model of Student Persistence and Achievement (Swail, 2003), critical factors emerged based on patterns and themes observed in the qualitative data. To further investigate the connections between students and faculty, staff, and peers, we assessed two integrated numeric measures in addition to the qualitative data analysis. The first measure, faculty/staff relations (FSR), was calculated based on the UBQ questions regarding relationships with faculty and staff. The second measure focused on peer interactions derived from a subgroup of survey questions. We compared the descriptive statistics of the two measures, conducted a paired t-test, and used Cohen's *d* to report the difference between the connections. Pearson's correlation was conducted to examine the correlations between the two types of connections (faculty/staff relations and peer interactions) and the three measures of sense of belonging (Direct, UBQ, and Alternative scores). By investigating qualitative and quantitative data, we aimed to understand how post-traditional students connect with faculty, staff, and peers and if these connections impact their sense of belonging.

Results

From August 2021 to May 2022, the survey was distributed through Qualtrics to 400 Applied Computing, Computer Science, Human Services, and Family Studies & Human Development students via official university emails. The survey was accompanied by a research study description and informed consent document. Monthly email reminders were sent to potential participants during the survey's availability period. A total of 79 responses were received, of which 53 were considered complete, generating a response rate of 13.3%. Table 2 presents the demographic information of the 53 responses, including data on discipline programs, gender, race, and ethnicity. In total, the four programs comprised 222 computing students (Applied Computing and Computer Science) and 178 applied science students (Human Services and Family Studies and Human Development); 52% male students and 48% female students; 43% Hispanic or Latinx, 36% White, 9% Black or African American, 5% Asian, 3% American Indian or Alaska Native, 1% Native Hawaiian or Other Pacific Islander, 0.5% International, and others. Table 2 shows that the study sample comprised 36 responses from computing students and 17 from applied science students, indicating a higher response rate in computing programs. However, the sample distributions of gender and race/ethnicity are close to those of the total potential cohort. Percentages may not total 100% due to rounding.

Table 2

Participant Demographics

Demographic	Frequency	Percent
Academic Programs		
Applied Computing (Major)	28	52.8%

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Human Services (Major)	8	15.1%
Computer Science (Major)	6	11.3%
Family Studies & Human Development (Major)	5	9.4%
Human Services (Minor)	2	3.8%
Computer Science (Minor), Applied Computing (Major)	2	3.8%
Family Studies & Human Development (Minor)	1	1.9%
Human Services (Major), Family Studies & Human Development (Minor)	1	1.9%
Gender		
Male	27	50.9%
Female	24	45.3%
Different identity	1	1.9%
Prefer not to identify	1	1.9%
Race/Ethnicity		
White	20	37.7%
Hispanic or Latina/o	15	28.3%
Hispanic or Latina/o, White	7	13.2%
Asian	4	7.5%
I prefer not to respond	2	3.8%
American Indian or Alaska Native, White	1	1.9%
Asian, White	1	1.9%
American Indian or Alaska Native	1	1.9%
Black or African American, White	1	1.9%
Another race or ethnicity	1	1.9%

Findings to Address R1

R1: Do our online post-traditional students report a sense of belonging? How do their academic disciplines, gender, and ethnicity affect their sense of belonging?

To address R1, we calculated three measures, Direct Score, UBQ Score, and Alternative Score, for each of the 53 responses. Table 3 shows the three measures' mean, median, and standard deviation. The second column in the table shows the calculated Cronbach's alpha values to evaluate the internal consistency of the items used to calculate each score. The Cronbach's alpha value was 0.97 for the overall survey items. These values suggested the survey instrument was highly reliable to measure sense of belonging among our online post traditional students. Analyses revealed that our students reported a moderate sense of belonging from their online education experience. Specifically, the mean of each measure was lower than the median, suggesting left-skewed measure scores: most students had a relatively strong sense of belonging, but some individuals reported low levels of belonging (11 responses with Direct Score < 3, 9 with UBQ Score <10, and 9 with Alternative Score <0).

Table 3

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Reported Sense of Belonging Measures

	Cronbach's Alpha	Mean	Median	Std. Deviation (SD)
Direct	0.88	3.69	3.80	0.99
UBQ	0.94	11.87	12.11	2.23
Alternative	0.94	11.43	15.0	12.34

Table 4

Correlations Between the Three Measures

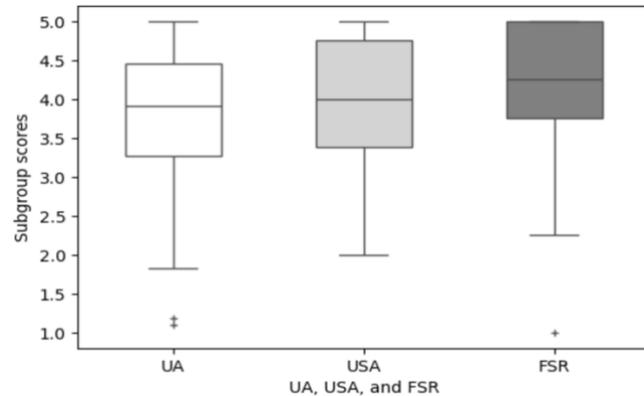
	Direct	UBQ	Alternative
Direct	—	0.84***	0.74***
UBQ	—	—	0.81***
Alternative	—	—	—

Note. ***p < .001

Table 4 displays Pearson's correlation coefficients between the three measures of sense of belonging. All p-values were zero, indicating statistically significant positive correlations between the measures. These results suggest that all three scores were appropriate for measuring students' sense of belonging. However, the correlation between Direct and Alternative measures was weaker than other correlations, which may imply that UBQ and Alternative scores assess different aspects of a sense of belonging. Although all three scores were intended to measure the sense of belonging, the various correlations between the three scores highlight the multidimensional nature of this construct.

Figure 1

UBQ Subgroup Scores



To reveal additional insights at a subscale level, categories of the UBQ survey questions were analyzed to identify three factors based on the subgroups of quantitative questions: University Affiliation (UA), University Support and Acceptance (USA), and Faculty/Staff Relations

(FSR). Figure 1 shows the boxplots of the three integrated measures representing UA, USA, and FSR factors. The medians of the three factors were 3.91, 4.00, and 4.25, respectively. We also conducted paired t-tests between each pair of subgroup scores. Our findings revealed that the differences between the subgroups were statistically significant ($p < .02$), suggesting that FSR was the strongest factor and UA was the weakest among the three factors in our online post-traditional students.

Table 5

Correlations Between UBQ Subscale Factors and Sense of Belonging Measures

	Direct	UBQ	Alternative
USA	0.74***	0.87***	0.73***
UA	0.67***	0.81***	0.63***
FSR	0.70***	0.83***	0.68***

Note. *** $p < .001$

Table 5 presents the correlations between these three UBQ factors and the overall measures of sense of belonging resulting from Pearson's correlation. Our findings indicate that USA and FSR had strong positive correlations with students' sense of belonging. The correlation between USA and sense of belonging was the strongest, and the correlation between UA and sense of belonging was consistently weakest among the correlations.

We investigated how student identities such as academic discipline, ethnicity, and gender relate to belonging. Table 6 presents the numbers of students and the means and standard deviations (SD) of the three composite scores in separate groups based on student identities. We conducted Mann-Whitney U tests to compare groups based on gender and academic disciplines, finding no significant differences. To examine differences in belonging scores among students of different ethnicities, we conducted Welch's ANOVA tests. We found that at least one group's mean Direct score differed from others ($p = .02$). Post hoc Mann-Whitney U tests following Welch's ANOVA revealed statistically significant differences in Direct ($p = .01$) and UBQ scores ($p = .01$) between Hispanic and White students. Cohen's d values of 0.96 (Direct) and 0.76 (UBQ) indicated large effective sizes, suggesting a substantial difference in the sense of belonging between Hispanic and white students as measured by Direct and UBQ scores.

Table 6

Belonging Measures in Student Groups

Identity		Number of Responses	Direct		UBQ		Alternative	
			Mean	SD	Mean	SD	Mean	SD
Academic Disciplines	Applied Science	17	3.51	1.15	11.55	2.47	8.47	13.69
	Computing	36	3.78	0.90	12.02	2.13	12.83	11.58

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Gender	Female	24	3.55	1.00	11.86	2.29	12.58	12.43
	Male	27	3.87	0.90	12.04	2.01	10.96	11.93
Ethnicity	Hispanic	15	4.19	0.68	12.79	2.12	15.33	12.23
	White	20	3.33	1.06	11.20	2.08	9.00	11.68
	Other	18	3.69	0.99	11.85	2.33	10.89	13.03

Table 7

UBQ Subscale Factors in Student Groups

Identity		Number of Responses	UA		USA		FSA	
			Mean	SD	Mean	SD	Mean	SD
Academic Disciplines	Applied Science	17	3.83	0.83	3.87	0.82	3.85	1.17
	Computing	36	3.64	1.00	4.05	0.85	4.33	0.68
Gender	Female	24	3.89	0.92	3.96	0.80	4.01	1.06
	Male	27	3.74	0.86	4.05	0.83	4.34	0.66
Ethnicity	Hispanic	15	4.02	0.90	4.37	0.71	4.40	0.80
	White	20	3.30	0.83	3.77	0.84	4.13	1.07
	Other	18	3.87	1.00	3.92	0.87	4.06	0.74

We also investigated the integrated scores of subscale factors, including UA, USA, and FSA, adapted from the UBQ survey among student groups categorized by their reported identities. Table 7 presents the means and standard deviations of the subscale factors for these student groups. Mann-Whitney U tests revealed no significant differences between groups based on academic disciplines and gender. However, Welch’s ANOVA tests to compare student groups based on their ethnicities indicated that at least one group’s mean UA score differed from the others ($p = .047$). Post hoc Mann-Whitney U tests revealed that Hispanic students reported significantly higher UA scores than white students. The Cohen-d measure of 0.86 indicated a large effect size between the two groups.

Findings to Address R2

R2: How do social, cognitive, and teaching presences impact the sense of belonging of online post-traditional students? How do their connections with faculty and peers influence this sense of belonging?

To better understand the factors contributing to students' sense of belonging, we analyzed the qualitative data from the four open-ended survey questions that explored students' experiences: positive, negative, belonging, and disconnection. Table 8 presents the response rates for the four open-ended questions based on the 53 complete responses received.

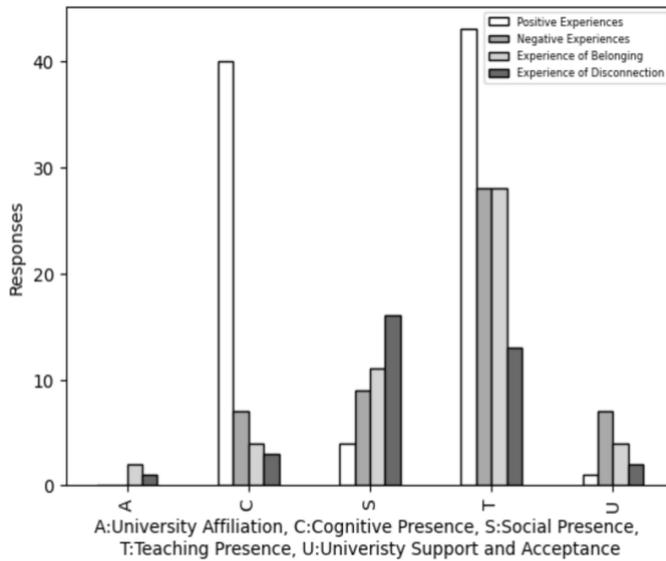
Table 8

Qualitative Question Response Rates

Question Topic	N	Response Rate
Positive experience	46	86.8%
Negative experience	45	84.9%
Experience of belonging	41	77.4%
Experience of disconnection	39	73.6%

Figure 2

Factors Identified in the Four Open-Ended Questions



Based on provisional coding, we identified five factors: university affiliation (UA), cognitive presence (CP), social presence (SP), university support and acceptance (USA), and teaching presence (TP). Figure 2 presents the factor frequencies in positive experiences, negative experiences, experiences of belonging and connections, and experiences of disconnection. Notably, TP was overwhelmingly reported across all categories, with 43 students reporting it in positive experiences, 28 in negative experiences, 28 in experiences of belonging and connections, and 13 in experiences of disconnection. CP was also frequently reported in positive experiences (40 students). While SP was reported in fewer instances than CP and TP, it was mentioned in experiences of disconnection (16 students).

Figure 3

Factors Identified by Students in Computing and Applied Science

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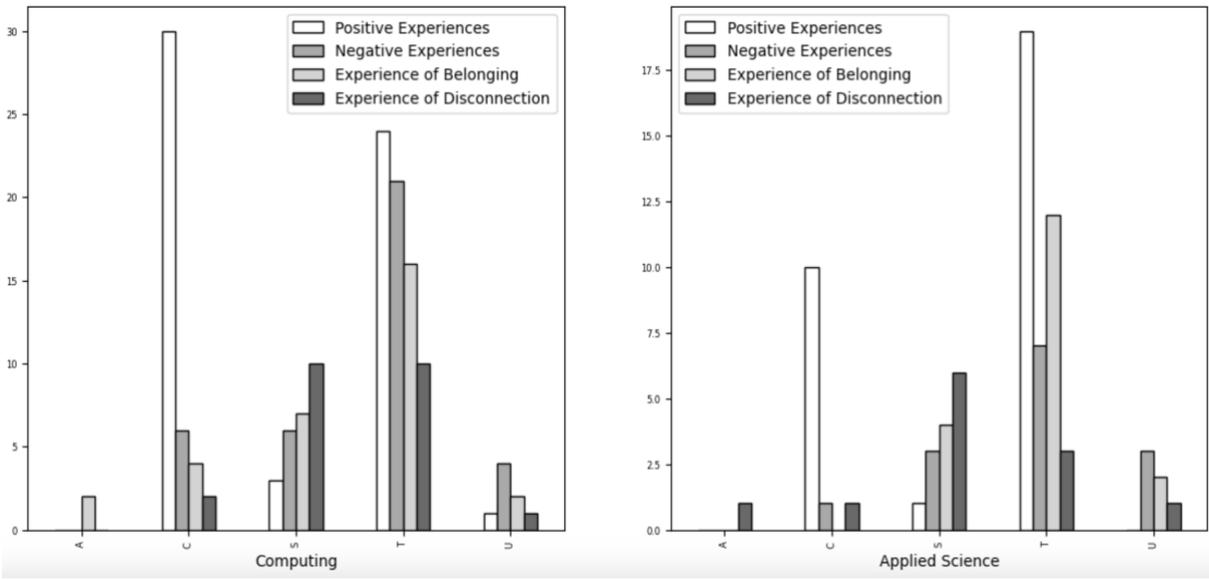


Figure 4

Factors Identified by Gender Groups

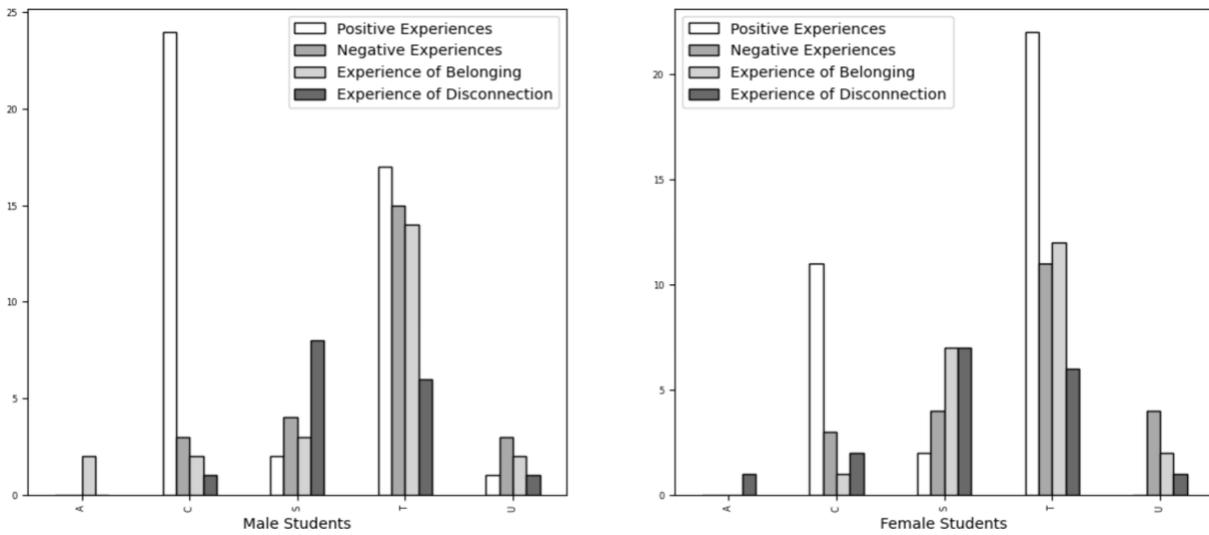
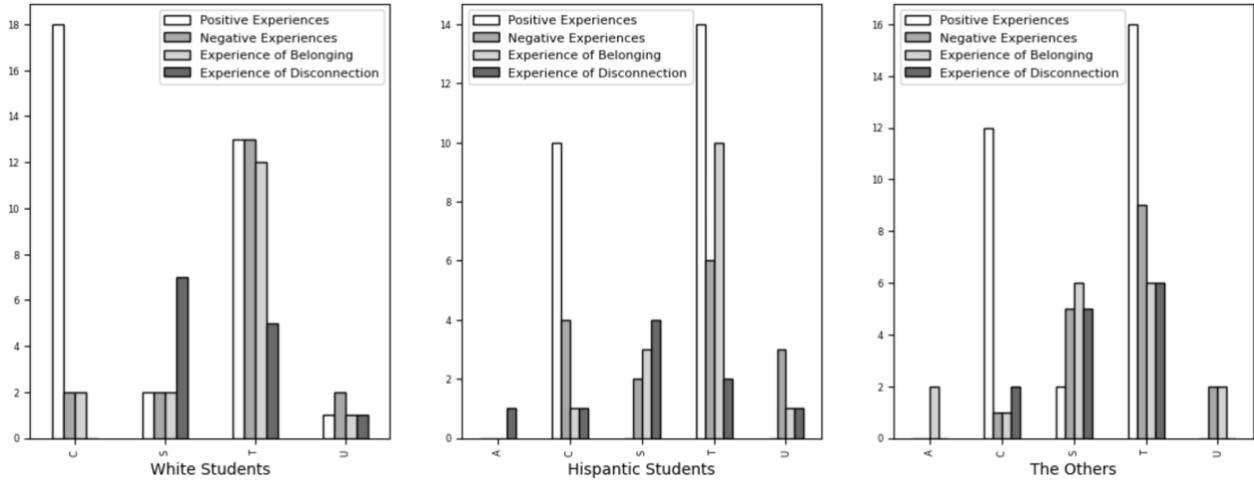


Figure 5

Factors Identified by White, Hispanic Students, and Others

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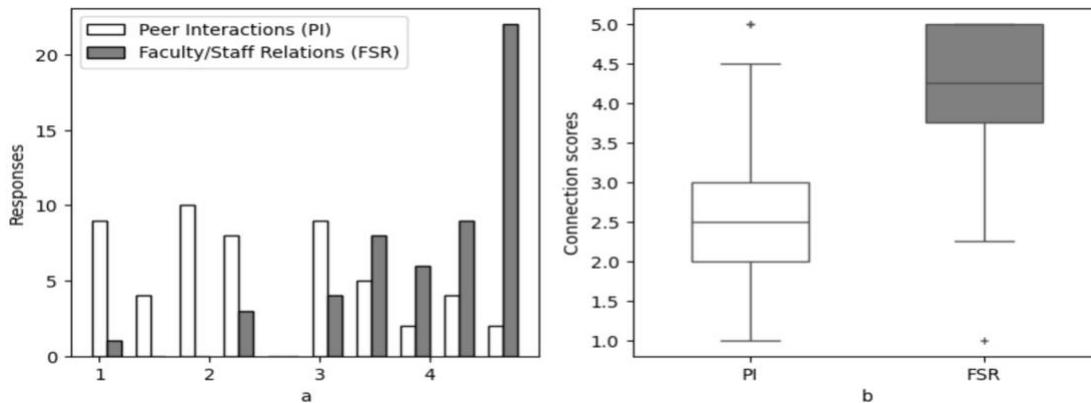


Figures 3, 4, and 5 display the factor frequencies in different student groups based on their reported identities. Notably, TP was overwhelmingly reported in belonging experiences across all groups. CP was more frequently reported in positive experiences by computing, male, and white student groups. SP was reported to have the most experiences of disconnection across all groups based on student identities.

Figure 5 reveals insight from our analysis using the qualitative data from students' groups based on their ethnic identities. We found that white students more frequently reported CP in their positive experiences. In contrast, other groups, including Hispanic students, highlighted TP in their positive experiences. Specifically, Hispanic students reported TP more in their positive and belonging experiences than other groups. Both white and other groups reported TP in their positive/negative and belonging/disconnection experiences. Across all ethnicity groups, students emphasized SP and TP in their disconnection experiences.

Figure 6

Peer Interactions Versus Faculty/Staff Relations



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To evaluate whether students established meaningful connections with faculty, staff, and peers, we further explored the survey’s quantitative data based on two groups of questions: the first group consisted of questions on peer interactions within and outside the academic program, and the second group comprised UBQ questions on relationships with faculty and staff. Figure 6a displays the distribution of the two integrated scores. The white distribution represents levels of peer interactions (PI), while the gray distribution represents faculty/staff relations (FSR). Figure 6b uses boxplots to visualize the difference between the two integrated scores representing PI and FSR. The median of the PI scores is 2.5, and the median of FSR is 4.25. Figure 6 suggests an apparent difference between the two types of connections/relations. A paired t-test between PI and FSR scores confirmed that students perceived a significantly stronger relationship with faculty/staff than their interaction with peers ($p = .000$). Cohen's d value of 1.60 indicated a substantial difference between FSR and PI.

Table 9 displays the results of Pearson's correlation with p-values in parentheses between the interpersonal interaction measures (PI and FSR) and the three measures of sense of belonging (Direct, UBQ, Alternative). We found significant positive correlations between FSR and all three measures of sense of belonging. However, we did not find any significant correlation between PI and the three measures of sense of belonging ($p < .05$), although we did observe some positive correlations. Meaningful connections with faculty and staff impact students' sense of belonging more than their interactions with peers.

Table 9

Correlations Between Interactions and Sense of Belonging Measures

	Direct	UBQ	Alternative
Peer Interactions (PI)	0.21 (0.128)	0.26 (0.051)	0.04 (0.783)
Faculty/Staff Relations (FSR)	0.70***	0.83***	0.68***

Note. *** $p < .001$

These analyses highlighted the importance of direct instruction and faculty connections. Students mentioned TP 28 times, with 17 referring to direct instruction/connection with faculty. In contrast, in the reported disconnection experiences, four students noted the negative impact of having little or no personal connection or direct interaction with their instructors. Although no significant correlations were found between peer interaction and a sense of belonging via our quantitative data analysis, peer interaction was reported nine times in belonging experiences, four times in disconnection experiences, and five times in negative experiences. Further, group cohesion, related to peer interaction, was mentioned three times in disconnection experiences.

Students’ qualitative responses were analyzed further to understand the priorities of online post-traditional students and develop actionable strategies for enhancing their sense of belonging. Responses to the four open-ended survey questions were categorized by SP, CP, and TP; Tables

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10, 11, and 12 feature representative quotes for each of these three presence categories, illustrating the diversity of experiences within the Community of Inquiry (CoI) framework.

Table 10

Quotes on Social Presence (SP) in Student Experiences

Quote in Experiences	Identities
[1] My professor this semester has been amazing, and the small course makes me feel seen. <i>Positive experience</i>	Female, (Hispanic or Latina/o, White), Human Services
[2] In a classroom that has open discussion for students, teachers, and tutors. When students have the opportunity to attend a meeting or study environment that wasn't part of a lecture, it allowed us to talk and get to know one another. <i>Belonging experience</i>	Male, (White), Applied Computing
[3] During the online discussions you find that backgrounds of fellow students mirror that of your own. Any group project/meeting/discussion really embodies a sense of belonging. <i>Belonging experience</i>	Male, (West Indies), Applied Computing
[4] The lack of connection with my classmates. I was lucky enough to meet one of my classmates, but there is just a lack of connection. I miss classrooms and I am looking forward to a hybrid class I am taking next semester. <i>Negative experience</i>	Female, (Hispanic or Latina/o, White), Human Services
[5] Lectures, mostly. Other students simply aren't willing to engage or talk about the material presented. I am mostly the one doing all the talking. <i>Disconnection experience</i>	Male, (White), Applied Computing
[6] Because I'm non-military, I sometimes feel steamrolled by the cyber intelligence folks. It definitely feels more like a college for the military than for the general public. <i>Disconnection experience</i>	Male, (Hispanic or Latina/o, White), Applied Computing

In Table 10, Quote 1 shows the student’s sense of belonging and being “seen” as an individual, which is a crucial aspect of SP. Additionally, mentioning a "small class" indicates a more intimate learning environment where interactions with the professor and peers may be more personal and meaningful, further enhancing SP. Quote 2 highlights activities to interact with peers outside class meetings. Quote 3 underscores the use of online discussions where they found their fellow students’ backgrounds mirror their own. These quotes emphasize that group interactions can foster SP and contribute to a more profound sense of belonging. Quote 4 expresses a lack of connection with classmates, leading to feelings of isolation and disconnection. Quote 5 reflects a similar sense of disconnection in the context of class discussion. The student's perception of being the one who did most of the talking further underscores the issue of SP, where others' engagement could have been improved. Quote 6 introduces a unique dimension related to identity within the context of SP. This experience highlights a potential cultural or identity-related barrier to SP.

Table 11

Quotes on Cognitive Presence (CP) in Student Experiences

A Sense of Belonging in Online Post-Traditional Students: What Matters?

Quote in Experiences	Identities
[1] One of my courses really challenged me with a subject outside of my comfort zone: English composition. That course gave me a lot of sleepless nights and agony, but I feel that my grade was well worth the effort. I definitely improved my writing as a student at cast. <i>Positive experience</i>	Male, (White), Applied Computing
[2] As a student, I feel like I am learning a lot of skills and information that can be applied to the workforce. For example, I have taken two courses so far that have given me knowledge and programming in the command line. I am using that knowledge in my current job to run a quick scan on txt files to save us time from clicking and examining each file line by line. Being able to apply these skills in a work setting has really made me feel confident in my learning. <i>Positive experience</i>	Male, (Hispanic or Latina/o), Applied Computing
[3] Some classes have taught antiquated techniques that are outdated or that are updated. This has caused a lot of frustration as a student, because we must force ourselves to learn something that is no longer relevant and we are not able to use the current up-to-date knowledge we have. <i>Negative experience</i>	Male, (White), Applied Computing
[4] Didn't have the opportunity to get involved in extra-activities outside the courses. <i>Negative experience</i>	Female, (Hispanic or Latina/o), Applied Computing
[5] I have not felt a strong sense of disconnection, but sometimes it's hard to connect during discussion posts where the content is not as engaging, and therefore students are not as active in responding/commenting. <i>Disconnection experience</i>	Female, (Asian, White), Applied Computing

In Table 11, Quote 1 indicates the student's critical thinking and problem-solving engagement as they grappled with new concepts and skills. Additionally, the student's reflection on improving writing skills indicates the construction of meaning through learning. Quote 2 emphasizes learning skills (programming in the command line) that they were able to apply in their current job. This demonstrates not only the acquisition of knowledge but also the practical application of that knowledge in a real-world context. Further, this quote showcases the "exploration" phase within CP, where learners actively seek to understand and apply what they have learned to solve real problems. Quote 3 expresses the student's frustration regarding outdated or irrelevant course content, highlighting the importance of meaningful and relevant learning experiences. Quote 4 shares the experiences of lacking the opportunity to be involved in extracurricular activities, highlighting the importance of a holistic educational experience. Quote 5 represents a disconnection experience, where students found it challenging to connect during less engaging discussion posts, aligning with CP.

Table 12

Quotes on Teaching Presence (TP) in Student Experiences

A Sense of Belonging in Online Post-Traditional Students: What Matters?

Quote in Experiences	Student Identities
[1] Most of the professor are great at clarifying information and being available when needed. D2L was used in a very organized and easy to follow manner with updated information when needed in most of the cases. This really allowed me to use my time more effectively on assignments. Having access to professor really makes a difference. <i>Positive experience</i>	Female, (Hispanic or Latina/o), Human Services
[2] There have been some professors who make the course fun and enjoyable. These professors show us how we can use the material we learn in the future in school and in the real world <i>Positive experience</i>	Female, (White), Applied Computing
[3] The way some of the syllabuses were written were a bit strict and some came across as rigid, which made me begin the course with a cautious and negative attitude toward the course and the instructor, and it took time to get warmed up to the instructor and the course itself (and to readjust my attitude). <i>Negative experience</i>	Female, (Hispanic or Latina/o), Human Services
[4] I disconnected when there is no weekly Zoom meetings or open ZOOM office hours and the class is just based off of pre-recorded videos. <i>Disconnection experience</i>	Male, (White), Applied Computing

In Table 12, Quote 1 reflects effective TP, where the student highlighted that most professors were great at clarifying information and being available when needed. Using the learning management system (D2L) in an organized and informative manner contributed to a positive learning experience. The instructors' availability and the organized course materials indicate that TP was well-established, helping students feel supported and informed. Quote 2 mentions that certain professors made the course fun and enjoyable while demonstrating the real-world relevance of the material. This quote represents instructors effectively engaging students and demonstrating the practical application of course content, contributing to a positive learning experience. Quote 3 reflects the initial challenges with TP, where the approachability and support needed to create a positive learning environment improved over time. The disconnection experience points to the importance of TP in maintaining student engagement. Quote 4 mentions feeling disconnected when there were no weekly Zoom meetings or open Zoom office hours, and the course relied solely on pre-recorded videos, suggesting that the absence of real-time interactions with the instructor may lead to a sense of disconnection.

Discussion

Findings and Sample Characteristics

This study used three scores (Direct, UBQ, and Alternative) to measure the sense of belonging of online post-traditional students at our college. The results show that, overall, our online post-traditional students reported a moderate sense of belonging. However, it is noteworthy that a small number of respondents reported lower scores on all three measures (11 responses with Direct Score < 3, 9 with UBQ Score <10, and 9 with Alternative Score <0), indicating that there is room

for improvement in promoting a sense of belonging. Nonetheless, the overall findings confirm the usefulness of the survey instrument in measuring the sense of belonging among a larger group of online post-traditional students.

In terms of the sample characteristics, the sample used in the study included a disproportionate number of computing students compared to applied science students. Additionally, due to a low survey response rate of only 13.3%, the sample size may introduce self-reflection bias, potentially reflecting the experiences of students who were more engaged or performed well academically. However, the other sample demographics, including gender and race/ethnicity, closely mirrored those of the overall student cohort population, which helps mitigate the concern about the sample's representativeness. Despite this consistency, the low response rate still warrants caution when interpreting the results and applying these results to post-traditional students at large. Targeted efforts to increase response rates are needed to improve the generalizability of future studies.

Impactful Factors

This study identified several critical factors central to fostering a sense of belonging among online post-traditional students. These factors include university support and acceptance (USA), faculty and staff relations (FSR), university affiliation (UA), teaching presence (TP), social presence (SP), and cognitive presence (CP). Based on quantitative data analysis, the findings indicated that USA had a stronger correlation with a sense of belonging than UA and FSA. This may imply that when students perceived that they were accepted and supported by their institution, they were more likely to feel like they belonged. This study did not identify the impacts of student's academic program and gender identity. However, Hispanic students reported a stronger sense of belonging and UA than white students, which may reflect our university's designation as a Hispanic-Serving Institution (HSI).

The qualitative data analysis showed that students emphasized the importance of CP, including content knowledge, high-quality learning experiences, and effective time management strategies, in their positive experiences. TP emerged as a crucial factor in experiences, suggesting it may be critical in shaping students' experiences of belonging and connections, both positively and negatively. Positive experiences were associated with effective course design and organization, while negative experiences were linked to issues with online learning facilitation.

Informed by the literature review, the research design emphasized examining the roles of faculty, staff, and peers in fostering students' sense of belonging. The quantitative and qualitative survey data analysis revealed that students placed a higher value on their relationships with faculty and staff than on interactions with their peers. This finding is consistent with previous research on interpersonal interactions (Jaggars & Xu, 2016). However, the peer interaction in the current study demonstrated a positive correlation ($r = 0.28$, $p = .045$) with faculty/staff relationships. While our results indicate that faculty and staff interactions were more critical to students' sense of belonging than peer interactions, peer interaction was the most frequently reported factor in SP based on the qualitative data analysis. Additionally, the qualitative data regarding student-faculty connections revealed critical factors to those previously reported (Hoffman et al., 2002), including emphatic faculty understanding, perceived faculty support and comfort, and perceived classroom comfort.

Actions to Improve Connections

Based on the findings of this study’s two key research questions, we proposed strategies at multiple levels of our education system, pedagogy, and people to enhance online post-traditional students' sense of belonging and foster connections. The goal is to create positive influences, including trust-building, meaning-making, and deepening understanding, which can contribute to online learners' educational experiences (Peacock & Cowan, 2019).

Table 13 presents a comprehensive set of recommended actions to enhance social presence (SP), cognitive presence (CP), and teaching presence (TP) within online learning environments. The five actions focusing on SP aim to normalize challenges, provide support, and promote interactions and inclusions. The four actions emphasizing improving CP focus on integrating extracurricular and research activities to promote active learning. The four actions highlighting TP aim to provide feedback, enhance learning engagement, and promote student-centered reflective learning. By implementing these recommendations, institutions can create a supportive online learning environment that enhances student engagement and learning outcomes.

Table 13

Actions to Improve Connections and Sense of Belonging

SP [1]	Promote trusting, open, and meaningful interactions via online discussion, tutoring, undergraduate research works, clubs, and student service.
SP [2]	Identify marginalized students to help them fit socially and academically.
SP [3]	Normalize challenges to belonging and provide strategies to overcome them.
SP [4]	Provide online materials that discuss coping mechanisms for working in online realms.
SP [5]	Develop peer mentoring programs, inclusive virtual support networks, and personalized advising services to enhance social integration.
CP [1]	Provide extracurricular activities, even in virtual space.
CP [2]	Integrate class-based research experiences with online program curricula that allow learners to contribute collaboratively.
CP [3]	Develop active learning activities by addressing and discussing ongoing and timely issues during the learning process.
CP [4]	Develop reflective activities that encourage learners to engage metacognitively in consolidating their meaning-making on concepts and skills.
TP [1]	Make plans to check in with students to ensure they can approach, access, and engage with appropriate course content, peers, and instructors.
TP [2]	Develop well-designed concept maps to inform self-directed navigation of course topics associated with skills.
TP [3]	Develop reflective activities that promote learners to engage metacognitively in deepening their understanding of concepts and skills.
TP [4]	Provide clear, meaningful, timely feedback and guidelines to facilitate student learning effectively and efficiently.

Conclusion

A Sense of Belonging in Online Post-Traditional Students: What Matters?

In conclusion, this study has provided valuable insight into the sense of belonging among online post-traditional students and the factors that contribute to it. By addressing two key research questions, we evaluated the extent to which our students feel accepted and valued and examined how their identities, such as academic program, gender, and ethnicity, impact their sense of belonging. Our findings suggest that faculty and staff relationships, university support and acceptance, teaching presence, cognitive presence, and social presence are pivotal contributors to students' sense of belonging. Specifically, facilitating learning in teaching presence and peer interaction in social presence were identified as particularly important for fostering a stronger sense of belonging. These results highlight the importance of cultivating meaningful connections within the online learning community. Our research findings have important implications for designing effective online programs and supporting the success of post-traditional learners. By pinpointing critical and negligible factors affecting the sense of belonging, we offer actionable strategies to develop a more engaging and supportive online learning environment. However, we are aware of the limitations of our research study, such as the small sample size due to the low survey response rate. Further research gathering more student responses is essential for the generalizability of the findings.

Conflict of Interests Statement

The authors declare that they have no competing interests.

Author Note

The authors report no conflicts of interest in conducting this study. The study's protocol (STUDY00000062) was approved by the Institutional Review Board (IRB) at the authors' home institution.

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Introduction to OLJ Section III

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Abstract

In addition to the two special sections in this third quarterly volume, this issue also contains 10 articles from our regular submission process. These articles cover a broad range of related themes such as online student retention, online faculty effectiveness, developing community, and

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some of the longer-term effects of the COVID pandemic on online students. This paper provides an integrated overview of these articles.

Keywords: online learning, online student retention, faculty effectiveness, developing online community

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Online learning has been an option in higher education for decades. My own institution, the University at Albany, SUNY began offering an online graduate degree in education in the late 1990s. I have taught in that program, first as an adjunct and now as a tenured full professor for more than 20 years. Much of what we know about online learning emerged from early research conducted in the late 1990s and early 2000s. As Editor of this journal, I am frequently surprised to see “settled” questions and findings being addressed again by a new generation of researchers. Initially I felt that re-examining issue around student satisfaction, for example, was unnecessary – we know a lot about what online students like and do not like with regard to online courses and faculty. However, with the tremendous growth in distance learning in light of the pandemic, the definition of an “online student” underwent a dramatic change. In the past, student opted in to online education – it was a voluntary option especially appealing to students who were older,

working, and perhaps also raising families. These students were especially appreciative of asynchronous online options that allowed them to participate in online education when they had the time to do so. The vast majority of online programs in the US were asynchronous, reflecting this need for flexibility.

With the rise of Emergency Remote Teaching (ERT) in response to the pandemic, the assumptions about who opted to enrol in online courses and programs were violated. The asynchronous “solution” to providing flexibility and convenience to a specific population was not necessary – so the vast majority of ERT courses were built around synchronous modalities – primarily around Zoom and other computer conferencing software systems. Suddenly, we were working with a new population (involuntary distance education students) in a new environment – primarily synchronous online coursework. So, it does make sense to re-examine some of the settled questions given the significant changes in population and learning environment. Some of the articles in this issue do investigate issues that may seem settled, but again the populations and technologies are different. Note – it would be sensible and helpful if authors acknowledged these facts and explicitly sought to discover changes to processes and outcomes in these new environments and populations compared with the more traditional ones.

If we consider approaches to enhancing student retention online, for example, one topic that inevitably arises is sense of community in online settings. When students feel affectively and intellectually connected they tend to do better in online settings (and classrooms). We know that sense of community can be enhanced by developing social presence, one component of which is the immediacy behaviours of online faculty. In “It Helped Push Me through the Class”: Community College Student Perceptions of the Role of Instructor Immediacy Behaviours in Completing an Online Course, authors Michelle Orcutt of Amarillo College, and Grant Jackson and Stephanie Jones of Texas Tech University contribute to the literature on online immediacy through a qualitative examination of the perception of online students in an associate’s degree program. Using interview methods, these authors gain insight into empirically informed approaches to enhancing online instructor immediacy with a goal of improving student retention.

The next article, “Student Perceptions of Effective Educators in Online Learning” by Erica Kelly, Julia Colella, and Angela Sottosanti-Kusnir, of Lambton College looks more generally at factors that appeal to online students with regard to their instructors. Through a combination of quantitative and qualitative data analysis the authors sought to determine what factors online students found appealing and what online faculty need to do differently from classroom faculty. They found that, especially in post-pandemic learning, students value instructors who are flexible and empathetic. Moreover, findings establish that students value engagement with instructors, content and peers; flexible course design, a clearly organized learning management systems, and regular communication. These result support previous research on similar topics during the pandemic.

At a more specific level is a paper by the authors Minji Kim, Debalina Maitra, Meseret Hailu and Brooke Coley of Arizona State University. In their paper “Never Met Them in Person, But We Help Each Other”: Black Women’s Experiences in Online Undergraduate Engineering Programs these authors investigate issues of diversity in online education. The authors argue that

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Black women are underrepresented in engineering programs in the US and ask whether online learning represents a partial solution to this problem. Using a qualitative exploratory, case study research design to collect data, the authors conducted interviews based on a 31-item interview protocol with 14 participants. The participants were all undergraduate students attending a large public university in the United States who self-identified as Black women. The analysis identified four themes. Subjects reported: (1) experienced isolation, (2) witnessed varying impacts of COVID-19, (3) observed the benefits and limitations of flexibility of online programs, and (4) engaged in virtual connection building. The paper includes recommendations for programs and future research.

As noted above, the pandemic redefined who was likely to be an online student and what kind of learning environment these students experienced. One group that saw a vast increase was, of course, students in high schools and other pre-college settings. Students and teachers in k-12 distance settings were especially unlikely to have experience with online learning and we know that many of these students and their teachers struggled. The next paper, “The COVID-19 Learning Divide: How Demographics Shaped Online Learning Outcomes for High School Students”, by Kristine Webster of Northern Illinois University investigates which specific groups struggled more. Using data from before and after the pandemic with more than 1100 students, she shows that low income and special education students were more likely to be among the newly struggling (defined as those who received a “D” or “F” grade in two or more classes). Unlike some previous research, this analysis indicates that among newly struggling students, there was not a statistically significant relationship between racial/ethnic minority status and the between-semester difference in the number of D and F course grades.

Again, as noted above, the pandemic changed not only who was likely to be an online student, but also who was now teaching online courses. This change is documented in the next paper, “The Impact and Process of Transition from Face-to-Face to Online Teaching During a Pandemic: A Grounded Theory Approach” by Steven Busby, Elena Wong Espiritu, Marnie Vanden Noven, Jenny Mills, and Julie Hunt of Belmont University. These authors acknowledge that their institution was primarily engaged in face-to-face instruction and that the switch to emergency remote instruction was abrupt and disruptive. Using grounded theory methods to analyze interviews with 24 faculty members, the paper reveals that faculty preparedness to teach online was dependent on their self-efficacy, which in turn affected their experience of the transition for better or worse. There is much detail here, some of which instructors may find resonant, for example, despite significant hype around the concept of “hyflex” teaching, “Hyflex teaching (half the students in the classroom and half online), proved to be clunky, technologically challenging, and ineffective by every participant who mentioned it.”

The next paper in this section is Language Teacher Development in Technology Integration: Exploration, Communication, Collaboration, and Reflection by Jeong-Bae Son of the University of Southern Queensland, Australia, Moonyoung Park, of Jeju National University, Republic of Korea, and Mei-Hui Liu Tunghai University, Taiwan. The paper documents the mechanism by which language teachers enhance their digital competencies. The study sought to explore language teacher development with Son’s (2018) ECCR model and investigated how in-service language teachers engage with their professional development in terms of ECCR. A total of

twelve in-service teachers (2 males and 10 females; age ranging from 26 to 56 years old) from two countries (Taiwan and Hong Kong) participated in the study. Using a questionnaire and semi-structured interviews the authors reveal that the teachers in both countries engage with various ECCR activities with different interests and competencies in their contexts.

Readers of OLJ will recall that Massive Open Online Courses were once predicted to fully disrupt higher education, resulting in consolidation of colleges and potentially closing of many others. The initial hype about MOOCs gradually receded as it became apparent that “free” is not a sustainable business model. One wonders if there are parallels between MOOCs a decade ago and AI now, but I digress. On the bright side (for Harvard and MIT at least), the creators of edX did manage to sell the successful operation to a for-profit online program management company (2U) for hundreds of millions of dollars, putting a seemingly cynical end to the once idealistic vision of free Ivy League education for all. It turns out, however, that the many thousands of online MOOC courses from various MOOC platforms still draw millions of learners and that many of the k-12 students still taking MOOCs have adapted their study to include local support and sharing, a blended learning phenomenon that was reported early on (see for example, Goodwin-Jones, 2014). The theory of Connectivism by Siemens, Cormier and Downes actually originally conceived of MOOCs as a form of open blended learning. The authors of the next paper, “Communities of K-12 Adolescent MOOC Learners from Nepal” Zixi Li, and Curt Bonk of Indiana University and Meina Zhu of Wayne State University investigate these local practices. They note that research on how MOOCs that are designed for adult learners are implemented in K-12 settings is extremely limited. Using a qualitative exploratory interview research approach with 13 adolescent students from Nepal, who had completed from 10 to over 100 MOOC courses the authors, the authors reveal that support from local learning communities (i.e., teachers, peers, school, and family) contributed to a robust open learning environment. MOOCs are not dead, but continue to provide value for many students in the developing and developed world.

The authors of the next paper, “Automatic Detection of Metacognitive Language and Student Achievement in an Online STEM College Course” Hannah Valdiviejas, Renato Ferreira Leitão Azevedo, Nigel Bosch, and Michelle Perry of the University of Illinois Urbana Champaign argue that metacognition is a helpful indicator of much needed self-regulatory behaviours among undergraduate online STEM students. Traditional methods of measuring metacognitive indicators rely on either unreliable student reports or time-consuming analyses of online forums. They also considered how students’ engagement, verbosity, and prior knowledge might relate to their metacognition to impact their performance in an online STEM course. They found that metacognition predicted course grade with no significant differences between under-represented and non-underrepresented STEM students. They conclude that the online learning may allow students from diverse groups to engage equally in a critical aspect of self-regulated learning: metacognition. Implications of the results for teaching and learning are discussed.

The next paper in this section is “A Meta-Analysis of Self-Regulated Learning Interventions Studies on Learning Outcomes in Online and Blended Environments” by Mochamad Guntur and Yoppy Wahyu Purnomo of Universitas Negeri, Yogyakarta, Indonesia. Clearly online learning demands new forms of self-regulation that is not required in classroom settings. My colleagues and I have written about this in numerous articles dating back more than a decade (Shea

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& Bidjerano, 2010) but most recently in 2022 (Shea, Swan, Richardson, J., 2022). In that paper we argued that forms of collaborative online learning required new approaches to the notion of regulation in online environments, included consideration of co-regulation and socially shared regulation of learning, a concept we labelled “learning presence” to highlight the kinds of awareness of learning traditionally captured under the concepts of meta-cognition and self-regulation. Guntur and Purnomo make an argument that many authors have recently conducted intervention studies to try to enhance learning processes and outcomes through the lens of self-regulation and that providing a quantitative summary of these studies through meta-analysis may help us better understand the average effects of these interventions. They conclude that self-regulated learning strategies had a “moderate” effect on learning outcomes in online and blended environments. Interestingly, the calculated common effect size showed no significant difference according to the type of self-regulated learning strategy, course type, school level, and learning context. Clearly, more research is needed in this area.

The final paper in this issue is “Skills Needed for Success in Online Teaching: A Qualitative Study of Experienced Instructors” by Mary Ellen Dello Stritto and Naomi Aguiar of Oregon State University. The goal of this qualitative study was to identify the most valued skills online instructors need to teach successfully. Faculty with at least ten years of online teaching experience at a highly ranked institution for online education were interviewed about their online teaching experiences. Guided by the Community of Inquiry theory, Faculty Readiness and the Technology Acceptance models, six themes emerged from the authors’ analysis. These themes include written communication, responsiveness, organization, time management, flexibility and creativity.

Many thanks to Aras Bozkurt and Haesol Bae for their efforts on the AI special issue of the journal and also to Patsy Moskal for her work on the conferences issue. These guest editor dedicated much time and effort to communicating, screening, reviewing, and curating this extensive issue and we are appreciative for all of their work. Also a huge thank you to our other editors, authors, reviewers, copyeditors and the staff at OLC for their many contributions to support the success of the journal.

Please consider joining OLC, our publisher, as a community, professional, or institutional member. The Online Learning Consortium provides support that allows OLJ to continue to publish as an open access journal, providing free access to scholarship as a service to the field. Your support, even as a free community member, is a way to give back to OLC and support our mission to remain open access and free.

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“It Helped Push Me Through the Class”: Community College Student Perceptions of the Role of Instructor Immediacy Behaviors in Completing an Online Course

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**“It Helped Push Me Through the Class”: Community College Student Perceptions of the Role of
Instructor Immediacy Behaviors in Completing an Online Course**

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Abstract

For decades, the number of students enrolling in online courses has been increasing, and this trend toward online education has been further intensified as a result of the COVID-19 pandemic. The completion rate of online courses is not as high as in-person instruction, and researchers and practitioners have long been invested in identifying ways in which online education can be optimized. One dimension of online education that has received scholarly attention is the *transactional distance* that exists between students and instructors, which, if not appropriately minimized, can lead to a variety of negative student outcomes. Scholars have also identified a variety of verbal and nonverbal *immediacy behaviors* that can help online instructors decrease this transactional distance and promote a variety of positive student outcomes. To date, the study of immediacy behaviors in online college courses has focused primarily on four-year institutions utilizing quantitative methods. As complement to this research, we interviewed 12 community college students to better understand how a particular set of immediacy behaviors (i.e., a “welcome” phone call, sending personalized emails, using humor, creating videos, and sending “check-in” emails) influenced students’ desire and ability to remain in and complete an online course. Implications of these findings for practice and future research are discussed.

Keywords: Online teaching, online learning, immediacy, immediacy behaviors, transactional distance

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Over the last decade, the number of college students taking online courses has grown significantly in the U.S., with over half of college students enrolled in online coursework as of 2020 (51.8%; Smalley, 2021). At the community college level, this has led to an increase in online courses that has outpaced the increase in traditional, in-person courses (Allen & Seaman, 2017). Although the successful completion of online courses can nearly double the likelihood that community college students earn a degree or transfer to a four-year institution (Shea & Bidjerano, 2019), there is a “tipping point” of online coursework (i.e., 40% of course enrollment) beyond which the beneficial effects of taking community college courses online begin to diminish (Shea & Bidjerano, 2018). Overall, student success in online coursework (e.g., course completion, academic

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performance, persistence to future coursework) continues to lag traditional course delivery (Allen & Seaman, 2015; Bawa, 2016; Glazier, 2016; National Center for Education Statistics, 2014, Tate & Warschauer, 2022).

Research on online education reveals a variety of factors associated with students’ struggles in online learning. For example, college instructors are rarely trained in pedagogy, curriculum, and assessment (Bair & Bair, 2011; Chang, 2018; Fletcher & Bullock, 2015; Tinto, 2012) and they are often not provided leadership, guidelines, or formal procedures related to online course development (Kanuka, 2001; Shaw, 2012). In addition, without the consistent presence of an instructor, online courses can feel like isolative, automated course experiences comprised of reading assignments, posting on discussion boards, and completing assessments with automatic scoring and feedback (Campbell, 2014; Chang, 2018).

Researchers have described this feeling of isolation as a lack of immediacy, which refers to the perceived physical and/or psychological closeness between people (Baker, 2010; Mehrabian, 1969, 1981; Ladyshevsky, 2013). Research has also illuminated a variety of immediacy behaviors that instructors can perform to reduce the perceived transactional distance between them and their students (Moore, 1973; Moore & Kearsley, 1996). Such behaviors (described hereafter) can be verbal, nonverbal, and range from requiring relatively little time and energy (e.g., being enthusiastic when providing instruction) to requiring significant time and energy (e.g., devoting hours to meeting with students or providing substantial feedback on assignments) (Bello et al., 2020; Dixon et al., 2017; Schutt et al., 2009).

The reduction of this perceived transactional distance through such immediacy behaviors has been found to be associated with a variety of positive college student outcomes related to student motivation and learning in both face-to-face courses (Andersen, 1979; Christophel, 1990; Christophel, 1990; Edwards & Edwards, 2001; Gorham, 1988; Jensen, 1999; Roberts & Friedman, 2013) and online courses at four-year universities (Bailie, 2012; Baker, 2010; Bello et al., 2020; Campbell, 2014; Dixon et al., 2017; Schutt et al., 2017), including graduate-level coursework (Russo & Benson, 2005; Arbaugh, 2001). Though courses at four-year institutions have been the focus of the majority of such studies, similar positive relationships have also been found in three studies of online community college courses (Dilling et al., 2020; Jackson et al., 2010; Pelowski, 2005).

Research Question and Purpose

In addition to focusing primarily on online courses at four-year institutions, the research on immediacy behaviors in online teaching has relied almost exclusively on quantitative methodologies. The one exception was a study conducted by Melrose and Bergeron (2006), in which the researchers conducted and analyzed interviews with healthcare graduate students. We also found studies that used content analysis (Johnson & Card, 2007) and other observational

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methods (Dixson et al., 2017; Pelowski, 2005), though the findings associated with each of these approaches were coded by the researchers in order to conduct quantitative analyses. Thus, as a complement to previous research that focused on coursework at four-year institutions and in graduate school, the present study utilized semi-structured student interviews to discern the ways in which a set of instructor immediacy behaviors (i.e., a “welcome” phone call, sending personalized emails, using humor, creating videos, and sending “check-in” emails) influenced community college students’ experiences and success in an online course. Our efforts were guided by our overarching research question: How did students perceive their instructor’s immediacy behaviors to have influenced their overall success and persistence in the course?

The purpose of this study was to illuminate behaviors and pedagogical practices that community college students perceived their instructors had implemented to reduce the perceived distance between them and their students (and why students found such practices to be helpful or not), thereby enhancing the teaching, learning, and overall experience that this unique (and underserved) group of students have in online courses. In the following sections, we provide a review of the literature on transactional distance and immediacy, which provided the theoretical grounding for our interview protocol, data analysis, and the overarching research question that guided these efforts: In what ways do community college students perceive their instructor’s immediacy behaviors to have influenced their completion of their online course? We then outline the methods we used to answer our research question, describe our findings, and discuss implications of this study for practice and future research.

Literature Review

Transactional Distance and Immediacy

While distance education scholars and professionals emphasize and value the ways in which online offerings increase access to higher education, particularly among minoritized groups (Anderson & Simpson, 2012; Moore & Kearsley, 1996), scholars and professionals are equally invested in optimizing the quality of such online offerings (Batts, 2010; Bawa, 2016; Ray, 2009). Though such optimization will depend upon the efforts of multiple parties (e.g., scholars, researchers, professionals) at multiple levels (e.g., national, institutional, departmental), the interactions and relationships between instructors and students (or lack thereof) have been found to be central to the overall quality of students’ experiences in distance education (Gaytan, 2015; Harrison & Mathuews, 2022; Meyer, 2014).

One predictor of student success in online education is the prevalence, quality, and timeliness of student-instructor communication and interactions (Baker, 2010; Croxton, 2014). High quality communication between instructors and students and strong instructor-student rapport are associated with a variety of positive outcomes, including higher levels of student motivation, improved learning, and overall course satisfaction (Andersen, 1979; Bailie, 2012; Wilson & Ryan, 2013). Scholars also see the establishment of such rapport as a rather accessible route to improving online education, one that can help instructors and departments reduce some of the more cumbersome aspects of departmental or institutional change (e.g., policy revisions, consensus gaining, budget considerations, committee work) (Glazier, 2016).

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In the distance education literature, scholars have described this dimension of the instructor-student relationship in terms of transactional distance (Falloon, 2011; Moore, 1973; Moore & Kearsley, 1996; Stein et al., 2005; Ustati & Hassan, 2013; Weidlich & Bastiaens, 2018), immediacy (Mehrabian, 1969, 1981), and immediacy behaviors that can reduce transactional distance between instructors and students (Andersen, 1979; Baker, 2010; Chang, 2018; Christophel, 1990; Gorham, 1988; Ladyshevsky, 2013). Transactional distance theory describes how the quality and intensity of the interaction between learners and the learning environment (as opposed to the quantity), and the responsiveness of instructors to learners’ needs, influences student success. The theory highlights “a distance of understandings and perceptions, caused in part by the geographic distance, that has to be overcome by instructors, learners and educational organizations if effective, deliberate, planned learning is to occur” (Moore, 1991, p. 2). As this transactional distance increases, student learning, development, and the overall course experience is hindered.

Conversely, immediacy refers to a perceived physical and/or psychological closeness between people, and immediacy behaviors are verbal and nonverbal actions that, in reducing the perceived “distance” between instructors and students, help promote increased affective and cognitive learning (Andersen, 1979; Baker, 2010; Christophel, 1990; Gorham, 1988; Richmond & McCroskey, 2000). Examples of instructor immediacy behaviors include the sharing of personal experiences, encouraging students to talk, addressing students by name, using inclusive language, providing timely and thoughtful feedback, praising students’ work, and, generally, having an overall willingness to meet, converse with, and interact with students (Bello et al., 2020; Dixon et al., 2017; Edwards & Edwards, 2001; Gorham, 1988). Instructors can also reduce transactional distance by recognizing and affirming individual students and their viewpoints, incorporating student input into course and class design, communicating availability and willingness to engage in one-to-one interactions, and using humor and self-disclosure as ways to signal accessibility to students (Baker, 2010; Gorham, 1988).

The importance of such behaviors in online settings is brought into sharp relief by the significant transactional distance that can be felt between instructors and students in online teaching and learning (Arbaugh, 2001; Baker & Woods, 2004; Croxton, 2014; Weidlich & Bastiaens, 2018). As described in the following sections, the interviews conducted in this study were designed to discern the ways in which a set of instructor immediacy behaviors (i.e., a “welcome” phone call, sending personalized emails, using humor, creating videos, and sending “check-in” emails) influenced students’ completion of an online course.

Method

Research Design and Paradigm

Participants in this study first experienced five empirically informed immediacy behaviors in an online community college course:

1. A “welcome” phone call: The community college instructors called students during the first week of the course to welcome them and ensure the student understood course expectations. The instructor explained where their office was located and welcomed them to call or come by if they had any questions (Gorham, 1988; Ladyshevsky, 2013; Legg & Wilson, 2009).

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2. Personalized emails: The instructors used students’ names in all individual email correspondence (Gorham, 1988).
3. Use of humor: When appropriate, the instructors used humor in email correspondence through emojis and feedback to build rapport (Arbaugh, 2001; Campbell, 2014; Gorham, 1988).
4. Instructor-created video: The instructors created videos to explain assignments (Arbaugh, 2001; Campbell, 2014, Gorham, 1988).
5. Personal “check-in” emails: The instructor sent two check-in emails to students with their current grades (in week three and week six of an eight-week semester) (Legg & Wilson, 2009).

Given the nature of our research question, the lead researcher subsequently conducted semi-structured interviews as part of this qualitative, narrative study. Narrative inquiry centers on individuals’ perceptions of their lived experiences that are “extended over time, shaped by personal and social conditions” (Clandinin et al., 2007, pp. 25-26). In providing participants opportunities to relate their own stories of how they perceived and experienced the five instructor immediacy behaviors, our research efforts are grounded in social constructivism, a paradigm in which knowledge is produced by illuminating and making meaning of the complexity of individuals’ lived experiences (Creswell & Poth, 2018).

Participants were first asked to share their perceptions of the ways in which the five instructors immediacy behaviors influenced their decision to remain in the course. Subsequent questions provided participants opportunities to discuss each of the behaviors individually and, if applicable, share why they perceived some of the behaviors to be more positively influential for them than others. Throughout the interviews, follow-up questions were asked to allow for additional elaboration and clarification. Participants were also given an opportunity at the end of their interview to share any additional thoughts or perceptions related to their course experience that they had not yet shared.

Author Positionality

In the social constructivist paradigm, researchers recognize the ways in which their own identities and background shape and influence the research process (Creswell & Poth, 2018). The first author of this study is a white woman and communication professor at a large community college. She attended the community college as a non-traditional student, and her background includes 15 years of experience taking, designing, and teaching online and hybrid courses. The second author is a white man and faculty member in the field of higher education at a large research university. As part of his research agenda, he studies inclusive teaching, college student belonging, and he has conducted multiple studies related to both online learning and community college students. He has also taught college courses online, and he attended a community college as an undergraduate. The third author is a white, female faculty member in the field of higher education and administrator in research and innovation at a large research university. She has over 23 years of distance learning experiences in institution-wide leadership roles, instructional design, as well as faculty and scholar of distance learning.

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Sample and Data Collection

The sample for this study was purposeful, given our need to interview students who had experienced the five instructor immediacy behaviors (described previously) in an online course. Students who had experienced these five behaviors in one of six sections of an online interpersonal communication course during the Fall 2020 semester at a large, public community college in Texas were invited to be interviewed via an email from their instructor (which had been written by the lead researcher). These six sections were taught by four instructors and consisted of the same course content, structure, textbook, and assignments. Students were offered a \$25 gift card for their time, and a total of 12 students (9 female, 3 male) responded to the email and became participants in the study.

The lead researcher was not one of the four instructors of the course, but she was a member of the department that offered the course, so multiple steps were taken to help reassure participants that their identities and responses would not be identifiable to their instructors or others within the department (i.e., cameras being turned off during Zoom interviews, no collection of demographic information beyond sex, the use of pseudonyms). Demographic information for the four course instructors is provided in Table 1.

Table 1

Select Instructor Demographics

	Age	Sex	Race	Years Teaching	Years Teaching Online
Instructor 1	36	Female	White	10	10
Instructor 2	49	Female	White	10	6
Instructor 3	52	Female	White	10	10
Instructor 4	65	Male	White	33	12

Data Analysis and Trustworthiness

Participants’ responses were recorded, transcribed, and analyzed by the lead researcher using constant comparison as well as an open, axial, and selective coding approach (Strauss & Corbin, 1998). Such coding facilitates “a cyclical and evolving data loop in which the researcher interacts, is constantly comparing data and applying data reduction, and consolidation techniques” (Williams & Moser, 2019, p. 47). In so doing, themes were identified and interpreted, which were guided by the study’s theoretical framing and research question. To help ensure trustworthiness, reflexive journaling (Creswell & Poth, 2018; Janesick, 2011) and member checking (Cohen & Crabtree, 2006) were employed throughout the data collection and analysis processes.

Findings

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Perceptions of the Relationship Between Immediacy Behaviors and Course Completion

Our research question focused on students’ perceptions of how their instructor’s immediacy behaviors helped them persist to the completion of an online interpersonal communication course. These five immediacy behaviors included instructors making a “welcome” phone call, sending personalized emails, using humor, creating videos (recordings of lectures and assignment overviews), and sending “check-in” emails. Themes that emerged in students’ discussions of these immediacy behaviors are summarized in Table 2 and described in greater detail in the following sections (including student quotations via pseudonyms).

Table 2

Students’ Perceptions of How Instructor Immediacy Behaviors Influenced Their Course Experience and Completion

Instructor Immediacy Behavior	Themes
Making “Welcome” Phone Calls	<ul style="list-style-type: none"> • Helped established a more personal relationship with their instructor • Helped students feel more connected to their instructor/less on their own • Provided students a better sense of the course experience that was ahead of them • Humanized the instructor and made them more approachable • Opened lines of communication early in the semester
Sending Personalized Emails	<ul style="list-style-type: none"> • Made students feel seen and valued in their online course • Set a personal tone that made students feel comfortable to reach out to their instructor • Made the instructor seem more personable and caring • Increased students’ desire to pay attention, engage, and be successful in the course
Using Humor	<ul style="list-style-type: none"> • Made the instructor more relatable • Made the course experience more relaxing, comfortable, positive • Increased students desire and ability to attend, pay attention, participate, “open up,” and retain what they were learning • Made the instructor easier to approach when students were struggling • The use of emojis helped students feel that the instructor understood them
Creating Videos	<ul style="list-style-type: none"> • Provided students multiple ways of understanding assignments (i.e., written instructions and video instructions provided by the instructor) • Provided the instructor additional opportunities to talk about themselves and help students get to know them better • Increased students’ understanding of the material • Helped students feel less isolated/on their own

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- Enabled students to access assignment instructions more than once/freely
 - Enabled students to take notes at their convenience
- Sending
Check-in
Emails
- Provided students renewed sense of purpose and motivation
 - Made students feel that the instructor cares
 - Prompted students to improve/modify their efforts (e.g., overcoming procrastination or struggling with the course in other ways)
 - Enabled the instructor to provide individualized guidance and support
 - Enabled the instructor to provide individualized adaptation (e.g., when students became sick)
 - Created a channel through which students could ask the instructor questions
 - Made students more desirous to stay in the course (when told by the instructor in a check-in email that they were doing well in the course)
-

Making “Welcome” Phone Calls

Students shared a variety of ways in which their instructor’s welcome phone call had a positive influence throughout the semester and helped them complete the course. The phone call was unexpected, catching them off guard, as it was not something they experienced regularly. It left an impression and caused them to perceive a more personal relationship. The call made students feel more connected and less isolated. It gave them a better sense of what was going on with the course. Some examples of these connections were shared by the students.

Stephen said that “the phone call especially helped [me] to be a little bit more connected because I am online.” Stephanie shared that the phone call “helps you to develop a more personal relationship and lets us know our instructor. They’re human too, you know?” Jacob discussed how getting the phone call from his instructor was one of the most influential immediacy behaviors, highlighting how his instructor

actually got to talk to us one-on-one, instead of it being them introducing themselves over the whole classroom, I guess. Because you were able to talk to her one-on-one, and I feel like that’s a lot. It gives you a better chance to communicate and get to know your instructor as well as them getting to know you. So, I got to know who I was attending class for.

Kathleen shared similar sentiments and went further, suggesting that such phone calls should be a norm:

I definitely think I need to hear [the instructor’s] voice. So, I know that you’re my teacher and stuff like that, so I can get a little bit personal and like be able to text you. I think that’d be good for people, too.

Students shared how making such connections early in the semester opened the line of communication, made the instructor seem more approachable, and made it easier for them to reach out when they needed help. In these ways, such phone calls helped the instructors reduce the

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transactional distance between them and their students (early on in the semester, but with semester-long effects).

Sending Personalized Emails

Students also discussed ways in which personalized email from instructors influenced their experience and completion of the course. Stephen described how helpful it was to have the instructor call him by his name, which is something he does when he interacts with customers at his job:

Something I’ve learned after guest interaction is that I try to at least get somebody’s name so I can have that sort of connection. And even though it’s used over email, reading that kind of feels like she actually took the time to get to know the student a little bit more, even know my name and be familiar with my question enough to respond.

Kathleen shared that some teachers do not reach out at all in online courses, and that this makes it harder to go through the course; however, personalized emails felt like an opening in the beginning of the semester to make communicating more comfortable:

So, [some instructors] give you one email in the beginning and that’s it. So, you don’t know, “if I email him, is he going to reply? Is he going to tell me this?” But when you get to know them at the beginning, I think it’s easier for kids to email and text and be like, “Hey, I need help.”

She also said that she liked it when teachers used students’ names when emailing, and not just “student.” She shared how this made her instructor more personable, and “it seems as though she cared, I guess is what I am trying to say. So that was actually very helpful.” Stephanie also discussed how the emails helped her feel noticed and strengthened her relationship with the instructor:

I think using my name because, you know, in these online classes and stuff, it’s hard to feel like they notice you, but when they call you by name it makes it feel more personal, you know? And it’s easier to listen to somebody I feel that knows me, than to just some random person, you know?

Overall, students perceived the instructor as more caring when the instructor took the extra time to use their name in email correspondence, and they felt more of a personal connection with the instructor. They perceived this connection as the instructor “knowing” them more, resulting in them wanting to pay more attention and be more engaged and successful in the course.

Using Humor

In addition to the kinds of communication that instructors initiated via phone and email, students described how their instructor’s use of humor influenced their experience and completion of the course. Marcie answered, “for sure,” when asked if the immediacy behaviors influenced her decision to remain in the course, and she described how the use of humor and emojis “helped make things a little more relaxing.” Zackery similarly described how instructor rapport influenced his persistence in the course as he described “being more comfortable” and “having a positive atmosphere” created by the instructor. Stephanie shared that the use of humor.

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gives you a sense that they're more there. Not just because they have to be, you know, adding a little humor and jokes and stuff like that. It just makes you want to be there. It just helps me open up personally.

Similarly, Chrishelle described how the use of humor can make instructors easier to pay attention to and helped her retain what they were teaching her:

It's just nice to have a fun teacher because then they interact more, and it's harder to listen to someone just talk and not really explain. But mine who use humor, I feel like they explain more because they would add the humor in and they'd be like, “oh, that's funny.” And I remember it because you said that.

Melanie explained how the instructor's use of humor made her more relatable, which influenced her success in the course:

She treated us as if like, “oh hey, you're struggling a little bit? They need a little bit of help.” And she was lighthearted about it. She did have jokes. She didn't make us feel dumb about asking for help, or she was like, “there's no stupid questions,” basically, and that helped a lot.

In addition to the use of humor through jokes and other verbal means, students also discussed how emojis (a nonverbal immediacy behavior) had a positive influence on their course experience and persistence. When explaining which of the immediacy behaviors influenced her success the most, Kathleen said, “probably using the humor through emojis, because I know we're all the little young'uns using texting emojis and everything. So, it kind of felt like she understood us, I guess.” Similarly, Whitley perceived that the younger students probably found emojis beneficial, but she did not as much: “It's fun and maybe once or twice, but I wouldn't get carried away with the emojis just because . . . I'm a little bit older in college.”

Overall, students generally perceived the instructor to be more relatable when they used humor. They perceived that an instructor who was more relatable was easier to approach when struggling with something, which played a significant role in their engagement, overall success, and persistence in the course.

Creating Videos

Instructors also created recorded lectures and videos to describe assignments, which students found to be helpful in a few ways. Jacob described how his instructor was able to “explain [the assignment] to us a bit better, and she made sure to include herself and a little bit about her in that. So, I thought that was really cool because I've never had a professor do that.” Misty shared how the instructor videos increased her understanding of the material and helped her to feel less isolated:

Whenever she created videos to explain an assignment, it was easier for me to understand a lot of the times just because listening to it and her explain all the assignment, I think it was more like, it doesn't make you feel like you're just at home . . . Like you actually get to see somebody. It's not like you're just reading and doing it on your own.

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Melanie appreciated instructor videos for similar reasons, but also found it helpful to be able to access assignment explanations at more than just one point in time:

She would actually do a video lecture and it was so great because I’ve had the teachers that they’re just like, “well, okay, here’s [the textbook]. And here’s what you’re supposed to do.” And they explain everything and they just kind of expect you to take it on yourself and be like, “Oh, okay.” And I understand it’s, like, an element of college, but it helps to have the video lecture from her where we could just watch it.

Chrishelle also discussed how she “can go back and watch [the video] if I miss something,” and Misty perceived that “it was nice to be able to refer back to [recordings] because it was already videoed.

Overall, students perceived the instructor videos as contributing positively to their success and course completion because it helped them to feel less isolated and as if they just needed to figure things out on their own. They appreciated the assistance in explaining assignments and getting personal examples from the instructor, who they saw as a real person from the videos. Students agreed that being able to go back and access the instructor videos anytime throughout the course was beneficial, and they perceived that it helped them do well on assignments. They shared that having the ability to take notes at their convenience by watching the videos was invaluable to their grade and their success in the course.

Sending Check-in Emails

Finally, students discussed how instructors sending check-in emails during weeks three and six helped them persist in the course. Jacob enjoyed that his instructor would send motivating messages: “She would message us randomly, and she would be like, ‘Hey you’re doing really good in the course.’ I thought that was very neat, I’ve never had professors do any of what she did, honestly.” Jacob also shared that, in past semesters, he had to withdraw from his courses because of some “stuff” he was going through at home. He reflected on the check-in emails from his instructor fondly as he shared, “Whenever I got that [email], I thought that was very, very nice, because I’ve really never had a professor do that, so I do remember all of that.” Jacob also shared that, at times, students struggle to remain motivated in the course, and the instructor’s check-in email was the biggest influence on him: “I just feel like [the check-in emails were] the biggest [immediacy behavior] for me, honestly, because you really never know what someone’s going through at home and you don’t know if they just needed like that extra push, you know?” Kylie added:

I think the check-in email on the third and sixth week was nice. It’s like, she actually cares . . . Not many teachers do that, especially online. I’ve taken a lot of online courses over the past year, especially. So, yeah, I think they did very well keeping us engaged.

Crishelle described getting the emails as being motivational in ways that made her want to stay in the class:

Just them emailing, like, “oh, you’re making this grade,” or, “you’re doing such a good job.” Just made me like, “okay, I’m doing good in this class, so I want to stay in the class”

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and then they acknowledge that. I keep close track with my grades. It’s just nice to have them acknowledge it.

Marcie agreed that the instructor’s check-in emails helped her push through the class at a difficult point:

I check my grade pretty frequently, but getting those check-in emails were also great too because if my teachers [saw] something we could improve on, they also included that, or just the words of encouragement was great. It helped push me through the class when I was kind of procrastinating, and if there was something I could improve upon, that was just a great reminder that I could keep going back to and referring to whenever I was doing my next assignment.

Similarly, Melanie said she got sick with COVID-19 during the course, and those check-in emails helped pave the way for her and her instructor to navigate that together, which left a positive impression on her:

She was like, we can pause it for you. You can come back later. And then afterwards she still was checking up on me just to make sure I was okay. Did I get the content? Did I need extra time? And it was so relieving to have a professor just email, just to check up on you, just to make sure you were doing okay. Luckily, I was able to get through it, but I was so sick, and she was the only one professor out of all of the ones that I had that semester that actually did check up on me after I told them, “Hey, I have COVID. I don’t know how sick I’m going to get, but I’m going to try to do the work.” She’s the one that said we can move this over, and we can pause this for you just to make sure you don’t fail the course.

Marcie also shared how important the check-in emails were for her, given that she needed to travel frequently:

I’m actually a performer, so I had to have online classes because I’m not always in town. So, [the check-in emails] just made it to where I could relax a little bit more in the class, and I wasn’t as stressed out. The instructor sending check-in emails with me made it easier for me to know how I was doing in the class and what I could improve on.

Kathleen also found the check-in emails to be an opportunity to ask questions about course content: “That was actually very resourceful . . . the check-in emails helped a lot. Like, ‘Oh, I don’t understand this, can you help me out?’ It was very helpful.”

Many students appreciated the emails as they gave them a sense of how they were doing and the areas where they could improve. Students explained that it was easy to respond to the email to get clarification from their instructor, helping them be more successful in their coursework. The check-in emails left a memorable impression, as it was not something that was common among the instructors they had previously. Students perceived that the check-in emails showed that the instructor cared about them and their well-being, even outside of the course. Many of them explained that it gave them an extra “push” when they needed motivation and helped push them through to the end.

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Study Limitations

Before discussing the implications of these findings, a few limitations to the study should be noted. This study focused on a particular set of five immediacy behaviors, which do not represent an exhaustive list, thus limiting the implications of the study to those particular behaviors. Similarly, students in this study experienced these behaviors in conjunction with the same course (albeit different sections) at the same college. Therefore, the transferability of these findings will vary in terms of how they apply to students who (a) attend different types of institutions, (b) take courses in other fields and disciplines, and (c) have different instructors of diverse identities and backgrounds who vary in the ways they perform these immediacy behaviors.

We also acknowledge that, in asking students to share their perceptions of these immediacy behaviors, we were collecting a form of self-reported data that can be influenced by social desirability bias (i.e., the desire to present oneself favorably in the interview setting), the extent to which students were able to remember these five behaviors, and the extent to which students were able to remember how they experienced these behaviors at that time and thereafter. It should also be noted that these students were describing a course that they took in the fall of 2020 during the COVID-19 pandemic. Though this represents a time in which immediacy behaviors would presumably be all the more important and, therefore, an important time in which to study how students experience them, the ways in which students experience instructor immediacy behaviors may differ in non-pandemic times.

Discussion

Our research question examined community college students’ perceptions of how their instructor’s immediacy behaviors helped them experience success (in various forms) and persist to completing an interpersonal communication course. The findings of this qualitative study align closely with previous studies of immediacy behaviors in college teaching, the majority of which have been quantitative analyses that focused primarily on students at four-year institutions (including graduate school) that generally do not experience the kinds of struggles and limited resources that community colleges and their students experience. While the interviews conducted in this study provided additional evidence that community college students appreciate immediacy behaviors, and that such behaviors help them persist in their coursework, the interviews also provided participants in this study opportunities to elaborate on why and how these behaviors are helpful to this vulnerable group of college students, providing researchers and instructors deeper insight into how immediacy behaviors decrease the “distance” between instructors and students and promote student success and persistence.

Overall, participants perceived that the check-in emails and the phone call from their instructor benefited them the most. This perception aligns with Moore’s transactional distance theory (Moore, 1973; Moore & Kearsley, 1996) in that, by reducing the transactional distance between student and instructor, students feel less isolated. Similarly, past research shows that early contact (as with the “welcome” phone calls in this study) has the potential advantage of improving retention (Legg & Wilson, 2009). This aligns with research findings that online courses with high levels of interactivity lead to higher levels of student motivation, improved learning outcomes, and satisfaction (Bailie, 2012), and that student-instructor dialogue is essential for reducing transactional distance in online courses (Moore, 1973; Moore & Kearsley, 1996).

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Most participants agreed that one-on-one interactions with the instructor were beneficial. Instructors taking time out of their day to make phone calls gave the personal touch that they perceived to be lacking in online classes. Students perceived a personal connection with the instructor, and several commented that they wanted to do better in and remain in the class when they had even a small personal connection with the instructor. Through the use of such instructor immediacy behaviors, the level and quality of interactions increased, enabling these students and instructors to reduce the psychological and perceived physical distance between them (Menchaca & Bekele, 2008; Tinto, 2012).

When describing how students perceived the instructor after receiving personalized emails, students used words like “caring,” “helpful,” “connecting,” and “responsive.” By taking the extra time to use the students’ name, the instructor showed that they were open to communicating with them and made students feel more comfortable reaching out. The findings correlate with research done by Gorham (1998) who studied verbal immediacy behaviors that include addressing students by name, using inclusive language (referring to class as “our” class or what “we” are doing), and praising students’ work, providing online instructors a relatively low-effort way of making a positive impact on their students’ course experience and persistence.

Students also perceived that the use of instructor humor and rapport-building made the atmosphere of the online course more fun and relaxed. The relaxed interaction allowed the students to see the “humanness” of the instructor (Gorham, 1988, p. 52) and that the instructor enjoyed what they were doing, which helped students want to remain in the course. Participants made comments relating to how the instructor was lighthearted, could joke around, and understood them. Research has found that such rapport between students and instructors leads to numerous positive student outcomes, including attitudes toward the instructor and course, student motivation, and perceived learning (Andersen, 1979; Wilson & Ryan, 2013). This aligns with Glazier’s (2016) observation that rapport building is an effort that, on the one hand, leads to significant improvements in student success and, on the other hand, does not require budget requests, policy revisions, committee meetings, or other more time-intensive efforts at the organizational level.

Finally, students found the instructor videos informative, accessible, and helpful in terms of helping students get to know their instructor and feel less isolated. Such videos have been found to be especially important to students in asynchronous online courses (Gaytan, 2015), providing instructors opportunities to be expressive, smile at the class, and be at ease in their presentation (Gorham, 1988). Such efforts decreased the perceived transactional distance between students and their instructors and helped students develop a similar sense of ease, which, in turn, strengthened their desire to persist and their confidence in completing the course.

Recommendations for Practice

Whether academic programs at community colleges offer students a blend of online and in-person coursework, and particularly if programs offer online courses exclusively (see Shea & Bidjerano, 2018 for an analysis of such blends), it will be important that programs and instructors are invested in optimizing the online learning experiences of their students. A key dimension of their students’ experience will be the extent to which transactional distance (Falloon, 2011; Moore, 1973; Moore & Kearsley, 1996; Stein et al., 2005; Ustati & Hassan, 2013; Weidlich & Bastiaens, 2018) can be minimized through instructor immediacy behaviors (Andersen, 1979; Baker, 2010;

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Chang, 2018; Christophel, 1990; Gorham, 1988; Ladyshevsky, 2013), a subset of which were the focus of this study. Grounded in students’ descriptions of how such behaviors enhanced their overall learning and success, the findings of this study provide unique insights into minimizing such “distance” between students and their instructors.

Creating Consistent and Structured Opportunities to Communicate with Students

As part of the development of a syllabus, online instructors should consider creating a schedule for communicating with students throughout the semester. In this study, students shared that they felt more connected in online courses when the instructor was actively involved and present in the course. In line with Croxton’s (2014) assertion that one of the greatest predictors of student satisfaction and success is the prevalence, quality, and timeliness of student–instructor communication, creating a schedule for communication with students at the beginning of the semester (and augmenting it as needed throughout the semester) can be a simple way for instructors to ensure that such interactions are central in their course. In addition, providing such a schedule in the syllabus and talking about it with students at the beginning of the semester (along with why it is there and why the instructor values such interactions) sends an important signal to students and can have a positive influence on the overall tone of the course.

Furthermore, the messages instructors share throughout the semester should be thoughtful, supportive, and demonstrate genuine care for their students (Bailie, 2012; Gorham, 1988). It is also important for instructors to maintain consistent contact, meaning that instructors need to respond to learner-initiated communication and provide feedback on assignments in a timely manner (Dennen & Darabi, 2007). In this study, such communication (e.g., personal check-in emails, “welcome” phone calls, and instructor videos) helped learners and instructors reduce the psychological and perceived physical distance between them, which, in turn, motivated students to be successful and persist in the course (Andersen, 1979; Chang, 2018; Mehrabian, 1969, 1981; Moore, 1973; Moore & Kearsley, 1996; Weidlich & Bastiaens, 2018).

Of course, such immediacy behaviors may not come naturally to everyone. Some instructors may not be comfortable with making phone calls to students, using humor in their courses, or teaching in ways that differ from the ways they were taught as students. In this sense, the effective implementation of immediacy behaviors in online teaching may require some experimentation and refinement. Trying new things can take time and/or cause discomfort, but as immediacy behaviors become the norm in one’s teaching, they can not only increase student learning, but save instructor time as well (e.g., students experience less struggles, questions, and confusion, requiring less instructor assistance outside of class).

Providing Online Instructors with Online-Specific Instructional Training

Online instructors’ efficacy in decreasing transactional distance through immediacy behaviors can depend significantly on the training they receive (Ustati & Hassan, 2013). Such training and related instructional development opportunities will need to focus not only on the basics of course delivery and technical areas (i.e., the minimum necessary to get a course up and running), but best teaching practices as well (Batts et al., 2010). Further, scholars emphasize that online faculty need training that would allow them to gain a better understanding of a wide range of online instructional best practices, including those that can reduce the transactional distance between them and their students (e.g., high quantity and quality of instruction, recorded videos;

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various forms of faculty-student and student–student interactions, prompt and high-quality feedback) (Croxtton, 2014; Gaytan, 2015; Menchaca & Bekele, 2008). Given that many immediacy behaviors are not very time- and effort-intensive, even a small amount of training on such practices (e.g., one 90-minute session) can have a significant, positive impact on instruction and student learning (Bawa, 2016), perhaps representing a starting point for programs, departments, colleges, and institutions establishing infrastructure to provide better and more continual resources and developmental opportunities (Jackson et al., 2010; Pagliari et al., 2009).

Recommendations for Future Research

In our review of the literature, we found only three studies that focused on immediacy behaviors in online community college courses (Dilling et al., 2020; Jackson et al., 2010; Pelowski, 2005) and only one study that utilized qualitative methods (i.e., among graduate students; Melrose & Bergeron, 2006). As higher education shifts online (e.g., because of the COVID-19 pandemic), it will become increasingly important to discern to the kinds of immediacy behaviors that decrease the transactional distance between instructors and students, distances that have the potential to likewise increase as part of such trends (Sevnarayan, 2022). This will be especially important within community college contexts, given that minoritized students are often overrepresented in community colleges (Bahr et al., 2017, 2022) and the ways in which community colleges, their students, and their instructors are often on the margins in terms of resources (Yuen, 2020) and scholarly attention (Haynes & Zhang, 2023).

In addition to discerning the kinds of behaviors that most effectively enhance community college students’ learning and overall experience (e.g., through quantitative research), qualitative studies will continue to be an important focus, illuminating *why* and *how* immediacy behaviors have an influence on students. This will be especially important as (a) new educational technologies are developed to meet the needs and wants of an increasingly online society and (b) instructors become more open to utilizing educational technologies that already exist. A few behaviors were the focus of the present study, but many more exist, and many other opportunities and means through which immediacy can be pursued will be developed going forward.

Finally, building on the work of Dilling et al. (2020), future qualitative studies could compare the experience of students in different sections of the same course who experienced the presence and absence of immediacy behaviors. While most of the students in this study felt that their instructor’s immediacy behaviors did influence their completion of the course, two students commented that they were going to remain in the course “no matter what.” This would suggest that, for some students, immediacy may not be necessary for their course completion; however, students who experience the presence and absence of immediacy behaviors (regardless of whether they would ever consider dropping the course to be a viable option) would presumably have different experiences, levels of overall satisfaction, and learning. Whereas Dilling and colleagues (2020) found that instructor presence could be equally strong in both in-person and online environments, qualitative studies comparing the presence and absence of instructor immediacy would help us better understand why and how the course experience varies for students who experience larger and smaller transactional distances between themselves and their instructors.

Conclusion

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Although students can feel isolated in online courses, the findings of this study illuminate how instructors can reduce the transactional distance between themselves and their students by making “welcome” phone calls, sending personalized emails, using humor, creating videos to present content and describe assignments, and sending check-in emails throughout the academic term. Instructor engagement in such immediacy behaviors is especially important at community colleges, where community and locality are central to the institutional mission, and where there is often a lack of the resources necessary to enhance online teaching, learning, and community in other ways. In this study, students described how a set of immediacy behaviors had a positive influence on their course (e.g., making the experience more personable, positive, comfortable, clear, accessible, and, ultimately, one in which they can feel that their instructor cares about them and their success), thus increasing their desire and ability to complete the course.

The findings of this study highlight the importance of community colleges investing in online-specific instructor training that focuses on instructional best practices, including immediacy behaviors, as well as the need for instructors to be willing to experiment with and refine these behaviors in their teaching. Given that the research on immediacy behaviors in college coursework has focused primarily on four-year institutions and relied almost exclusively on quantitative analytic approaches, future qualitative studies within community college contexts represent a promising area of future research. Indeed, in an increasingly online world, and one that instructors and students are still learning how to navigate, such efforts on the part of researchers and instructors stand to enhance the teaching that community college instructors provide and the learning that community college students experience.

Statements

This study was approved by the [institution name temporarily withheld for peer review purposes] Institutional Review Board.

The authors have no conflicts of interest to declare.

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**“It Helped Push Me Through the Class”: Community College Student Perceptions of the Role of
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Student Perceptions of Effective Educators in Online Learning

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Abstract

This research project surveyed college students about their experiences with online learning in the aftermath of the move to Emergency Remote Teaching (ERT). Specifically, students reported on strategies they appreciate in an online instructor. While students shared varied advice for best practices, their responses confirmed what previous studies have found: especially in this moment of post-pandemic learning, students value instructors who are flexible and empathetic. Additionally, our findings demonstrate that students value engagement (with their instructor, their course content, and their peers), flexible course design, clearly organized learning management systems, and regular communication. The opinions and observations students have shared in response to our questionnaire, and the patterns across students' answers, are important for online educators to consider. This knowledge can be used to guide instructors aiming to deliver effective and engaging online courses. We recommend that instructors continue to check in with students about their learning needs and requests.

Keywords: Online learning; synchronous; asynchronous; engagement; emergency remote teaching

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Student Perceptions of Effective Educators in Online Learning

In the spring of 2020, many post-secondary instructors were tasked with moving their courses online immediately to allow students to complete their semester amidst unfolding health regulations. Since that abrupt emergency transition, many post-secondary students remain enrolled in at least some online classes. That time of Emergency Remote Teaching (ERT) helped many post-secondary educational institutions to recognize the potential benefits of online options, and now, more than three years later, many post-secondary students remain enrolled in at least some online classes.

The move to ERT required instructors and institutions alike to listen to student perspectives (Widodo et al., 2020). Even after the emergency period has ended, that responsibility remains: Considering students' insights and experiences can help instructors develop more successful online learning environments. Listening to students was the primary motivation behind this study.

We wanted to hear from students at our own institution during this time of transition: Which practices would they identify as helpful to their success? The responses students shared will help us to review and improve online course offerings. For the purpose of this study, we will use the term "online" to refer to course delivery that includes synchronous digital format, asynchronous digital format, or a combination of the two. This broad definition helps us to capture students' various experiences at this moment of transition.

Even before the Covid-19 pandemic, online learning was gaining in popularity. The number of students enrolling in online courses had been continuously increasing (Allen & Seaman, 2017; Burkle & Cleveland-Innes, 2013; Landrum, 2020), and online learning already "played a significant role in shifting the pedagogical, economic, and social landscape of post-secondary education" (Francis et al., 2019, p. 218). Cinar et al. (2021) suggest that "the number of students enrolled in online higher education programs is expected to rise in the future especially with the driving force of online education awareness that possibly occurred throughout the community during the pandemic period" (p. 177). Now that students and institutions are increasingly aware of the potential, online learning opportunities are likely to increase.

Online learning brings benefits in addition to its ability to allow students to continue to study safely during a public health crisis. Decades of research confirm that at its best, online learning can lead to innovative teaching, increased access, and improved flexibility (Bates, 2017). Francis et al. (2019) suggest that as the development of educational technologies and pathways toward degrees and diplomas increases, online teaching and learning can help to meet the needs of diverse learners. Learning about the factors that impact students' experiences of online learning, including the strategies that various course creators and facilitators have employed, can help instructors improve online courses (Kurucay & Inan, 2017). Bayrak et al. (2020) state that it is "important for faculty members involved in designing, developing and delivering online courses to seek the opinions and perceptions of online students about their successful learning experiences and share this information to advance the knowledge related to online learning" (p. 111). Listening to students' perspectives of online learning can help instructors better communicate course design decisions with students. As more classes move to an online or hybrid/high-flex model in the aftermath of the pandemic, it will be important to help faculty prepare to meet students' needs, and that preparation should begin with student input.

Literature Review

Recent ERT research confirms that learner engagement is central to successful online courses (Boardman et al., 2021; Castro & George, 2021; Gonzalez-Ramirez et al., 2021). The

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isolation felt during the health crisis may have helped students to more immediately recognize the importance of connection, but even before the pandemic, researchers identified engagement as key to online success. The research repeatedly demonstrates that students are more successful when online learning provides opportunities for interaction (Bolliger & Martindale, 2004; Jones & Blankenship, 2017; Yukselturk & Bulut, 2007) and, ideally, for genuine connection (Rose, 2018). Of course, the risk is not exclusive to the online environment; students can feel isolated and lonely while participating in in-person learning, too. In the online space, chances for connection must be thoughtfully implemented (Bolliger & Martindale, 2004; Jones & Blankenship, 2017). Online instructors are instrumental in facilitating student interaction.

ERT research confirms another long-established finding in online-learning research: Clear communication is key. McPhee and Lyon (2020) suggest that students want “clear and consistent” communication (p. 1). Regular personal communication and feedback helps students to stay motivated (Means & Neisler, 2021). Connected to clear communication, course organization is key to student success (Minichiello et al., 2022). Because the Learning Management System (LMS) becomes the interface for the learning experience, students will not arrive at the possibility for engagement and interaction unless the online course is carefully and clearly organized. Much research over the past decades confirms the importance of clear instructions and carefully organized material (Jones & Blankenship, 2017; Rose, 2018; Savery, 2005). Successful online instructors make their presence felt, checking in to the online learning space and communicating with students regularly (Heuer & King, 2004).

Students have questions and concerns about content, technology, motivation, interaction, and more, and in an online course, the instructor is often speaking to many of these concerns simultaneously. In addition to managing the pedagogical, technical, organizational, and social elements of the class (Berger, 1995), the online instructor is also expected “to act as a planner, a role model, a coach, a facilitator and, above all, a communicator” (Heuer and King, 2004, p. 6). Perhaps increasingly during the era of COVID-19, online students are also looking for empathy and understanding from instructors (Mcphee & Lyon, 2020; Minichiello et al., 2022). Because expectations are so broad and varied, hearing directly from students about which kinds of help are most important to them can help instructors design better online learning experiences.

We believe students’ insights will be useful in guiding online educators in course planning and delivery. As Shim and Lee (2020) have noted, the move to ERT is not uniform: “methods of emergency remote teaching differ from college to college,” and post-secondary institutions were at various levels of readiness to navigate this emergency transition. The result has been “various perceptions of the process and effectiveness of learning among students” (Shim & Lee, 2020, p. 2). Our aim with this study was to investigate students’ experiences of online learning at our own institution: Our primary goal was to learn what students want from their online educators.

The student ideas and opinions gathered through this survey provide a sample of students’ perceptions of online learning needs. Instructors can use this information to consider their current practices and adjust their content and delivery to better align with students’ self-identified needs, or, where appropriate, to be aware of the need to articulate reasons for divergence from those requests. We began our study with the following research questions:

- What do students want in an online teacher?

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- Which strategies do they appreciate?
- Do students prefer synchronous or asynchronous learning, or a combination of both?
- Which practices from teachers will students say increase their chances of success?

Method

This study received Research Ethics Board approval. Participants were students (both domestic and international) at a college in southwestern Ontario, Canada, who were currently enrolled in at least one online course or who had taken at least one online course within the previous 12 months. In the fall 2021 semester, students received an email to their college email account with the study's description and a link to the Letter of Consent. This same study description and link were posted on the college's LMS. Two weeks after the initial email and message on the LMS, a reminder email was sent out and a reminder message was posted on the LMS. The full list of survey questions can be found in Appendix A.

The questionnaire was hosted in Microsoft Forms, which required students to be logged into their college account, ensuring that only registered students could participate and that no individual student could complete the questionnaire more than once. Student names were not linked to survey data. Remuneration included the option to link to a separate form to be entered to win one of three \$50.00 gift cards to the college's campus shop. Participants were able to skip items if they chose to do so.

Results

A total of 350 students participated in this anonymous online survey; our college's total enrollment that term was approximately 4300, making our response rate 8.14%. The majority of participants (95.7%) were enrolled full-time, less than 1% were enrolled part-time, and 3.4% preferred not to answer. Eighteen point three per cent (18.3 %) were 20 years or younger, 30.3% were 21-24 years of age, 26% were 25-28 years of age, 24% were 28 years or older, and 1.4% preferred not to disclose their age. The participants were enrolled in various schools of study (see Table 1).

The survey explored student perceptions of preferences for online learning. The quantitative items included three demographic variables, namely enrollment status, age, and program of study, and eight close-ended items that asked participants to report their preferences for the following: delivery format, social engagement, features of course-meetings, student-instructor interactions, feedback and organization, weekly overviews and reviews, and technology. The last two questions were open-ended questions. These open-ended questions asked participants to share what they think an online instructor needs to do differently than an instructor who teaches face-to-face and any additional suggestions for online instructors.

Since we explored student perceptions, we used a questionnaire, which is a common means to measure attitudes, beliefs, and perceptions and is often used in educational research as it can inform teaching (Ary et al., 2002; Lauer et al., 2013). We analyzed our open-ended items inductively using thematic analysis, which included "identifying, analysing, and reporting patterns (themes) within data" (Braun & Clarke, 2006, p. 6).

Table 1

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Student Enrolment by School (N= 338)

School of Study	Number of Students
School of Business, English & Liberal Studies	123
School of Health, Community Services & Creative Design	91
School of Technology & Trades	57
School of Information Technology	55
Unknown	12

Course Delivery Format

Question: Please rank the following course delivery formats based on your preference in online learning.

Participants used a drag-and-drop scale to rank the following online course delivery formats based on their preference: asynchronous (working through pre-recorded lessons), synchronous (attending live lessons), and both (a combination of asynchronous and synchronous learning). The results reveal that the most common order for delivery format preference in online learning is asynchronous format, followed by synchronous format, followed by a combination of asynchronous and synchronous (33.9%).

Table 2

Course Delivery Format Preferences by Ranking in Percentages (N=342)

Order for Course Delivery Format Preferences	Percentages
Asynchronous, Synchronous, Both	33.9%
Synchronous, Both, Asynchronous	19.6%
Both, Synchronous, Asynchronous	15.8%
Both, Asynchronous, Synchronous	11.7%
Asynchronous, Both, Synchronous	10.2%
Synchronous, Asynchronous, Both	8.8%

Social Engagement

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Question: How important to you is social engagement (connection with peers) in online learning?

Participants responded to this question using a 5-point Likert scale (very important, important, neutral, unimportant, and very unimportant). Almost half of the participants (45.7%) reported that social engagement in online learning is very important; on the other hand, a handful of participants (2.9%) reported that social engagement in online learning is very unimportant.

Table 3

Importance of Social Engagement in Online Learning in Percentages (N=350)

Importance of Social Engagement in Online Learning	Percentages
Very Important	45.7%
Important	24.9%
Neutral	19.7%
Unimportant	6.9%
Very Unimportant	2.9%

Support for Social Engagement

Question: Which of the following do you believe support your social engagement (connection with peers) in an online learning environment?

Participants who selected “very important, important, or neutral” to the previous question (How important to you is social engagement (connection with peers) in online learning?) were branched to this question. Participants were presented with four items and were asked to select all that apply. More than three-fifths of participants (62.2%) reported that they believe completing course work that requires them to communicate with peers is important for social engagement in online learning.

Table 4

Social Engagement Factors in an Online Learning Environment in Percentages (N= 278)

Social Engagement Factors in an Online Learning Environment	Percentages
Completing course work that requires you to communicate with peers (for example, group projects and group tasks)	62.2%
Being required to communicate with classmates through posting on discussion boards	10.1%

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Being required to participate during synchronous lessons (live lessons) in the large group	9.4%
Being required to participate during synchronous lessons (live lessons) in smaller breakout rooms	18.3%

Course Meetings

Question: Please indicate how important the following items are to you regarding course meetings in online learning.

Participants responded to the next five questions using a 5-point Likert scale (very important, important, neutral, unimportant, and very unimportant). For the next five questions, the number of responses (N) is included under each item. Participants were presented with four items that focused on their preferences regarding course meetings in online learning. The item that was rated as the most important for course meetings is *the instructor starts the lesson at the exact start time*; 71% of participants reported this as very important (35.8%) or important (35.2%)

Table 5
Course Meetings Preferences in Online Learning in Percentages

	Very Important	Important	Neutral	Unimportant	Very Unimportant
The instructor opens the class meetings 5-10 minutes earlier. (N=350)	21.3%	35.0%	30.5%	11.4%	1.7%
The instructor starts the lesson at the exact start time. (N=338)	35.8%	35.2%	22.5%	4.7%	1.8%
The instructor stays on the class meeting 5-10 minutes after class. (N=341)	15.2%	29.3%	30.8%	21.1%	3.5%
The instructor the lesson at the exact end time. (N=333)	27.0%	26.4%	29.7%	13.2%	3.6%

Student-Instructor Interactions

Question: Please indicate how important the following items are to you regarding student-instructor interactions in online learning.

Participants responded to five items that focused on their preferences regarding student-instructor interactions in online learning. The first item includes “D2L;” D2L is the LMS that is used at the college at which this study was conducted. All of the five items were rated as very important or important by at least 73% of the participants. The item that was rated as the most important for student-instructor interactions is *the instructor encourages students’ questions*

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through any channel (D2L or Teams); 88.8% of participants felt this was very important (53.9%) or important (34.9%). Interestingly, none of the participants rated any of the items as very unimportant.

Table 6
Student-Instructor Interaction Preferences in Online Learning in Percentages

	Very Important	Important	Neutral	Unimportant	Very Unimportant
The instructor encourages students' questions through any channel (D2L or Teams). (N=349)	53.9%	34.9%	8.9%	2.3%	-
The instructor reaches out to students individually at least once during the term. (N=336)	42.0%	31.8%	20.5%	5.6%	-
The instructor holds scheduled office hours for students. (N=336)	40.5%	42.0%	13.4%	4.2%	-
The instructor makes time to check on students' stress-levels and wellbeing. (N=337)	49.5%	34.1%	12.5%	3.9%	-
The instructor makes an effort to get to know the students. (N=336)	47.9%	34.8%	13.7%	3.6%	-

Feedback and Organization

Question: Please indicate how important the following items are to you regarding feedback and organization in online learning.

Participants responded to six items that focused on their preferences regarding feedback and organization in online learning. All six items were rated as very important or important by at least 47% of the participants. The item that was rated as the most important for feedback and organization is *the instructor provides personalized feedback in written format*; 86.1% of participants reported this as very important (49.4%) or important (36.7%). This is also the only item that none of the participants rated as very unimportant.

Table 7
Feedback and Organization Preferences in Online Learning in Percentages

	Very Important	Important	Neutral	Unimportant	Very Unimportant
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The instructor provides personalized feedback in video format. (N=344)	26.2%	23.0%	33.7%	14.8%	2.3%
The instructor provides personalized feedback in audio format. (N=336)	19.9%	27.4%	34.8%	14.9%	3.0%
The instructor provides personalized feedback in written format. (N=338)	49.4%	36.7%	12.4%	1.5%	-
The instructor provides an overview at the beginning of each class. (N=336)	47.3%	36.3%	14.0%	1.8%	0.6%
The instructor provides a review at the end of each class. (N=333)	38.7%	39.3%	16.8%	4.5%	0.6%
The instructor includes a question period at the end of each class. (N=333)	38.7%	40.5%	17.4%	3.0%	0.3%

Overviews and Reviews

Question: Please indicate how important the following items are to you regarding weekly overviews and reviews in online learning.

Participants responded to three items that focused on their preferences regarding weekly overviews and reviews in online learning. All three items were rated as very important or important by at least 59.9% of the participants. The item that was rated as the most important for weekly overviews and reviews is *the instructor provides a weekly checklist to clarify the students' obligations*: 89.2% of participants reported this as very important (47.4%) or important (38.9%). This is also the only item that none of the participants rated as very unimportant.

Table 8

Weekly Overviews and Reviews Preferences in Online Learning in Percentages

	Very Important	Important	Neutral	Unimportant	Very Unimportant
The instructor provides a video overview of the weekly	25.3%	29.6%	29.9%	13.1%	2.0%

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plans. (N=344)					
The instructor provides a written overview of the weekly plans. (N=332)	47.9%	41.3%	9.9%	0.6%	0.3%
The instructor provides a weekly checklist to clarify the students' obligations. (N=329)	47.4%	38.9%	11.8%	1.8%	-

Technology

Question: Please indicate how important the following items are to you regarding technology in online learning.

Participants responded to two items that focused on their preferences regarding technology in online learning. Both items were rated as very important or important by at least 62% of the participants. The second item, *the instructor shares clear policies around students' use of technology*, was perceived as more important than the first item; 72.6% of participants rated this item as very important (40.0%) or important (32.6%).

Table 9

Technology Preferences in Online Learning in Percentages

	Very Important	Important	Neutral	Unimportant	Very Unimportant
The instructor shares guidelines on how to use technology in the class (for example, how to turn the microphone on). (N=345)	33.9%	28.1%	24.0%	10.4%	3.5%
The instructor shares clear policies around students' use of technology during the class (camera, microphone, and chat functions). (N=322)	40.0%	32.6%	20.5%	6.2%	0.6%

Open-Ended Questions

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Our survey concluded with two optional, open-ended questions. Our first question asked, “What do you think an instructor who teaches online has to do differently than an instructor who teaches face-to-face?” We used thematic analysis to identify five themes within student responses, each of which included subcategories: Engagement, Expectations and Organization, Communication, Teacher Traits, and Technology. We organize our findings here by prevalence, beginning with the topics that were most often recurring.

Within the theme of *engagement*, we identified three subthemes: *challenges*, *technology*, and *group work*. Respondents noted that *challenges* to engagement may be increased online. One student, for example, said, “Its much harder for the profs because they're used to having students in person to engage and participate in discussions so it's a lot less personal for them.” Another said, “Find ways to encourage student participation in class. It seems harder to do. I don't find many students offering to speak up when the instructor asks a question.” The inability to see class members prompted numerous responses tying engagement to *technology*: Student responses indicated that they recognize the difficulties involved in “understand[ing] where students are at in the subject without seeing their reactions.” One student, for instance, said, “The professor who teaches online needs to ask questions after explaining a topic to get an idea if everyone is attentive because most of the students' cameras and audio is off.” Some student responses addressed instructors' attempts to engage students with each other through *group work*, and these responses were divided. One respondent, for example, said, “I think that when teaching online teachers need to rely less on group work during class.” Others, in contrast, said that online instructors should consider “Giving more group activities to increase the social connection between the students” and “make more breakout groups so that classes become more interesting.”

Within *expectations and organization*, we identified three subthemes: *clear and consistent scheduling*, *scheduling reminders*, and *clarifying connections*. Student responses indicated the importance of making scheduling requirements *clear and consistent*, suggesting that online instructors should “Provide very clear information about what we are to be doing each week (homework, assignments, due dates) in an easy-to-read format” and should “be extra clear with instructions and expectations for the week. I find unclear instructions, timelines, and expectations made school more stressful especially online where it is harder to communicate with teachers.” Perceived disorganization in scheduling was linked to stress, and “They [online instructors] have to reduce the work stress for students.” Students requested clarity around class format as well as timing: “Not knowing if your class is synchronous or asynchronous does not work for [the] student.” Many student responses highlighted the importance of *scheduling reminders* for upcoming tests and assignments. Students indicated that “Online instructors NEED to provide a weekly update on what is expected/due for each week,” that “posted weekly tasks are extremely helpful,” and that they appreciated a “list of whole week work like due dates for assignment.” Respondents linked the possibility of becoming overwhelmed with scheduling demands to the specific challenges of studying online: “Teachers need to specifically tell about each and everything because many of us have not been studied online so it is hard to remember everything without going to class.” Students also appreciated when instructors *clarified connections* in content across previous and future lessons. For instance, students noted “The professor must provide an overview of the last lecture before starting a lecture” and suggested that “before the class begins the instructor clearly identifies the objectives of the class,” and “The professors can have a review section at the start and end of the classes which discusses about the work to be

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completed and exams and due dates coming up.” Responses indicated students’ gratitude for any reminders that helped them to confidently orient themselves in the class schedule.

Within the theme of *communication*, we identified two subthemes: *consistency and clarity*, and *direct access*. Multiple student responses addressed the importance of *consistency and clarity* in an instructors’ communications: “Communicate more clearly,” “Provide clarity regarding assessments and how they will be administered,” and “Go over things more clearly.” Students also noted an increased need because of the online format for instructors to check in frequently to gauge student understanding: “A professor who teaches online has to make more effort to collect the questions from students in class.” Respondents requested that instructors check on their students not just collectively but also individually throughout the term: “Maybe it’s complicated, but I would like professors to reach every student at least once during the term.” Multiple respondents suggested that *direct access* to their instructors is essential to their understanding. Students recommended “anything that helps them [instructors] be more available despite content being delivered online ... professors excel when they lend themselves to the students by making extra drop-in sessions available to ask questions and review the course content.” Some responses noted that the switch to online learning increased the need for drop-in help, since “in person we could have asked directly the instructor.”

Many student responses noted the importance of particular *teacher traits*, and within this theme we identified four subthemes: *understanding and empathy*, *caring and friendliness*, *patience and flexibility*, and *enthusiasm*. Students requested *understanding and empathy* and said instructors “should understand the difficulties faced by the students,” and “they should understand that there is a huge difference between online and offline classes.” The desire for understanding sometimes connected to students’ efforts to balance multiple responsibilities: “They need to understand that students are working full time hours now, because of online schooling,” and “I think they have to accommodate or compromise more often with the students home situations.” Many student responses called for empathy: “The instructor should be empathetic towards problems faced by students,” and instructors need to “support students, and have the understanding that everyone has a life at home and when doing online classes at home- it’s hard to ‘leave home at home’.” Students suggested that instructors teaching online need to demonstrate *caring and friendliness*: Respondents called on instructors to “be more friendly,” and said the “instructor who is teaching online should be more friendly and cooperative with students.” Another said, “Work harder to make connections with the students, in person you are face to face [and so] you build a more personal connection. Online you miss that kind of connection.” The requests for understanding were often linked to practical calls to be *patient and flexible*. One student, for instance, suggested that online instructors must “be more patient and understanding, things may take longer online rather than if we were in class.” Requests for a slower pace connected to both the content delivery (“professors need to teach the material a little slower in online classes”) and the conversation. Students suggested that instructors must “Patiently wait for student to type out their question” before moving on. Student responses also noted the importance of *enthusiasm* for keeping students’ attention: They recommend that instructors “Be enthusiastic.” Another student wrote, “From what I’ve seen so far in online classrooms, it’s critical that a teacher be enthusiastic about what they’re doing, even if the class is virtual. Our ‘inspiration’ comes from them.”

Within the theme of *technology*, we identified three subthemes: *knowledge, flexibility and understanding*, and *recording*. Many students’ responses repeated the idea that instructors in an

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online setting must begin the course with clear *knowledge* of the technology that the course will require. Respondents said that “online professors must be competent with technology,” and “A professor should know at least a little [about the] tech which they use.” Some student responses called for *flexibility and understanding* from instructors when students face technology-related problems. Students called on online instructors “To understand that there are times that our internet connection is not working well,” to “Be flexible around students’ technical errors,” and to “normalize struggles with technology.” Many students shared that they were grateful to instructors who chose to *record* their synchronous class lessons. As one student explained, “With an online class we can record and review the lecture to refer back to. I found it super helpful in case I could not attend class or wanted to review [the] lecture for studying.” For some, the ability to revisit recorded lectures gives online learning an advantage over the traditional face-to-face classroom space: “For me, instructors are more familiar than face to face coz he/she is more attentive actively respon[ding] to chats box comments and 2ly [secondly] we have recorded lecture so that we can repeat and use this [for] practice.” No student responses indicated that making recordings available caused problems, but multiple students indicated that recording supports their learning: “I would highly recommend to ask each and every professor to record their lectures.”

Our second question asked, “*Are there any other steps you feel online instructors can take to assist in your learning? What suggestions would you share with online instructors? Please keep your comments generalized: do not include specific teachers’ names or courses.*” Seven themes emerged from the participants’ responses: technology, schedule/time, LMS and organization, review, clarity, engagement, and teacher traits.

The first theme, Technology, included four subthemes: *applications and tools*, *recording lessons*, *use of students’ cameras*, and *pre-recording*. Participants shared that they prefer consistency in *applications and tools* that are used in their courses. For instance, one participant acknowledged that “Different professor[s] use different browser/application[s] for their class which makes it difficult for student to manage. Please make sure that only 1 application like MS teams is used by everyone.” On the other hand, some participants reported they prefer instructors to use different *applications and tools*: One participant shared “Use variety of technologies...” Another participant recommended “Utilizing technology to its fullest.” Some students recommended *recording lessons* and suggested “keeping all the classes recorded.” Participants shared that the recorded lessons help as they can go back to the lesson and review: “While at home there are distractions that wouldn’t be there if we were in a classroom, it is nice to refer back to points we missed.” The *use of students’ cameras* is the third subtheme. Participants prefer not to have to turn their cameras on, and one participant shared, “Don’t force camera use.” The last subtheme, *pre-recording*, includes various preferences for pre-recorded lessons. Some participants suggested pre-recorded lessons: “More pre-recorded video lessons!” and “Pre-recorded video lessons.” Others suggested not using pre-recorded lessons: “Please take live classes rather than pre-recorded modules.”

Another theme that participants discussed was Scheduling/Time. Three subthemes were present: *time differences*, *breaks*, and *delivery format*. In the *time differences* subtheme, participants noted that it is important to consider the time zone when scheduling classes. One participant shared that “Most of the instructors fix their classes in Canadian which makes us not to be able to participate in the live classes.” Another participant added, “Am not yet in Canada and time indifference is a major problem.” The second subtheme is *breaks*. One participant suggested,

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“Slightly longer breaks,” and another participant shared, “Give breaks if lecture is too long.” In the third subtheme, *delivery format*, one participant suggested that “Asynchronous professors could probably offer a hour or two drop in room if a student has questions about content,” and another shared, “If possible have drop-in sessions once a week or every other week for questions.” Some requested on-campus classes, recommending “in person meetings once a week,” and that instructors “Maybe have some classes once or week in the college. Because it feels like we don’t know anyone [and we are] just sailing in our own boat alone.”

The third theme, LMS and Organization, included three subthemes: *weekly checklists*, *notifications*, and *calendar dates*. Participants shared the following suggestions for *weekly checklists*: “Provide weekly checklists as online classes sometimes are chaotic to organize,” and “Professors can upload a written form of a to-do checklist (weekly) on d2l so that students can not miss out on anything important.” Students also requested *notifications*: “Biggest thing for me would be D2L having more notifications when instructors update or add new content” Another participant shared they “prefer being able to reach out in [Microsoft] Teams. I can get notifications to my phone” The final subtheme was *calendar dates*. Participants prefer due dates to be available on the LMS. One participant’s suggestion is to “Provide dates on calendar of when assignments are due.” Another participant suggested instructors “Keep the calendars updated on d2l for external calendar apps.”

The theme of Review included three subthemes: *study guides and extra resources*, *reviewing answers*, and *quizzes*. Participants shared they would like instructors to provide *study guides and extra resources*, and one participant explained that “Providing some sort of study guide is very useful when trying to learn through a computer.” Participants suggested they want instructors to *review answers* to coursework, quizzes, and tests; instructors can “share and discuss the correct answers after the quiz or tests,” “take up coursework so we know we’re on the right track,” and provide “review of exams and tests.” The final subtheme was *quizzes*. One participant noted that “Nongraded surprise quiz can help them [instructors] to understand students learning things that they are teaching.” Another participant added that “Could be helpful if they provide some kind of mock test to practice before every test.”

The fifth theme is Clarity, which included two subthemes: *instructions* and *content*. Participants revealed that they want *clarity in instructions* regarding coursework. One participant shared that “Instructors should clarify their assignment requirements and not be all over the place while trying to explain a query.” Another participant suggested that instructors can “Explain assignment details better/more in-depth.” *Clarity in content*, the second subtheme, includes participant suggestions that focus on instructors providing clarity in course topics. One participant suggested “Proper explanation of topics and methods as most students are new to this system.”

The sixth theme, Engagement, included three subthemes: *engagement with peers*, *make it fun*, and *ask questions*. Participants’ recommendations around *engagement with peers* were mixed. Some called for less group work: “I believe it would be better to do less work in groups so that I am not dependent on classmates.” In contrast, other participants shared their preference for “more interaction with peers.” Students also called on instructors to *make it fun*: “Online instructors should make the class content exciting, and they need to be more engaged with students.” Another participant recommended “Also making more activities during the lessons to make them more entertaining.” A number of participants suggested that instructors should *ask questions* throughout

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the class. For example, one participant shared that “I would suggest [instructors] make the online class more interactive by asking questions to the students.”

Teacher traits, the seventh theme, included five subthemes: *connection*, *feedback*, *teaching*, *providing support*, and *pace/workload*. Some participants noted the importance of *connecting* with their instructors. Participants explained that “If they could connect more with us and understand our situation, that would be great,” and suggested that “They should be calling each student personally once a week to have a check on them.” Participants’ suggestions demonstrated that they value *feedback* from their instructors: “Providing feedback on our daily assignments is a great thing,” and “Explaining the mistakes instead of marking right and wrong only.” Some participants shared they want additional *teaching* from their instructors: “Have classes. I feel these teachers should have class there should not be one class that the teacher doesn't come online and teach the material.” Participants requested *support* from instructors if an absence is required: “They can rearrange/reschedule a test or exam if a student has missed it due to some[thing] reasonable because it takes some time for students to get to know about culture and rules.” A few participants suggested the instructor check in with students who miss a class: “In case of absence of any student, may be enquire about him/her. As many of the students face problem about housing/internet/any other and afraid to say so.” One participant noted instructors can “Individually support students when possible.” *Pace/workload* is the final subtheme. One participant shared, “If instructors could reduce the portions covered in a day, it would help a lot.” Another participant added that “Learning should be a bit slower than its going.”

Outside of the themes we identified, some participants provided their current opinion of online learning and instructors. Several of those comprehensive comments shared frustration with online learning: “Make class in-class ASAP,” and “Be in person, live classes are way better than trying to teach yourself.” Other responses were neutral: students said, “Nothing is different,” and “With tools like [Microsoft] teams, I don't feel the difference between remote teaching and having the teacher in front of me.” There were more positive overall assessments of online learning than negative responses. Positive participant responses included the following: “Overall online classes have been great! I love being able to stay home, saves time and money,” “I personally love the online portion,” and “As of now everything is perfect in online.” Some positive comments focused on online instructors specifically: “The professors are teaching perfectly,” “All teachers are doing their best to teach us and to communicate with us,” and “The teachers are doing a great job so far in online teaching.”

Discussion

Many of the findings in our quantitative results were confirmed in the themes we identified in student responses to our open-ended questions. Students’ answers throughout indicated the importance of engagement and interaction, scheduling and organization, clear communication, and certain teacher traits.

Engagement and Interaction

Throughout the survey, respondents demonstrated a preference for courses that engaged participants with course content, their instructors, and each other. A combined total of just over 70% of our survey’s respondents ranked social engagement as either Very Important (45.7%) or Important (24.9%) (see Table 3), and just over 62% of students said that completing course work with peers is a Very Important (45.7%) or Important (24.9%) component of social engagement

while learning online (see Table 4). Interestingly, students were divided in their ideas on how to best encourage peer-to-peer engagement. Some were clearly frustrated with the group work experience and advised against it, while others requested more assigned group work to help facilitate social interaction. Our participants' comments make it clear that they believe it is the responsibility of the instructor to create an environment conducive to participation. The emphasis on engagement is in keeping with previous research, especially in the ERT literature. Baloran et al. (2021), for example, call student engagement a "critical concern in online learning" (p. 3); while engagement is always important to learning, research suggests that interaction is the key determinant of student success while online (Castro & George, 2021, p. 29). When students are provided with opportunities to interact, they are more successful (Jaggars & Xu, 2016; Jones & Blankenship, 2017; Yukselturk & Bulut, 2007).

In an online format, engagement is always mediated through technology. Students' focus on cameras throughout our findings made that connection clear. Student responses repeatedly identified the difficulty of maintaining (or even gauging) students' engagement levels without access to body language, but many suggested that they do not want to be required to turn their camera on during live classes. That gap would suggest that teachers need to continue to explore strategies for engaging students. Clear technology policies and guidelines may help to ease student concerns around camera use. We found that more than 70% of students reported it was Very Important (40%) or Important (32.6%) for instructors to provide policies regarding technology use (see Table 9). Our findings support previous research (Francis et al., 2019; Heuer & King, 2004; McPhee & Lyon, 2020) confirming the instructor's role (at least from a student perspective) in helping students with technology.

Scheduling and Organization

Our findings reveal that students prefer asynchronous delivery format, followed by synchronous delivery format, followed by a combination of both asynchronous and synchronous. Students recommended that class recordings be made available, echoing the results of previous studies (see McPhee and Lyon, 2020). This finding is not surprising: Providing recorded lessons signals an understanding of students' busy schedules and conflicting obligations while also supporting individual students' need for additional review. Our participants shared that they appreciate class recordings that are tailored to their context, and they responded negatively to pre-recorded lessons that they felt were being recycled.

Organized course content makes it easier for participants to navigate through the work that needs to be completed. Previous studies found that clearly organized material is a factor in student success (Minichiello et al., 2022; Rose, 2018), and the importance of organization surfaced in our findings, too: More than 86% of respondents said weekly checklists clarifying students' obligations are Very Important (47.9%) or Important (38.9%). Our qualitative results confirmed that participants want weekly checklists. Weekly checklists are an optional function in our college's LMS; students have the ability to check off the items as they complete them, which may help with student motivation and organization.

Clear Communication

Clarity (in both instructions and content) was a central theme in student responses. Our results demonstrate that students value clear and consistent communication: The majority of respondents identified instructors' communication strategies (like inviting questions, checking on students' wellbeing, and reaching out to students) as either Very Important or Important (see Table

6). Communication surfaced often in responses to our open-ended questions, too. Other studies have similarly found that communication in online courses is essential (Jones & Blankenship, 2017; Minichiello et al., 2022; Rose, 2018) and that “Students value clear and consistent ongoing communication embedded in remote courses” (Mcphee & Lyon, 2020, p. 1). Our participants also valued reviews, study guides, and extra resources, which support student learning and foster relationships that can positively impact student success. Many participants want reviews at the end of their classes, which 78% reported as Very Important (38.7%) or Important (39.3%). Reviewing course content at the end of class can add clarity and can help the instructor and the learner to determine if further instruction is needed.

Feedback is another factor that can impact student success in online learning. Our results indicate that students value personalized feedback: 86.1% of participants identified personalized written feedback as either Very Important (49.4%) or Important (36.7%). Personalized feedback would seem to bring together many of the key priorities we identified in student responses, including a desire for engagement, communication, and understanding. Kandemir and Cakmak (2021) suggest that multiple types of feedback be provided in online learning, and our findings confirm this as some participants rated written feedback, video feedback, and audio feedback as all being Very Important or Important to them. Other research confirms the value of personalized communication: Boardman et al. (2021) recommend that instructors “Reach out individually to students to check in” (p. 9), and Means and Neisler (2021) found that students reported personalized check-in messages from instructors helped them to stay motivated. Over 70% of our participants reported that it was Very Important (42%) or Important (31.8%) that “The instructor reaches out to students individually at least once during the term.” Our findings indicate that students appreciate one-on-one check-ins from instructors, a practice that is likely to increase engagement and demonstrate the kind and caring teacher traits that students value, and again emphasizes the importance of clear communication.

Teacher Traits

Engagement is, in part, about humanizing the classroom, making students feel individually welcomed and necessary to the learning process. Humanizing the instructor can be equally important. Carter et al. (2014) suggest that “Every effort should be made to ensure that the human connection remains front and central in the e-learning experience” (p. 13). Students studying online are seeking “social presence” (Nguyen et al., 2021), and that presence extends to the instructor, too. Our findings confirm that students identify the instructor’s social presence as key to their success: Their open-ended answers often noted that teachers who are kind, caring, friendly, and understanding help them to succeed. Our participants shared that it is important for instructors to try to get to know the students: Almost half of participants who responded to this question (47.9%) ranked this as Very Important, and an additional third (34.8%) said this is Important. Multiple responses to our qualitative questions emphasized the importance of the student-instructor relationship as the foundation for learning.

Students also want instructors to check on their well-being, which more than 80% said was Very Important (49.5%) or Important (34.1%) (see Table 6). These findings, in addition to requests for drop-in sessions and opportunities to meet weekly in a face-to-face format, speak to some participants’ desire for opportunities to connect with their instructors. Empathy and connection may be especially important in our current moment: Minichiello (2022), in a survey of ERT-era research, found that “a common theme underpinning the growing pandemic ERT literature is students’ need for faculty expressions of care and compassion” (p. 4). While calls for understanding and empathy may have been especially pronounced because of the additional

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challenges imposed by the pandemic, kindness and empathy seem likely to foster student success not only during moments of crisis, but always. Flexibility, a key practical indicator of an instructor's empathy, can help students to succeed (Kandemir & Cakmak, 2021; McPhee & Lyon, 2020; Minichiello et al., 2022).

Our findings confirm that, while there are common threads to student requests, there is also great variety among respondents. Strategies for engagement, clear and consistent schedules, regular communication and some room for flexibility according to students' needs all serve to demonstrate an instructor's empathy and kindness and are likely to support student success.

Limitations

- Self-reporting was used, which can lead to inaccuracies (Williams et al., 2008). Participants may have clicked through questions to complete the survey without reading the questions as an incentive to participate in this study was provided (\$50.00 gift card to the college's campus shop).
- Participants were students at the college at which the researchers were teaching. Although the participants were informed that their responses are anonymous, they may have answered questions in a way they feel would be perceived as desirable.
- Participants may have responded with on-campus courses in mind. Although our questionnaire asked participants to consider their online courses when responding to items, participants may have considered both their online and on-campus courses or only their on-campus courses when completing the survey.
- Participants may have used the survey as an opportunity to vent. It is important to acknowledge that not all students enjoy online courses, and some students may have negative perceptions of their online courses.
- Participants' responses to the two open-ended questions (the final two questions in the questionnaire) may have been impacted by the previous questions they responded to.

Recommendations

Future Research Should Consider Students' Contexts

Students studying online are joining class conversations from a variety of settings, some more safe and convenient than others. Those varying circumstances inevitably impact the learning environment. Future studies should consider students' contexts and identities. Such work has already begun (see, for example, Means & Neisler, 2021). Research that considers the complexity of students' needs will help instructors to better contextualize information on students' preferences in online learning.

Focus Group Sessions Should Be Included in Future Research on Students' Preferences in Online Learning

Our study consisted primarily of close-ended questions (8 close-ended questions and 2 open-ended questions). Although our 2 open-ended questions allowed participants the opportunity

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to elaborate in their responses, focus group sessions may provide greater opportunities for explanation through an ongoing discussion among participants.

Instructors Need to Be Included As Participants in Future Studies

Instructors should be included in studies with the same objectives as this study. Gathering instructor preferences in online learning will help to determine if there are any discrepancies between what students prefer and what instructors prefer.

Conclusion

Not surprisingly, students were not unanimous in their recommendations. Respondents shared mixed opinions on what constitutes the best learning experience. While our findings demonstrate some commonalities in responses, individual student's preferences and beliefs may differ. It is likely impossible to create an online learning experience that is perfectly tailored to each student's individual needs; however, asking students about their preferences can help instructors tailor their courses where possible and appropriate. Landrum (2020) recommends that additional research explore the "collaborative aspects" of online learning (p.141). Listening to student voices—both collectively, through additional research projects, and individually, in the context of specific online courses—can help to build successful online learning experiences for everyone. The results shared here provide a sample of students' perceptions. We aim to keep listening.

Note

To honour the voices of student respondents, we have chosen to represent students' contributions exactly as they were shared: We have not standardized grammar. Where necessary, we have included clarification inside square brackets.

Declarations

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

The authors assert that their study obtained approval from the Research Ethics Board (REB) of Lambton College in Sarnia, Ontario.

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Appendix A: Survey Instrument

Section 1

Demographic Information

1. Are you currently enrolled in any online courses this semester at Lambton College?
 - Yes – branched to Question 3.
 - No – branched to Question 2.

2. Have you taken online courses at Lambton College within the previous 12 months?
 - Yes – branched to Question 3.
 - No – branched to End of Survey

3. Please indicate your current enrollment status.
 - Full-time student
 - Part-time student
 - Prefer not to say

4. What is your age?
 - 20 years or younger
 - 21-24 years
 - 25-28 years
 - 28 years or older
 - Prefer not to say

5. Which program are you currently enrolled in? (For example, Business Administration, Electrical Techniques, CPET, Photography, etc.)

Section 2

Online Course Delivery Preference Format

6. Please rank the following course delivery formats based on your preference in online learning. Drag and drop the items to rank them.
 - Asynchronous – working through assigned activities or pre-recorded lessons independently
 - Synchronous – attending live lessons
 - Both – a combination of asynchronous and synchronous learning (working through pre-recorded lessons and attending live lessons)

Section 3

Social Engagement in Online Learning

7. How important to you is social engagement (connection with peers in online learning)?
 - Very Important
 - Important
 - Neutral
 - Unimportant
 - Very Unimportant

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8. Which of the following do you believe support your social engagement (connection with peers) in an online learning environment? (Select all that apply.)
- Completing course work that requires you to communicate with peers (for example, group projects and group tasks)
 - Being required to communicate with classmates through posting on discussion boards
 - Being required to participate during synchronous lessons (live lessons) in the large group
 - Being required to participate during synchronous lessons (live lessons) in smaller breakout rooms

Section 4

Online Course Preferences and Instructor Characteristics

9. Course Meetings: Please indicate how important the following items are to you:

	Very Important	Important	Neutral	Unimportant	Very Unimportant
The instructor opens the class meetings 5-10 minutes earlier.					
The instructor starts the lesson at the exact start time.					
The instructor stays on the class meeting 5-10 minutes after class.					
The instructor ends the lesson at the exact end time.					

10. Student-Instructor Interactions: Please indicate how important the following items are to you:

	Very Important	Important	Neutral	Unimportant	Very Unimportant
The instructor encourages students' questions through and channel (D2L or Teams).					
The instructor reaches out to students individually at least once during the term.					
The instructor holds scheduled office hours for students.					

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The instructor makes time to check on students' stress-levels and wellbeing.					
The instructor makes an effort to get to know the students.					

11. Feedback and Organization: Please indicate how important the following items are to you:

	Very Important	Important	Neutral	Unimportant	Very Unimportant
The instructor provides personalized feedback in video format.					
The instructor provides personalized feedback in audio format.					
The instructor provides personalized feedback in written format.					
The instructor provides an overview at the beginning of each class.					
The instructor provides a review at the end of each class.					
The instructor includes a question period at the end of each class.					

12. Weekly Overviews and Reviews: Please indicate how important the following items are to you:

	Very Important	Important	Neutral	Unimportant	Very Unimportant
The instructor provides a video overview of the weekly plans.					
The instructor provides a written overview of the weekly plans.					
The instructor provides a weekly checklist to clarify the students' obligations.					

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13. Technology: Please indicate how important the following items are to you.

	Very Importan t	Importan t	Neutral	Unimportan t	Very Unimportan t
The instructor shares guidelines on how to use technology in the class (for example, how to turn the microphone on).					
The instructor shares clear policies around students' use of technology during the class (camera, microphone, and chat functions).					

14. What do you think an instructor who teaches online has to do differently than an instructor who teaches face-to-face? Please keep your comments generalized: do not include specific teachers' names or courses.
15. Are there any other steps you feel online instructors can take to assist you in your learning? What suggestions would you share with online instructors? Please keep your comments generalized: do not include specific teachers' names or courses.

“Never Met Them in Person, But We Help Each Other”: Black Women’s Experiences in Online Undergraduate Engineering Programs

**“Never Met Them in Person, But We Help Each Other”: Black Women’s Experiences in Online
Undergraduate Engineering Programs**

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Abstract

In this empirical analysis, we provide a qualitative investigation of online learning among Black women engineering majors. This study makes theoretical and practical contributions by expanding knowledge of diverse online learners and informing ways to provide accessible and equitable online engineering education. Guided by the literature review, our analysis addresses two research questions: (1) How do Black women describe their online program learning experiences? and (2) How do participants describe their interactions with other students and faculty in their online programs? Using an exploratory, qualitative case study research design and the online collaborative learning framework, we analyzed interview data of 14 Black women students enrolled in online undergraduate engineering programs. The analysis of the data identified four major themes. Participants: (1) experienced isolation, (2) witnessed varying impacts of COVID-19, (3) observed the benefits and limitations of flexibility of online programs, and (4) engaged in virtual connection-building. We conclude by discussing implications for higher education faculty and leaders.

Keywords: Black women, COVID-19, engineering, flexibility, online learning

“Never Met Them in Person, But We Help Each Other”: Black Women’s Experiences in Online Undergraduate Engineering Programs

Kim, M., Debalina, M., Meseret, F. H., & Brooke, C. (2024) “Never met them in person, but we help each other”: Black women’s experiences in online undergraduate engineering programs. *Online Learning, Volume, 28*(3), (400-424). DOI:10.24059/olj.v28i3.3936

The underrepresentation of Black women is a major problem for engineering programs across the nation. In 2021, women across all racial groups represented only 23.6% of all bachelor’s degrees in engineering and engineering technology (Roy et al., 2022). In the same year, a total of 1,808 Black women earned an undergraduate degree in engineering, making up less than 6% of all women who graduated with a baccalaureate engineering credential (Roy et al., 2022). When we compare these figures to the overall representation of Black women in the U.S. population (14% of women ages 15–44 in the United States are Black), we see that Black women’s representation is not proportional to their representation in broader American society (March of Dimes, 2022). This gap in education access deserves scholarly attention. Moreover, during 2021, some 254 institutions in the United States awarded at least one engineering degree at the bachelor’s, master’s, or doctoral level (Roy et al., 2022). From these figures, the need to broaden participation and access for Black women in engineering is evident. One potential solution for this issue is greater use of online learning, which increases convenience and access to higher education. However, online learning may still be problematic, especially in its utility for Black women pursuing engineering.

More pointedly, in a rapidly changing higher education landscape, online learning continues to play a major role in content delivery. According to the National Center for Education Statistics (NCES) (2022), three-quarters of all undergraduate students (totaling 11.8 million people) were enrolled in at least one online course in Fall 2020. During the same semester, 7 million undergraduates learned exclusively online due to the pandemic (NCES, 2022). However, engineering courses can be particularly difficult to host online because they require practical lab experiences (Feisel & Rosa, 2005; May et al., 2023). Still, universities have expanded their online course offerings to compete for student enrollment and cater to the growing demand for online programs (Hamilton, 2023; Wiley University Services, 2022). Such expansion not only offers flexibility and accessibility to a wider student population but also demonstrates a shift towards embracing online education as a permanent fixture in higher education. To this end, a recent consent decree faced by UC Berkeley shows that accessibility and equity can be advanced through online learning materials (D’Agostino, 2022).

In this study, we focus on the lived experiences of Black women students in online undergraduate engineering programs at a large public university (LPU) in the United States. This focus is important because Black women are demographically underrepresented in engineering, which suggests inequitable access to higher education. Our goal through this study is to contribute to academic scholarship that will increase access to online engineering education for Black women. Moreover, based on recent studies on online engineering education and the racialized and gendered experiences of online learners during the pandemic, which are discussed in the subsequent section, we have identified a gap in the literature: online learning experiences of Black women students. Given the continued underrepresentation of Black women in the field, addressing this gap also has significant implications for practice and policy. Doing so will not only improve online program development in engineering for Black women but also influence policy making to achieve equity in postsecondary education access and retention and, ultimately, workforce in the field. Therefore, we

seek to expand the understanding of online learners by exploring online engineering learning during the COVID-19 pandemic through the cases of Black women students.

Literature Review

Online Learning and Equitable Pedagogy

Online education, which falls under the broader umbrella of distance education (in which the learner and instructor are physically apart; Roffe, 2004), is not new to higher education in the United States. Since the 1990s, the creation of the internet has paved the way for universities to introduce online educational programs (Kentnor, 2015; Martin et al., 2023). More importantly, because online learning utilizes computers and the internet to deliver at least 80% of course materials (Allen et al., 2016), it requires a different pedagogy from traditional in-person learning (Bernard et al., 2004; Archambault et al., 2022). When all modes of learning became virtual due to the outbreak of the COVID-19 pandemic, university students reported a lack of motivation and engagement and feeling of fatigue (Top Hat, 2020; Asgari et al., 2021).

More importantly, online education has revealed equity issues in higher education, such as the digital divide (Bell et al., 2022) and the education outcomes of minoritized students (Smith et al., 2024), and has brought opportunities to rethink and promote equitable pedagogy. Since the pandemic, scholars have discussed equitable digital pedagogy in various ways. Some of the strategies included providing technology access to students and redesigning curriculum to reflect their cultures (Ladson-Billings, 2021), “re-establishing norms,” “using student names,” “using breakout rooms,” “leveraging chat-based participation,” and “using polling software” (Reinholz et al., 2020, p. 7).

Racialized and Gendered Aspects of Cyber World

While much of the literature above focused on the overall impacts of the pandemic on students, other researchers have considered how gendered and/or racialized experiences might further impact online learning outcomes.

A number of scholars have focused on either the racial or gendered aspects of online learning experiences and outcomes. Britton et al. (2022) evaluated the gendered effects of the pandemic on undergraduate engineering students at New York University between 2017 and 2020 and concluded that women students experienced online learning more negatively than their male peers. Miller-Young et al. (2023) made a similar observation, in that women students tended to feel less belonging than their male peers in their first-year online team-based engineering course at a Canadian university. While these studies shed light on gendered experiences, Fletcher et al. (2023) studied engineering students from historically Black colleges and universities (HBCUs) during the pandemic. Their study revealed that HBCU students experienced academic and off-campus challenges while learning online. In addition to being unable to access faculty or advisors on campus, sudden changes in employment, finances, and family responsibilities negatively impacted their online learning.

Building on the discussion of racial/ethnic and gender identities in online learning, other researchers have sought to understand the experiences of those at the intersection of race and gender. For example, Zajac and Benton-Lee (2023) investigated the online experiences of minority students related to microaggressions. Their study highlighted that requiring a profile picture is a risk factor for inducing microaggressions for Black and Brown students. For example, women students of color felt invisible as their introduction threads online went ignored compared to their white counterparts who received comments. Additionally, their competence was questioned by peers. These experiences have been widely documented in face-to-face classrooms (Zajac & Benton-Lee, 2023). In addition, the authors found that participants often decided not to declare their identities, to protect themselves from online bullying and harassment.

Black Women’s Learning During the COVID-19 Pandemic and the Black Lives Matter Movement

Regarding the racialized and gendered experiences of online learning, it is important to understand the broader impact of this study, which took place at the beginning of the fall semester of 2020. To this end, we discuss the recent literature on the Black Lives Matter (BLM) movement to understand its impacts on Black women’s learning.

To situate the context of the study, we consider the activities of the BLM movement in the summer of 2020. People have shared their experiences of racism and marginalization using the hashtag #BlackLivesMatter since 2014, which surged in 2020, following the death of George Floyd (Egbonu, 2020). More critically, Black women were going through racialized and gendered experiences due to the centering of Black men’s experiences (e.g., the initial erasure of the murder of Breonna Taylor and the following campaign of #SayHerName) (Egbonu, 2020; Pennant, 2022). Furthermore, Black college-aged women experienced fatigue and depression and did not want to draw attention in schools from being overexposed to racial microaggressions online (Tanksley, 2022). The pandemic also exacerbated Black women’s economic trajectories by affecting their financial obligations, support, and stability (Porter et al., 2023). As evidenced by the literature, Black women’s online learning experiences during the pandemic are especially unique because they were experiencing the intersection of race and gender due to the BLM movement while their offline lives were also suddenly transitioned online.

Faculty-Student Online Interactions as Barriers in Engineering

While online interactions in engineering have been considered as enabling flexible and diverse learning experiences (Bourne et al., 2005; Tremblay, 2006), they remain as barriers, especially in engineering. Even before the pandemic, online courses often provided few and less effective opportunities for faculty-student interaction.

Prior to the pandemic, researchers highlighted the lack of interactivity in U.S. online engineering classes. In online modality, they pointed out missing out-of-class interactions (Mackey & Freyberg, 2010), difficulty in teaching and learning through graphic information without rich communication (Kinney et al., 2012), and the impact of asynchronous remote instruction on faculty and student interactions (Gary et al., 2017).

More recently, post-pandemic studies have continued to reveal limitations of online interactions in the field. Students experienced the loss of hands-on activities and engagement when their lab-based engineering courses were moved online (Johnson & Barr, 2021) and went through “Zoom fatigue” (Asgari et al., 2021, p. 6), which is the feeling of exhaustion due to taking classes on Zoom.

Overall, prior research has substantially investigated the online learning experiences of the engineering student population during the pandemic. However, there are relatively few studies on how the students’ gendered and racialized experiences intersect. Meanwhile, there has been extensive research on Black women (Ross et al., 2017; Ross et al., 2021) and Black men (Burt et al., 2019, 2021) in engineering, and yet, the online aspects of their engineering education have not been adequately understood. The climate in science, technology, engineering, and mathematics (STEM) is often referred to as chilly (Flynn, 2016; Parson & Ozaki, 2017) for Black women due to their racialized and gendered experiences. Despite the existing research on the challenges faced by Black women in engineering, there is limited knowledge about how these experiences translate into virtual learning environments.

Our work is critical because we take a deeper look at Black women students’ online program experiences in engineering. Through this study, we aimed to understand Black women students’ overall online program experiences and their interactions with peers and faculty using the online collaborative learning framework, which provides us a new lens for looking at minoritized students in online settings.

Conceptual Framework

In this study, we use the online collaborative learning (OCL) framework. OCL is a theory of learning, which focuses on the learning environments that foster collaboration and building knowledge collectively (Harasim, 2012). It is anchored in the idea that students learn by talking to one another and co-constructing a solution to a problem, rather than memorizing correct information. Per OCL, there are three phases of knowledge construction through discourse: (1) idea generating, (2) idea organizing, and (3) intellectual convergence. Harasim describes OCL as a new theory of “learning that focuses on collaborative learning, knowledge building, and Internet use as a means to reshape formal, non-formal, and informal education for the Knowledge Age” (2012, p. 81).

We draw from the following tenets of OCL in this study: The learning environment and learning interactions as the context of our study is entirely online (see Appendix for interview questions that tie to each tenet). OCL integrates conversational learning, conditions for deep learning, development of academic knowledge, and finally, joint knowledge construction. The end goal for the theory is to make inferences and apply them under different circumstances. According to this theory, learners start the process of generating, organizing, and converging on ideas at a more advanced level, which is facilitated by professors through instructions and pedagogies (Harasim, 2012).

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OCL is a fitting theoretical framework for our study because of its past applications on related research studies. For example, McCollum (2020) has shown how this theory can be used in synchronous and asynchronous STEM courses. In addition, the framework has been utilized to design and capture online collaborative learning in cross-cultural and multicultural settings (Kumi-Yeboah et al., 2017; Kumi-Yeboah, 2018). Specifically, it helped capture minoritized students’ comfort in leading online discussions and magnified cultural differences in online settings due to the lack of engagement with cultural diversity and inclusion in curriculum and reading content (Kumi-Yeboah et al., 2017). However, to our knowledge, we are the first to apply OCL to better understand the experiences of Black women in online engineering programs.

Purpose and Research Questions

The purpose of this study is to understand Black women students enrolled in online undergraduate engineering programs. Our research questions stem from the literature review on Black women’s learning during the pandemic and online interactions in engineering. Accordingly, the guiding research questions are: (1) How do Black women describe their online program learning experiences? and (2) How do participants describe their interactions with other students and faculty in their online programs?

Methods

We used a qualitative exploratory, case study research design to collect data for this project. In this section, we provide additional details about participants, the data collection instrument and collection procedure, and the steps taken for data analysis. IRB approval was obtained.

Participants

As illustrated in Table 1 below, the participants in this study were 14 undergraduate students attending a large public university in the United States. All participants self-identified as Black women. Most women pursued majors in the field of information technology: Three studied information technology and four, graphic information technology; the rest were studying electrical engineering (3), software technology (2), engineering management (1), and web development (1). All participants were assigned pseudonyms. Black women participants were recruited via a one-page digital flier circulated via email to faculty, staff members, and students. The flier included a link to a 10-item recruitment Google questionnaire. The recruitment form asked each respondent to share their name, email address, enrollment level (undergraduate or graduate), expected graduation year, major, and other demographic information (e.g., birthplace, citizenship). This information helped us screen prospective participants. After a prospective participant completed the survey, a member of the research team (usually the study’s Principal Investigator) would email the individual to schedule an interview time. The recruitment Google questionnaire was provided to all who showed interest in the instrument, and some individuals who completed the questionnaire did not go on to participate in the study. All individuals who participated in the study were offered a \$50 participant incentive via a cash transfer app (e.g., Venmo, PayPal).

Table 1

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Participant Background Information

Pseudonym	Academic Major	Primary Aspect of Online Learning Appreciated
Andrea	Information Technology	Flexibility
Angellina	Information Technology	Campus resources
Brenda	Software Technology	Flexibility
Bristol	Web Development	Flexibility
Charley	Electrical Engineering	Program culture
Griselda	Graphic Information Technology	Campus resources
Jess	Graphic Information Technology	Course discussion
Laken	Engineering Management	Campus resources
Lauren	Information Technology	Course content
Lilian	Graphic Information Technology	Flexibility
Oakley	Software Technology	Course content
Reese	Electrical Engineering	Flexibility
Sharon	Graphic Information Technology	Caring faculty
Stacy	Electrical Engineering	Flexibility

Instrument

The demographic information of the participants was collected through the recruitment form; thereafter, we conducted semi-structured interviews with each participant. The primary data collection instrument was a 31-item interview protocol based on external literature and informed by expert review (see Appendix for the full protocol). The protocol was divided into four sections

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that focused on different variables, including: (1) departmental culture/campus supports; (2) personal identity; (3) academic support, classroom interactions, and mentorship; and (4) professional development and career goals.

It is important to note that we did not draw from OCL when designing the interview questions. Instead, we drew from OCL tenets in the data analysis process to make sense of the qualitative experiences of Black women in engineering. OCL helped us zoom in on how participants experienced knowledge building and interactions virtually in online degree programs.

Data Collection

The researchers collected qualitative data over a five-week period in the Fall 2020 semester. All interviews were audio-recorded over Zoom and then transcribed verbatim using a commercial transcription service.

Data Analysis

Data were analyzed in four distinct steps. In the first step, we reviewed the qualitative codebook compiled by a research team member by organizing codes such as academic major, perception of experience in major, interactions with other students, impact of the COVID-19 outbreak. Reviewing this codebook allowed us to identify constructs of interest. Next, the authors reviewed participants’ demographic information and researcher memos. During this stage, we also had iterative conversations about the compelling elements of this data set. The third and fourth step involved two cycles of open coding. In the first cycle of open-coding, the authors re-read each transcript and conducted line-by-line coding. In the second cycle, the authors identified components of the interview transcripts that addressed the research questions. Cumulatively, these steps helped us arrive at four themes that characterized online learning for Black women engineering majors, which are discussed next.

Results

In this section, we present the four themes that described how Black women students experienced their online programs in different majors within engineering. Of note, information on participants’ academic majors can be found in Table 1. Based on the analysis of the interview data, we identified that our participants: (1) experienced isolation, (2) witnessed varying impacts of COVID-19, (3) observed benefits and limitations of flexibility of online programs; and (4) engaged in virtual connection building.

Experiences of Isolation

Most of our participants reported learning in isolation due to the nature of their enrolled online programs in engineering. Participants articulated that they felt isolated because of limited opportunities to interact with their peers. They often missed the day-to-day peer interaction component in their learning environment, and often stressed the fact that they never really met their

peers. However, most participants reported the class projects to be collaborative and team-centric where everyone’s input was needed.

Lack of Interactions

Overall, participants expressed how they had limited opportunities for networking with peers. For example, Reese explained this when she said:

Since I’m an online student, I haven’t really interacted with any students at all. Any other students other than . . . I think in the beginning of the semester, we would have the discussion boards, introduce yourself to your other classmates. But other than that, I haven’t interacted with any other student.

Bristol echoed experiences with isolation. She mentioned that most of her interactions were isolated. The interviews for the study were conducted in the fall of 2020, as the BLM movement had a resurgence across the country. During those times, she mentioned missing out on interactions with others, especially Black students. Oakley also characterized online learning as isolated. She mentioned her experience of being a Black woman in engineering spaces; however, her quote captured the isolation components of an online setting.

Well, I guess it’s kind of hard for me because I’m online and so you’re not physically in a room with the teachers and the students. Everyone pretty much sees the one little icon picture that you have on your profile.

Talking about her experiences in a mathematics class, Oakley highlighted that she had to depend more on external sources to learn than on the lecture itself because they were not interactive.

I guess the explanation and the lectures aren't as interactive as were needed for some of the students to do well in the classes. And I felt that way too, especially with some of my second and third calculus classes. I feel like I relied heavily on a lot of outside sources versus some of the lectures.

The interview data show that the online format missed capturing the interaction from peers even virtually. Also, the classes lacked the interactive components to a point that students relied on outside sources. The lack of these interactive components, which often requires students to pursue learning experiences beyond what the course offers, increases their sense of isolation.

Sharon reiterated the need for opportunities to connect with other women students, especially Black women students:

I have not seen another Black woman in my courses. Maybe I’ve just like taking them in a different semester but I haven’t had that privilege to really connect with anyone. I think there was a girl that was Mexican in one of my classes but as far as Black women I really would like to be able to connect with other ladies.

This sentiment was shared by Oakley, Bristol, and Andrea. Specifically, Andrea explained the importance of peer networking with other women:

I do find more comfort in working with females and especially Black females because we can of course relate to each other more about different things. And males, sometimes, don’t get that. They just want to take control and tell us what to do.

Andrea’s statement highlighted the male-dominated nature of the engineering discipline. Her interview data imply that she perceived working with women easier than working with men.

Additionally, the data show that students experienced lack of faculty interaction due to virtual format. Many participants echoed the significance of pedagogies embraced by faculty. For instance, Sharon shared that while there were professors whom she got to know very well, there were those whom she did not know due to the online nature of the classes.

I think on the faculty side, the professors that I’ve really gotten along with are professors that are more dedicated to helping students in general. It’s like they have a different mindset. I have had really two professors that were just phenomenal. And when I think about the two is that they really want students to succeed. And then I have another group of professors that I couldn’t tell you much about them. Not that I didn’t attend their class is just because they didn’t teach the class, but you have a video recording taught by another professor and they give you feedback. And even with giving feedback, a lot of times it’s a student grader that’s giving the feedback.

Counterintuitive Reflections on Isolation

On the contrary, Stacy’s experience of isolation showed a stark difference from her peers as she enjoyed working by herself.

I’m a pretty secluded person. So the online environment is comfortable for me . . . I like working by myself. I don’t really like collaborative work, but I have ended up in a project before, and it’s just something that you end up getting used to, especially if you’re online or anything like that, but online actually, I haven’t had that many collaborative work unless I was in like a humanities course.

This quote from Stacy suggests that some students may, to some degree, appreciate being able to work by themselves. In addition, Stacy does not seem to expect collaborative learning experiences outside of the social sciences and humanities.

Moreover, it was also interesting to examine more closely the participants who did not engage much with peers in or outside of class time. Among such participants, Oakley mentioned that if she were interested, she would have participated in study groups. Meanwhile, she described herself as “an introverted learner” and “a self-learner.” Similar sentiments were shared by Charley, Griselda, and Stacy. Stacy, in addition to her preferred solitary study habit, elaborated that while she was part of “a lot of group chats,” she did not actively participate in study groups because of

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her negative experience with male students. In her occasional engagement with study groups, Stacy felt that men students did not take women students seriously, especially Black women.

Varying Impacts of COVID-19

When asked about the COVID-19 pandemic’s impact on their academic and professional journey, our participants voiced different stories. Griselda, Lilian, and Oakley stated that their academic journey was not “really” impacted. While Griselda did not elaborate on her response, Lilian added:

Academic journey, no. Only because I’ve been out of school for a while so it didn’t really make a difference. And now we’re in what, month nine of the pandemic so I think I just leveled everything out and it is what it is at this point.

This sentiment also resonated in Oakley’s experience. She explained that unlike in-person students, her academic journey “didn’t change much . . . Everything is pretty much the same” because she was an online degree student. Also, her work was “partly remote half of the week,” which seemed to further account for why she did not experience many changes during the pandemic. Interestingly, although both Lilian and Oakley described little impact from the pandemic, they identified different explanations of the shared phenomenon. Lilian attributed this to being “out of school for a while,” whereas Oakley perceived it as the result of being an online student.

In contrast, Brenda specifically highlighted the changes the pandemic brought to her experience as an online student. She described her classes as “rushed and unprepared” and without “individual attention” because, for example, one of her classes “had 400 to 500 students online.” Given that her classes had 300 students before the pandemic, this represents a critical shift not only in the number of students in classes but also in a faculty member’s capacity to interact with all the students.

For other students, the pandemic affected their in-person interaction and learning outside their academic programs. Specifically, four students described how the pandemic significantly affected their ability to network with people and have face-to-face interaction. Sharon summarized her experience: “COVID-19 really was an isolation cue. It’s just like, here’s the little box that you have to stay in now, on to everything.” Similarly, Angellina’s internship transitioned to online, making it impossible for in-person interaction or learning. Stacy and Sharon also experienced interruptions in interview opportunities. Jess experienced high stress due to her health vulnerability and frustration with being unable to work hands-on.

Observed Flexibility

The pursuit of online studies is associated with a flexibility not traditionally afforded to students through in-person learning. The modality of online programs enables participants to

essentially be in two places at one time. As a result, participants with caregiving duties may attend classes while caring for their dependents. Reese, mother of a newborn baby at the time of the study, was juggling the demands of coursework and other life roles. As she recalled:

Right now, it’s been really hard with having a new baby. So, I actually am with him all day and he goes to bed at about 7:30 PM and I’ll study from 7:30 PM until 1:30 AM. So, it’s difficult . . . And I’ll try to squeeze in studying in between his naps and stuff like that throughout the day, but that’s pretty much what I do every day. Even on the weekends, I’ll still study just to make up for the time I lose during the day.

While the juggling is described by Reese as “difficult,” taking classes online enables her to physically be with her baby as needed. One can sense the challenge of “juggling” these responsibilities as articulated by Reese. However, were she enrolled in in-person classes, it would limit time with her baby on a daily basis. Additionally, Reese would have to identify an alternative caregiver for her baby, which could result in an added expense. The availability of online studies reduces potential strain on other roles held by the students (e.g., caregiving)

For other participants, the modality of online studies enabled them to simultaneously pursue multiple opportunities. Oakley, a full-time student, worked a full-time job in addition to her student responsibilities. It is plausible that without the modality of online classes, it would not be possible for Oakley to simultaneously be both in her work environment and in a classroom. The same hypothetical was made real for Lilian, who held a job at a large corporation that beneficially offers a tuition partnership with the LPU. Lilian explained

Yeah, so, the [redacted corporation name] program has a whole separate team, separate from LPU that deals with specifically [redacted corporation name] partners which I really appreciated . . . I was in contact with a [redacted corporation name] partner hub that relates to [LPU-corporate partnership program], so that was definitely really helpful. And then once I started my classes and I found out there was a whole team that I could contact, that was also helpful. But the fact that there’s a whole system dedicated to just [redacted corporation name] partners, because it’s different when you’re going to school online and you’re working, I definitely appreciate that.

In her excerpt, Lilian refers to the resources available to her through her job that supported her ability to take classes online. The flexibility of her online learning was further strengthened with a corporate partner being connected, which established resources for her and other employees to leverage as online learners.

While the benefits of online learning flexibility were apparent in the stories of some participants, others did identify some limitations. Among them, Brenda mentioned the challenges to flexibility presented by online learning. She explained:

It’s really weird because for online classes, most of them, they only let you take an A or B session, which are seven weeks long. So, it’s like a 14-week course crunched

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into seven weeks. I have to have two classes for A session and two classes for B session. So, it adds the stress on of trying to stay caught up with homework. I don’t understand why they do that. I wish they just offered C sessions for us, like everyone else.

Brenda acknowledges the challenge of taking short, intensive courses. It is clear from this quote that Brenda is frustrated by the pacing of online courses.

Virtual Connection Building

While many of our participants felt isolated due to the online nature of their programs, online tools and technology enabled some students to make connections with their peers virtually and even build an online community outside of classrooms. For instance, Angellina, who was doing an internship at the time of her study, described her daily interaction with another online student from Vietnam:

Yes. I interact, actually, with one [student]. She’s from Vietnam, but now she’s a U.S. citizen. I interact with her on a daily basis. We worked on projects together because we ended up having a lot of the same courses. In fact, we worked on our capstone project together, too. And then we have, besides that capstone course, we have another course together. Like the last session we had all of our courses together. So, I talk to her on the regular. And some of the things that I’ve taken, she hasn’t taken yet and vice versa. So, we help each other out.

Angellina and her peer seemed to have cultivated a nurturing relationship in which they shared their courses and projects while helping “each other out.” Her story illustrated a one-on-one relationship building that extended outside the classroom. Similarly, Brenda discussed how she formed “a study buddy group” to get help on her classes and exams. Below, she explained how she took the initiative to find the group.

Well, what helps me is in my classes, I find a study buddy. So, I have a study buddy group of about three people now. So, we practice together, and we’ll make study guides before we take quizzes or midterms or finals. So that is super, super helpful. I feel like I’m not a very good test taker. So I know what I’m talking about.

In addition to the available campus resources, Brenda created her own community that further supported her academic success. As she continued to talk about her classmates, her story highlighted a proactive act of community building, which seemed to have come from her shared sense of solidarity with peers. In the next excerpt, Brenda emphasized that she and her classmates helped each other out even though they had “never met [each other] in person” because they were “on that same track.”

I have a few people that I’ve taken classes with online, never met them in person, but we help each other out because we’re on that same track. We’re not always

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taking the same classes at the same time, but sometimes we're like, “Hey, have you taken this yet?” Or “When do you plan on taking this?” So that we are able to help each other out if need be.

Virtual connection building also resonated in Lauren’s and Jess’ experiences. Their experiences were a bit different because they were able to adequately interact with classmates in the existing course format with the help of instant messaging applications. Lauren, a self-employed student, related that one of her classmates created a “GroupMe” that allowed them to talk more. GroupMe (2023) is a mobile group text messaging app known for its accessibility for team collaboration. While Lauren perceived that there “wasn’t a lot of interaction,” she stated that it was “more than just the normal discussion board interaction.”

I have talked to a few, because of the discussion boards that my courses require. I’ll end up having discussions and then we might end up talking about off topic things. One of my classmates, she created a GroupMe (chat), which allowed us to kind of talk a little bit more, but it wasn’t a lot of interaction, but it was more than just the normal discussion board interaction that spilled over into the group.

Similarly, Jess, who was a single parent of three children working full-time in the Air Force, brought up her class discussion experience with Slack. Slack is an instant messaging program like GroupMe that needs to be created on a team level and can be controlled by administrators (Ivanova, n.d.), in this case, by the LPU. Jess highlighted her positive experience with Slack:

So, a lot of our classes will have discussion boards and things like that. I think that my favorite thing was Slack. If every class used Slack as far as online, that would be great because that became almost like you’re texting everyone, not logging on some Blackboard and doing a discussion, but in real time. I think the best thing about it was that the professor put examples up not on Blackboard but on Slack. Because if I was having an idea moment, I can go back to Slack and say, hey, this is going to work, and see the examples. And then other people, once we were working through our processes, we put it on there and then other people would come in and we’d comment on each other.

For Jess, Slack allowed her to talk to her professor and classmates in “real time,” which thus facilitated connection building. In addition to having discussions via Slack, her professor’s use of Slack to share course materials further benefited her. As her professor posted course examples in Slack instead of Blackboard, the usual platform for class discussions at the LPU, Jess was able to access them easily as she reflected on her ideas and coursework. This messaging program promoted more active interactions among online students because they were able to share their work and provide feedback there

The examples from Angellina and Brenda show how online students took initiatives to extend their interaction and relationship building beyond the required course engagement and discussion boards. Then, Lauren and Jess highlighted the extent to which they were able to

increase their engagement with peers within their course organization by using technology applications. Overall, online learning experiences often led to a feeling of isolation. However, the online environment provided a platform for students to support one another in and out of their formal learning environments.

Discussion

As an exploratory study, our paper helps to fill a research gap on the experiences of Black women students in online engineering programs by shedding light on their experiences at LPU. While our findings do not explicitly reveal racialized aspects of their experiences, they are situated in the work of many other scholars who have shown that women of color navigate hostile educational spaces and discriminatory practices in engineering (McGee, 2020; Parson & Ozaki, 2017). Specifically, our study expands the discussion on Black women engineering students’ feeling of isolation in White spaces and need for counter spaces that are safe spaces for minoritized students (Blosser, 2020) by showing how isolation is experienced in online modality (Sung & Huang, 2024) by Black women. Participants highlighted their limited peer interactions, specifically with other women students in their online engineering programs. In relation to isolation, they also underscored the importance of faculty in fostering (or lack thereof) interactive components in online courses. Furthermore, this study shows how gendered educational experiences unfold in engineering for Black women students. The findings contribute to literature that shows how the COVID-19 pandemic encumbered learning (Harper, 2020). The results emphasize the key advantage of online learning, which makes room for students who may also have caregiving responsibilities or full-time jobs. Previous scholarship has shown that women of color must often balance caregiving with learning, and online learning may be a way to achieve educational access and equity for this student group (Sampson, 2020). Based on the fourth finding, we see that core social group formation and engagement involves classmates and peripheral relationships are made possible because of the online modality and technology. Online classrooms and engagement serve as a launch pad for Black women students to build connections, and even a community, outside classrooms. This finding is especially crucial for making online course formats more accessible for, and supportive of, Black women, who often do not have opportunities to interact with other women or Black women in online engineering programs. Thus, our study extends the literature on advising online students that highlight the importance of supporting their connection building through communication, relationship building, and support in personal and academic growth (Meyer et al., 2022).

When thinking about the application of OCL to our study site, participants experienced community building in an online space, which is a form of communities of practice. Because of OCL’s emphasis on idea generating, idea organizing, and intellectual convergence, OCL underscores that institutions such as LPU must be intentional in the consideration of what online engagement looks like, how it is facilitated, and how to assess and/or ensure that online education is not at a detriment to the student. For Black women, as several participants discussed the negative perceptions of men toward Black women in online classes and their impacts on working with other students, LPU needs to take into account these race/gender dynamics among online students and

redesign online engineering programs to enable positive virtual connection building in and outside of the programs. Finally, OCL helps us consider the implications of teaming as a critical component of most engineering thinking and learning. Thus, faculty designing online courses should carefully consider what content can truly be optimized through an online setting and how to deliver this content while providing opportunities for collaboration, especially for historically underserved communities (Bourne et al., 2005; Dziuban et al., 2015; Herman, 2020).

Overall, our study demonstrated that online Black women students undergo a unique experience of online education consisting of both isolation and virtual connection building. We understand that the Black women students reported isolation at large because they were enrolled in an online engineering program even before the pandemic. While students experienced increased flexibility and formed virtual support groups on their own, they often did not have institutional support for faculty and peer interactions. Due to the fully online modality of their degree programs with heavily lab-based engineering courses, these issues around isolation and interactions need to be addressed in ways that do not mimic the structure and delivery of in-person programs or classes.

Based on our findings, online engineering programs should be designed and structured in ways that leverage the technology and modality optimum for Black women. For example, institutions should take accountability for connecting Black women with their peers, to form a sense of solidarity and friendship in virtual counterspaces, especially with other women of color. Moreover, with the recent development of artificial intelligence and virtual reality technology, online programs should build in more interactive and immersive components with an understanding of Black women students’ needs and contexts.

These findings are important because our work makes both a theoretical and empirical contribution to literature. Theoretically, this study contributes because we are the first to apply OCL to better understand the experiences of Black women, specifically drawing from the two tenets: the learning environment and learning interactions. With the help of professors online, the students in our study generated new ideas and constructed applications of engineering. The learning environment refers to tools used during the classes (Zoom) and for interactions (GroupMe and Slack chat). In terms of our empirical research contribution, our study shows that there are nuances of using technology and that even though students often needed to take initiatives outside of their formal online learning environment, online platforms and tools helped them connect with others virtually. Also, our analysis extends the application of the OCL framework to study Black women students in an online setting.

Limitations and Delimitations

One limitation of this study is being a single-site study. We recognize that the themes we see in the data might be hallmarks of LPU’s online engineering programs, as opposed to these programs at large across U.S. higher education institutions. To address this limitation, future studies should explore other institution types.

Another potential limitation is the timing of this study. Our data were collected during a time of external stress due to the COVID-19 pandemic. Also, as discussed in the literature review

section, Black women were going through racialized and gendered experiences due to the pandemic and the BLM movement (Pennant, 2022; Tanksley, 2022). As such, if the study took place at a different time, isolation might not have been felt as strongly by the participants. While we observed varying impacts of the pandemic on students’ academic and professional experiences in our findings, it is important to note these various ways the BLM movement affected offline and online lives of Black women students. Accordingly, as argued by Pennant (2022), our participants’ stories are embedded in their multi-layered experiences of multiple pandemics (i.e., the COVID-19 pandemic and BLM movement), which may manifest differently in other non-pandemic time periods.

Recommendations for Future Research and Practice

The data from this study suggest a need for synchronizing and systematizing resources. Namely, resources should be designed for specific engineering disciplines, not only to provide technical assistance but to facilitate group interaction within and across programs. Online degree programs offer the same academic resources as in-person programs and only provide technical assistance related to online courses. This is concerning, given the reported lack of help specific to the Black women students’ majors and across online engineering programs and the missed opportunities for networking and interactions. Thus, it is essential to understand the diverse contexts and needs of online Black women students, which might be different from other Black women students enrolled in in-person degree programs.

Moreover, as shown in the study, we acknowledge that the need for online courses might be different for online Black women students. For example, some participants preferred studying alone and many had competing responsibilities, such as caring for children and working full-time. As such, this further warrants a closer look at these students’ contexts. Accordingly, university administrators and leaders should recognize the experiences of Black women students and provide funding for major-specific resources across online engineering programs.

For designing and facilitating an online learning environment for Black women students, the practices of LPU professors could be a potentially useful example for engineering faculty at other institutions, based on our participants’ positive narratives of faculty interactions. In addition, higher education faculty should try to optimize online education for online modality. Black women students in online degree programs do not want an online learning experience to be a replacement of the in-person modality but need support that is specific to their context and needs as online students who navigate racialized and gendered aspects of online education.

Future research should also investigate online engineering experiences across various racial groups, gender, and other identity markers. Moreover, future researchers may consider incorporating social and emotional support for distance learning. For example, past researchers have crafted the Inclusive Student Services Process Model framework that proposes identifying strategies across diverse phases of student learning to indicate where and when they can be

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delivered to online students (Rotar, 2022). The complex experiences of our participants show that inclusivity needs to be an integral part of engineering learning futures at different institutions.

Closing Remarks

Our study focuses on the lived experiences of undergraduate Black women students in online engineering programs. Based on the findings, we conclude that, on the one hand, these students experienced isolation, especially during the pandemic and BLM movement. However, due to the flexibility of their online programs, students managed various other roles while being full-time students. They also engaged in building virtual connections with peers and faculty with the help of online modality and technology. As a result, this study contributes to theory and practice by utilizing OCL as a lens to understand Black women students’ online learning in engineering and adding knowledge of their unique experiences to improve access to and equity in online engineering education. Higher education leaders should design online engineering degree programs in consideration of these experiences and learn to further support online Black women students to pursue their education in diverse contexts.

Conflict of Interest Statement

The authors do not have any conflicts of interest to declare.

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Appendix

Interview Protocol

Note: Questions that tie to OCL tenets are as follows:

- Learning environment: 2–3 in Section 1; 3–4 in Section 3; 5–7 in Section 4.
- Learning interactions: 5–10 in Section 3; 1, 5–7 in Section 4.

Google Form

1. Have you had a chance to fill out the Google form? Yes, or no?
 - a. If not, I’m going to just quickly fill in the information (ask questions aloud) and fill in Google form.

Section 1: Departmental Culture/Campus Supports

1. What first made you interested in this major?
2. Do you enjoy being at the engineering school?
 - a. Do you feel welcome?
3. Do you like this university?
 - a. How would you describe the culture of your program/department?

Section 2: Personal Identity

1. How would your best friend describe you?
2. Is your race important to your identity? Why?
3. What about your identity as a Black woman specifically? How important is that?
 - a. What about your culture and/or language?
4. Do Black students have a different experience here, compared to non-Black students?
 - a. What about Black immigrant students?
5. Are you the first to major in engineering in your family?
6. How would you describe your socioeconomic status?
7. Do you have other identities or responsibilities off campus that you often consider in your life, outside of your identity as an undergraduate student? If so, what are they and how do they impact your ability to continue in engineering?
 - a. For example, responsibilities to family members working 20+ hours a week, commuting from home, etc.

Section 3: Academic Support, Classroom Interactions, and Mentorship

1. What academic services available on campus positively assist/support you (tutoring, advising, etc.)?
 - a. How often do you use these services?

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- b. What supports/services do you wish were present at either the department level or the institutional level?
2. What was the transition from high school to college?
 - a. Could you tell me more about your experiences in your introductory math and science courses?
 - b. Could you tell me about your experiences in your introductory engineering courses?
3. Describe your ideal learning style. How does this preference vary from lecture based to laboratory courses, to project-based courses?
4. How would you describe your study habits? What enables you to best perform on exams/various forms of assessment? Would you say your abilities are accurately reflected in your assessment outcomes?
 - a. Do you study with other people? If you study by yourself, do you have groups that you could potentially study with? How did you form these study groups?
5. Describe your interactions with other women students in your engineering classes.
 - a. Are there other Black women in your class? How is interacting with non-Black women in these classes?
 - b. To what extent are interactions with women of color/women who are 1st/2nd generation immigrants similar or different from women from racial majority groups?
6. Did you have engineering faculty (including Teaching Assistants) that identified as women? If so, was your relationship/interactions different from your men professors?
 - a. How has that experience influenced your learning?
 - b. How has that experience influenced your sense of belonging in engineering?
7. Do you have any friends in your major? What is your friend group like?
8. To what extent have your interactions with faculty, staff, and and/or students outside of your engineering program (but on campus) impacted your experiences?
9. Do you have any women mentors (can be students too) within the university? How did this mentorship start?
 - a. Do you have any mentors in your career field?
 - b. How have your mentors shaped your academic and career interests?
 - i. What are their races?
 - a. Do you have any women mentors outside of the university?
 - i. What are their races?
 - b. Do you have any Black mentors?
 - i. What are their genders?
 - c. Do you have any immigrant mentors? Where are they from?
 - d. Do you have any mentors who are not from underrepresented groups?
10. What do you wish your professors knew about you that you don’t think they know? What about your classmates?

Section 4: Professional Development and Your Career Goals

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1. What professional opportunities, if any, have you had to gain exposure to the field of engineering (i.e., conducted an internship, study abroad or performed research in a lab, etc.)?
 - a. To what extent have you had the opportunity to take on leadership positions on campus in general or within engineering in particular?
2. Which opportunities have you had to travel abroad as it relates to your undergraduate experience (i.e., research study abroad, Engineers Without Borders, etc.)?
3. Do you see your career/employment/academic trajectory in the next 5 years?
 - a. What do you foresee will be the biggest hurdle toward reaching that goal?
 - b. What do you see as your greatest assets for reaching those goals?
4. Do you feel the impacts of financial pressures—like loans or debt?
5. What about the COVID-19 outbreak?
6. Describe a time where you felt like an engineer.
7. Describe your greatest challenge in your pursuit of engineering.
8. What advice would you give a Black (immigrant) woman who’s about to start going here?
9. Imagine that you were an administrator with the authority (and unlimited budget) to implement a policy or program to support Black (immigrant) women to be successful in their majors? Describe a change you would make?
10. Has anything come up that you would like to revisit or anything else you would like to share?

The Impact of Online Learning during the Covid-19 Pandemic on Academic Outcomes for Newly-Struggling High School Students

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Abstract

The COVID-19 pandemic led to worldwide school closures and a sudden shift to online instruction, which adversely effected academic performance for many students. This study investigated whether demographic characteristics were associated with decreased academic outcomes among newly struggling high school students during Covid-19 online learning. Specifically, the study examined four key characteristics: 1) gender, 2) race/ethnicity, 3) low household income status, and 4) special education status. Newly struggling students were defined as those who received a D or F as their final course grade in two or more classes during the first semester of online learning in 2020, compared to one or no D or F final course grades during the same period in 2019 with in-person instruction. Data from a high school in the Midwestern United States were analyzed to compare final course grades between fall 2019 and fall 2020. Correlational analysis revealed that students from low-income households experienced a more significant decline in grades than their peers not from low-income households. These students were not only more likely to struggle, but also showed a greater increase in D and F course grades between semesters. In contrast, while special education students also saw an increase in D and F final course grades between semesters, the rise was less pronounced compared to their newly struggling sample group peers. This study highlights the impact of demographic factors on academic outcomes during the pandemic, addressing a gap in research on how specific characteristics influenced academic performance amid the shift to online learning.

Keywords: Online learning, newly struggling students, COVID-19 impact, academic regression, special education students, low-income students, racial and ethnic minority groups, gender

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The Impact of Online Learning during the Covid-19 Pandemic on Academic Outcomes for Newly-Struggling High School Students

In the spring of 2020, the World Health Organization declared the COVID-19 outbreak a global pandemic. To mitigate the spread of this novel virus, governments around the world enacted stay-at-home orders, closing nonessential businesses and schools. These school closures, many still in place at the time of this study, caused a sudden and immediate shift from traditional in-person classroom instruction to fully remote online instruction. Teachers were forced to adjust their teaching methods in a matter of days. Most districts had little opportunity to properly implement the shift to online and remote learning (Burgess & Sievertsen, 2020; Murat & Bonacini, 2020, Vu et al., 2020). This resulted in an historical and unprecedented disruption to student learning across the globe (Anger et al., 2020; Andrew et al., 2020; Burgess & Sievertsen, 2020; Grewenig et al., 2020; Murat & Bonacini, 2020; NBC News, 2020; UNESCO, 2020).

Though online learning is not new, the implementation of online learning due to the pandemic was a sudden and unexpected experience for students who normally receive in-person instruction (Yates, 2020). Furthermore, teaching shifted to online learning on an untested and unprecedented scale (Burgess & Sievertsen, 2020; Fang et al., 2023). This sudden shift expanded the challenges that were already in existence in online learning for students, resulting in an urgent, novel, and historic global implementation of online learning (Fang et al., 2023). Many parents with school-aged children are now concerned that their children have lost academic ground due to the learning disruptions caused by the COVID-19 school closures (Horowitz, 2020; Yates, 2020). The full social and academic impact of this disruption remain uncertain (Yates, 2020).

To begin to understand these impacts more fully, this study explored the demographic variables of newly struggling high school students to determine which variables, if any, were most strongly associated with decreased academic outcomes among these students because of the shift to online learning.

Review of Related Studies

Online learning has increased significantly over the last decade, with many states now requiring that high school students take at least one online course before graduating high school (Bernard et al., 2004; Hart et al., 2019; Ya Ni, 2013). Advocates of online learning believe that it has the power to break down barriers for students by offering increased flexibility in setting and learning style, convenience, and more customized learning when compared to traditional in-person instruction (Cheng Chi & Swan, 2000; Hackbarth, 1996; Harasim, 1990; Hughes, et al., 2015; Kiser, 1999; Matthews, 1999; Ya Ni, 2013). However, there are also concerns about the quality of online courses being offered and the ability of these online courses to meet the needs of students as effectively as in-person classes. Some students may struggle more in an online environment than with in-person instruction (Hara & Kling, 2000; Maki et al., 2002; Paden, 2006; Picciano et al., 2011; Shah, 2021; Ya Ni, 2013).

Despite these concerns, there is limited research that has been conducted on the effectiveness of online learning towards academic performance, particularly for K-12 students

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(Hart et al., 2019; Heppen, et al., 2017; Means et al., 2013; Nguyen, 2015; Paden, 2006; Paul & Jefferson, 2019; Phipps & Merisotis, 1999; Tate & Warschauer, 2022; Ya Ni, 2013). The literature that does exist is inconsistent and, in the view of many researchers, also problematic. (Atchley et al., 2013; Brown & Wack, 1999; Driscoll et al., 2012; Hart et al., 2019; Means et al., 2013; Nguyen, 2015; Paden, 2006; Paul & Jefferson, 2019; Phipps & Merisotis, 1999; Rice & Dykman, 2018; Schachar & Neumann, 2010; Tate & Warschauer, 2022; Ya Ni, 2013). Those who find the research problematic contend that many of the research studies that have been conducted suffer from weak design, particularly in the populations used for comparisons, invalid comparisons between variables that determine cause and effect, the treatments used, samples that were not randomly selected, a less than robust validity and reliability of the instruments used to measure effects, as well as the choice of statistical techniques used to analyze the data (Bernard, et al., 2004; Paden, 2006; Phillips & Merisotis, 1999; Moore & Thompson, 1990; Nguyen, 2015). Bernard et al. (2004) contend that these design issues decrease confidence in the accuracy and generalizability of the results of these studies.

Recent research has shown that the academic performance of K-12 students who are enrolled in fully online classes is lower at statistically significant levels than K-12 students enrolled in in-person classes. Students in online courses typically perform anywhere from -0.10 to -0.30 SD lower than students enrolled in in-person courses (Tate & Warschauer, 2022). Students from low-income households, as well as minorities, experience the greatest performance gap when enrolled in an online course (Hart, et al., 2019).

Heppen (2017) conducted a study on 1,224 ninth grade students from across seventeen Chicago high schools enrolled in algebra credit recovery course. Students were randomly assigned to either an online or in-person credit recovery course. The students assigned to the online course scored lower on an algebra posttest than their in-person peers. Additionally, the online students were less likely to receive course credit and reported more difficulty with the course than their in-person peers. The online students had lower credit recovery rates, lower scores on an end-of-course algebra assessment and demonstrated less confidence in their mathematical skills than students who took an in-person credit recovery class.

An area of particular concern that has been identified in online learning is the attrition rate of online students versus students enrolled in traditional in-person classes (Rice, 2016). Student dropout rates in online learning are much higher than in a traditional in-person learning environment. The dropout rate for online courses is 10 to 20% higher than traditional classroom courses with the primary factors tending to be student academic skills, prior experience with online coursework, feedback from instructors, as well as social connections and supports (Aldowah, et al., 2020; Capra, 2011; Hogan, 1997; Herbert, 2006; McLaren, 2004; Moody, 2004; Morgan & Tam, 2006; Youngju et al., 2012). However, most of the studies that have been done on educational outcomes of online courses only include students who have completed the course. Those who were unsuccessful in the course and withdrew have generally not been included in the results. Therefore, the findings of successful educational outcomes in these studies have often been based on an

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exclusion of data from students who had the least positive outcomes in online courses (Hogan, 1997; Phipps & Merisotis, 1999; Youngju et al., 2012).

For example, McLaren (2004) compared persistence and performance measures from the five semesters of online and traditional sections of a required undergraduate business statistics course. Her findings indicated that there was a significantly lower persistence and completion rate for students in the online classes as compared to those in the in-person classes. Though including attrition rate in online courses as an area where further research was needed, when sharing her findings on performance efficacy for students, she based her findings on final grades from only those students who completed the course, thereby eliminating the students for whom the online course was not effective. Based on this analysis, McLaren determined that “while there are significant differences in persistence between the two cases, accomplishment of the learning objectives, as measured by the final grade in the course for those students who persist, is independent of the mode of instruction” (p.7).

As with the majority of the research in this area, when comparing student performance, these studies focused only on those students who successfully completed the course. While this approach does provide important empirical evidence on the impact of online learning when compared with in-person learning for students who successfully complete these courses, it leaves the impacts and experiences of those students who were unsuccessful unexplored.

Previous research has demonstrated that demographic variables can have an impact on student achievement. However, due to the very new and ongoing nature of the COVID-19 pandemic, there is little research to determine if there are demographic variables that are more highly associated with academic struggle because of this shift to online learning during these school closures. Additionally, much of the research that has been published has come from countries outside of the United States and focuses primarily on college and university students. (Burgess & Sievertsen, 2020; Cole, 2008; Coleman, 1966; Kaur et al., 2010; Nasir, 2012; Sirin, 2005; Yates, 2020; Yousefi, 2010). Using the lens of demographic variables, this study explored the relationship between demographic variables and academic outcomes in a group of newly struggling high school students during the shift to online learning as a result of the COVID-19 school closures. The findings of this study can begin adding to the nascent research on the impact of online instruction during the COVID-19 pandemic on K-12 students in the United States.

Research Questions

Newly struggling students are defined in this study as those students who earned a D or F as their final course grade in two or more classes during the first semester of 2020 online learning but earned zero or one D or F final course grades during the first semester of 2019 with in-person instruction.

The purpose of the study was to explore whether particular demographic variables were associated with newly struggling students as well as to determine if there was a relationship between these demographic variables and the change in frequency of D and F final course grades.

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RQ.1: To what extent do student gender, racial/ethnic minority status, low household income status, or special education status predict a student's status as a newly struggling student?

RQ.2: Is there a significant relationship between gender, racial/ethnic minority status, low household income status, or special education status and the change in frequency of D and F final course grades for newly struggling students?

Study Design

This study followed an action-oriented design. In an action-oriented study, the research can inform practice, programs, and policies while also contributing to the broader scientific knowledge base (Small & Uttal, 2005). This methodological framework provides the researcher the opportunity to study and collaborate with stakeholders on complex, real-world issues identified by the key stakeholders. An area of concern identified by both district and building administration for this study was an increase in newly struggling high school students.

This study employed a correlational research design to assess the impact of online learning during the pandemic for newly struggling students as well as to identify patterns, themes, and significant relationships within and between demographic variables. Students' course grades for the identified semesters were collected for analysis from the district's student information system. The data were used to measure academic performance and to compare this performance between in-person learning and online learning.

Regression analysis was conducted for each of the key demographic variables in the sample group to determine if there was a significant relationship between each variable and a student's status as a newly struggling student. Additional analysis was conducted to explore if there was a significant relationship between demographic variables and the frequency of D and F final course grades.

The independent variables in this study are gender (female or male), racial/ethnic minority status (yes or no), low-income household status as measured by participation in the Federal free/reduced lunch program (yes or no), and special education status (yes or no). The dependent variables are newly struggling student status (yes or no) as determined by final course grades during the first semesters of 2019 and 2020 respectively and change in number of D and F final course grades between the 2019 and 2020 semesters.

Methodology

Study Setting

The high school selected for this study was in a suburban school district in the Midwestern United States. Prior to the COVID-19 school closures, this school did not have any fully online courses where students completed their schoolwork remotely. Two years prior to the COVID-19

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school closure, the school did begin to offer two blended learning courses where students attended class in-person three days per week and had an open period the other two days of the week where they completed work online. During the first semester of the 2020-2021 school year, this school provided only online learning opportunities to students because of the COVID-19 pandemic school closures.

Population and Sample

Participants for this study were drawn from a group of just over 1,100 high school students. The participant group consisted of newly struggling students who attended the selected high school during both the 2019-2020 and the 2020-2021 school years.

The overall high school population is 80% White, 9% Hispanic, 3% Black, with less than 2% for each of the other racial groups. The high school dropout rate as well as English Learner percentage are low at 2%. 12% of the population receives special education services. The low household income rate, as determined by participation in the free/reduced lunch program, was 19%. The per-pupil expenditure was \$12,920 per student.

State and local standardized testing were paused during the COVID-19 school closures resulting in a lack of availability of that data. Therefore, to identify newly struggling students, overall course grades for both the first semester of 2019, which was in-person, as well as the first semester of 2020, which was online, were analyzed. A total of 130 students (10.9% of the overall school population) met the criteria of newly struggling for this study. Table 1 presents demographic information for newly struggling students, not newly struggling students, as well as for the combined sample.

Table 1
Distribution of Demographic Characteristics for Sample

Demographic characteristic	Newly Struggling		Not Newly Struggling		Combined	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Gender						
Female	57	43.8	531	52.9	588	51.8
Male	73	56.2	474	47.1	547	48.2
Total	130	100.0	1005	100.0	1135	100.0
Racial/Ethnic Minority						
No	108	83.1	836	83.2	944	83.2
Yes	22	16.9	169	16.8	191	16.8
Total	130	100.0	1005	100.0	1135	100.0
Low-Income Household						
No	90	69.2	807	80.3	897	79.0
Yes	40	30.8	198	19.7	238	21.0
Total	130	100.0	1005	100.0	1135	100.0

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Special Education

No	108	83.1	903	89.9	1011	89.1
Yes	22	16.9	102	10.1	124	10.9
Total	130	100.0	1005	100.0	1135	100.0

Statistical Analysis

For Research Question 1, a single binary logistic regression was conducted using the combined sample to determine the relationship between each demographic variable and status as a newly struggling student. For Research Question 2, the increase in the number of D and F final course grades between the two semesters was calculated for students identified as newly struggling. An ordinal logistic regression was conducted using this sample of students to determine if there was a relationship between demographic variable and increase in frequency of D and F final course grades for newly struggling students. The dependent variable for Research Question 2 consisted of seven range levels with each level indicating the difference in the number of D and F course grades between semesters. Table 2 describes the percentage of cases at each range level.

Table 2

Distribution of Between-Semester Difference in D and F Course Grade for Newly Struggling Students

Increase in Number of D and F Course Grades Between Semesters	<i>N</i>	% of Sample
1	13	10.0%
2	53	40.8%
3	23	17.7%
4	20	15.4%
5	13	10.0%
6	4	3.1%
7	4	3.1%
Total	130	100.0%

Results

Research Question 1

RQ.1: To what extent do student gender, racial/ethnic minority status, low household income status, or special education status predict a student’s status as a newly struggling student?

Binary logistic regression was conducted using the full sample to assess the relationship between the demographic variables and a student’s status as newly struggling. The omnibus tests of model coefficients indicated that the model with predictors fit significantly better than the null model ($\chi^2(4) = 12.65, p = .013$). Additionally, the Hosmer and Lemeshow test indicated good fit of the model ($\chi^2(4) = 1.75, p = .781$).

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As can be seen in Table 3, results of this analysis indicated that there was a statistically significant, positive association between low household income status and a student’s status as newly struggling ($B = 0.550, p = .012$). Students from a low-income household were significantly more likely to be newly struggling. No other demographic variable significantly predicted newly struggling student status.

Table 3

Logistic Regression Results Predicting Student Status as Newly Struggling

Effect	<i>B</i>	S.E.	Wald	<i>df</i>	<i>p</i>	Exp(<i>B</i>)
Constant	-2.044	0.146	196.86	1	<.00	0.130
Student Gender (Female)	-0.338	0.190	3.165	1	.075	0.713
Low Household Income (Yes)	0.550	0.220	6.269	1	.012	1.734
Racial/Ethnic Minority (Yes)	-0.190	0.259	0.542	1	.461	0.827
Special Education (Yes)	0.340	0.264	1.660	1	.198	1.680

Research Question 2

RQ.2: Is there a significant relationship between gender, racial/ethnic minority status, low household income status, or special education status and the change in frequency of D and F final course grades?

There were a total of 50 D and F final course grades out of a total of 861 final course grades for this group in 2019 and a total of 431 D and F final course grades out of a total of 812 final course grades for this group in 2020.

Using the difference between semesters variable as the dependent variable, an ordinal logistic regression was conducted to determine if there was a significant relationship between the demographic variables and the between-semester change in D and F course grades. A comparison of the regression model that included the predictors with the null model indicated that the former fit significantly better than the latter [$\chi^2(20) = 25.250, p = .192$]. Additionally, a chi-square test of model fit supported the regression model [$\chi^2(86) = 78.649, p = .701$]. The ordinal regression assumption of proportional odds was supported ($p = .192$).

As can be seen in Table 4, parameter estimates for the ordinal regression model indicated that, among newly struggling students, low household income status significantly predicted the difference in D and F final course grades between semesters ($B = 0.886, p = .017$). Therefore, not only were students from low-income households more likely to be a newly struggling student (as indicated by the results for RQ 2) but, among the newly struggling students, those from low-income households also showed a greater between-semester increase in the number D and F course grades than their peers from non-low-income households.

Table 4

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Ordinal Regression Results Predicting Change in Frequency of D and F Final Course Grades Among Newly Struggling Students

Effect	B	Std.		df	p	Exp(B)
		Error	Wald			
Student Gender (Female)	-0.191	0.324	0.346	1	.556	0.826
Low Household Income (Yes)	0.886	0.371	5.700	1	.017	2.426
Racial/Ethnic Minority (Yes)	0.096	0.441	0.047	1	.828	0.909
Special Education (Yes)	-1.071	0.460	5.426	1	.020	0.343

When status as a special education student was considered as predictor, results (Table 4) show that this special education status was significantly and negatively associated with an increase in the frequency of D and F final course grades between semesters [$B = -1.071, p = .020$]. That is, among newly struggling students, those with special education status showed a lower increase of D and F final course grades between semesters than their peers without special education status.

Among newly struggling students, there was not a statistically significant relationship between student gender or racial/ethnic minority status and the between-semester difference in the number of D and F course grades between semesters.

Discussion

The purpose of this study was to explore which demographic variables were associated with decreased academic outcomes among newly struggling high school students during the COVID-19 pandemic shift to online learning. This study focused on four key variables: gender, racial/ethnic minority status, low household income status, and special education status.

From this analysis it was determined that final course grades for students from low-income households were impacted more by the shift to online learning than they were for students who were not from low-income households. Not only were students from low-income households more likely to be newly struggling, but they also showed greater increase in D and F course grades between semesters than their sample group peers not from low-income households.

The findings from this study are especially important as they provide further evidence of the escalated impact of the COVID-19 pandemic on low-income households, as is also beginning to be evident in the broader nascent research on this topic. In a report by Dorn et al. (2020), the authors predicted that learning loss would be greatest among students from low-income households. They found that students from low-income households were less likely to have access to high quality remote learning from their school. They were also less likely to have a quiet space to work, less access to devices that were not shared, less access to high-speed internet connection and less parental academic support, all of which are key factors in providing an environment conducive to a remote online learning setting (Dorn et al., 2020; Goudeau et al., 2021).

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Additionally, previous research has shown that students from low-income households were more likely to be provided fully remote online learning during the pandemic. Parolin & Lee's (2021) study that tracked more than 100,000 schools across the United States throughout the fall and winter of the 2020 school year, for example, found that full school closures with remote online learning as the only source of instruction were more common and longer lasting in schools serving primarily low household income students.

In a study of student math and reading achievement scores for more than 5 million third through eighth grade students in the 2020-2021 school year, Lewis et al. (2021) found that achievement scores for students in high poverty schools were disproportionately impacted by the COVID-19 school closures. In fact, their research shows that students attending high-poverty schools showed more than double the declines of students attending low-poverty schools (Lewis et al., 2021).

Conversely, while special education students did see an increase in frequency of D and F final course grades between semesters, it was a significantly lower increase in frequency than their newly struggling sample group peers who did not have a special education designation. Unlike the research that exists on the impact of online learning on students from low-income households, there currently is conflicting evidence pertaining to the impact of online learning during the pandemic on students receiving special education services as well as the factors that contributed to that impact.

For example, Scott & Aquino (2020) conducted a survey of 605 higher education professionals who work with college students with disabilities to learn more about the challenges these students were experiencing with the shift to online learning during the pandemic. Over three quarters of the respondents indicated that—as was seen with students from low-income households—their special education students had difficulty obtaining the needed equipment (particularly access to high-speed internet service) to successfully make the shift to online learning. Respondents also reported that their special education students had more difficulty than their general education peers accessing their online coursework as well as more difficulty in communicating with their instructors. Each of these factors contributed to lower achievement rates for their special education students (Scott & Aquino, 2020).

Conversely, Lupas et al. (2021) studied the academic scores of two cohorts of special education students in the United States. The first cohort consisted of 85 special education students in the 2018-2019 school year prior to the pandemic. The second cohort consisted of 116 special education students in the 2019-2020 school year during the pandemic and online learning. Students in each of these cohorts were diagnosed with attention deficit hyperactivity disorder (ADHD) as the disability that qualified them for special education status. Lupas et al.'s (2021) analysis found that there was no significant difference in academic outcomes between cohorts, with both cohorts showing significant fall-to-spring academic growth. Based on these results, the authors contend that the move to remote instruction did not have a negative impact on special education students who participated in online learning during the COVID-19 pandemic.

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Rice & Dykman's (2018) review of the literature further demonstrates the inconclusiveness of the research conducted on the efficacy of online learning for students with disabilities. In their review of 20 research articles published between 2014 and 2017, they identified three critical themes. First of all, while it is possible for students with disabilities to benefit from online learning, these benefits are not experienced broadly and often vary by disability type. Second of all, much of the policy and practice in online learning does not specifically address the needs of students with disabilities. Lastly, while they are willing to learn, both teachers and administrators express an inability to provide an optimal online learning environment for students with disabilities.

Rice & Dykman (2018) also identified critical gaps in the literature they reviewed. For example, very few studies included information as to whether or not students were receiving the accommodations afforded them by their IEPs with fidelity in the online environment. Additionally, there was little included about the preparation and continual professional development for teachers and administrators in effective online learning practices and pedagogy, particularly for students with disabilities.

As in Lupas et al.'s (2021) study, the current study indicates that special education students were the least impacted within the newly struggling student group. Lupas et al. (2021) posit that the condensed school day, increased flexibility in schedule and reduced academic demand may have been factors in the better-than-expected student achievement scores of special education students during online learning. However, as was evidenced in Rice and Dykman's (2018) review of the literature, further research is needed to determine the factors that contributed to the diminished detrimental impact on special education students in both Lupas et al.'s (2021) study as well as the current study to more clearly understand the impact, or lack thereof, for these students.

Conclusion

This study underscores the exacerbated educational disparities among students from low-income households in the wake of the COVID-19 pandemic. The research has shed light on the intensified challenges faced by these students during the shift to online learning. To address these disparities, it is recommended that future research focus on specific factors contributing to the increased impact of online learning on students from low-income households, thereby laying the groundwork for targeted interventions.

Moreover, policymakers and educational leaders must proactively engage with the ongoing research to inform and adapt current strategies, policies, and initiatives. Priority areas for consideration include ensuring equitable access to high-quality online learning and academic support, as well as addressing issues related to device availability and high-speed internet connections for students from low-income backgrounds.

Special attention is warranted in the realm of special education, where existing research yields mixed and conflicting results. Further investigations into the impact of online learning on special education students are imperative to both mitigate negative effects and enhance positive outcomes.

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This study also highlights the need for a comprehensive exploration of the causes behind larger attrition rates in online learning environments. Understanding these underlying factors is crucial to ensure that online learning platforms are effectively meeting the diverse needs of all students.

Finally, this study has provided valuable insights into the immediate impacts of the shift to online learning, however the long-term consequences on student achievement remain a realm of uncertainty. Recognizing this, future research should include a more extensive exploration of these enduring effects, contributing to a more nuanced understanding of the evolving educational landscape in the post-pandemic era. Continuous research is essential to inform evidence-based practices and policies that foster an inclusive and equitable learning environment for all students.

Declarations

The author declares that they have no competing interests.

This study was reviewed by the Northern Illinois University Institutional Review Board and was determined to meet the definition of human subjects research according to the federal regulations. The submission was then reviewed and approved by the Institutional Review Board through the expedited review process under Member Review procedures on 17-May-2021. The study participants' legal guardians received and signed a Parent Permission for a Minor to Participate in a Research Study form provided by Northern Illinois University and approved by both the university and the school district where the study took place. No study participants are identifiable in this article.

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The Impact and Process of Transition from Face-to-Face to Online Teaching During a Pandemic: A Grounded Theory Approach

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Abstract

The COVID-19 pandemic required a “rethinking and retooling” of many educational interactions, especially in schools that offer primarily face-to-face educational models. The sudden necessity for altering teaching formats and styles created challenges and opportunities for faculty and their students. There is little understanding of the impact the abrupt switch had on faculty and students, or the process by which the transition took place. The purpose of this study was to develop a theory about the impact on and the processes used by faculty for implementing online education in response to the pandemic. A total of 24 faculty members from a private southeastern university in the United States that primarily uses a face-to-face educational model were interviewed. The grounded theory methods of Corbin and Strauss (2015) and Charmaz (2014) were used to inform the inquiry. The unexpected transition to online teaching impacted faculty and students personally, professionally, and academically. Faculty readiness to teach online was highly dependent on perceptions of self-efficacy, which in turn affected their perceptions of the transition. Study findings reinforce the need for university administrators to provide faculty with structured pedagogical support, specifically, technological and instructional design assistance, dedicated time to learn and incorporate instructional changes, and mental health services to care for themselves

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and their students during times of crisis. Determining the process by which the transition took place provides insight regarding both transition facilitators and barriers, which can inform future educational delivery and evaluation.

Keywords: Online teaching, emergency remote teaching, face-to-face teaching, COVID 19 pandemic, faculty perceptions, faculty development

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COVID-19 Pandemic Forcing Shift to Emergency Remote Teaching

Beginning in Spring 2020, educational institutions were faced with deciding if and how they were going to continue teaching and learning while simultaneously keeping their faculty, staff, and students healthy considering the evolving COVID-19 pandemic (Hodges et al., 2020). Ultimately, many institutions unprecedentedly shifted from in-person classroom teaching to online learning, all within a very short time (El Firdoussi et al., 2020; Gigliotti, 2020). This move resulted in educators experiencing significant challenges as they learned new technology and applied different pedagogy so they could continue teaching while also managing their own personal circumstances and emotional responses to the ever-changing situation (Hodges et al., 2020; Naylor & Nyanjom, 2020).

The temporary shift in instruction methodology provided during a crisis circumstance (e.g., COVID-19 pandemic) has been termed “emergency remote teaching” or “emergency remote education” which is different and should not be viewed the same as established online distance education (Bozkurt & Sharma, 2020; El Firdoussi et al., 2020; Gigliotti, 2020; Hodges et al., 2020). Online courses and teaching virtually can be a very effective way to deliver content; however, developing this type of course typically takes six to nine months to ensure systematic models are utilized during the design and planning stages and requires different skills than traditional teaching (Baldwin et al., 2018; Hodges et al., 2020). Additionally, a significant indicator of a faculty member’s readiness to teach online is the number of preparation days given to make the transition (Scherer et al., 2021). Unfortunately, faculty were not afforded the time and not all faculty possessed the skills needed for this type of careful and intentional course design (Gigliotti, 2020). Some institutions were more prepared than others for the transition. For those already adopting online teaching pre-pandemic, some faculty had the benefit of online training in best practices for teaching online, and some institutions were prepared to roll out additional training programs quickly (Jarvie-Eggart et al., 2023). For those at more traditional institutions that focused on in-person instruction, the overnight move to “emergency remote teaching” forced many instructors to make the move without training or with minimal support (Martinho, 2021). This qualitative study was undertaken to explore the process of rapid transition for faculty from face-to-face to online teaching at the university during the COVID pandemic.

Literature Review

Challenges to Shifting to Online Teaching During the Best of Times: Pre-Pandemic

Pre-pandemic studies show that the transition to online teaching can be challenging in the best of times. Some factors that influence a faculty member’s perceived success or difficulty in making the shift to online teaching include prior experience, attitude, institutional support and training, and discipline. Prior to the pandemic, the shift towards online education was already happening, with approximately 35% of post-secondary students participating in distance education, approximately 17% of students enrolled in online education exclusively, and online degree program enrollments increasing from 2012 to 2017 at public four-year (nearly 60%) and private nonprofit (greater than 66%) institutions (Gigliotti, 2020; National Center for Education Statistics, 2022). However, despite this movement, the percentage of faculty who had never taught online pre-pandemic remained high at nearly 46% (Gigliotti, 2020). As the number of semesters teaching online increases, a faculty member’s ratings of self-efficacy to teach online increases (Horvitz et

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al., 2015). More specifically, faculty members with at least five or more years of online teaching experience demonstrate increased self-efficacy and readiness in course design, classroom management, communication, and technical competencies compared to those with little to no experience (Horvitz et al., 2015; Martin et al., 2019; Scherer et al., 2021). Therefore, because having experience teaching online is a significant factor in a faculty member's ability to make the sudden shift to remote teaching and many faculty members did not have online teaching experience, some faculty members may have experienced increased challenges converting their courses to an online format (Scherer et al., 2021).

Faculty preferences between face-to-face and online teaching can also impact attitudes towards a change in delivery mode. Faculty new to online teaching often experience negative emotions regarding the transition and experience of online teaching, whereas faculty with experience often view online instruction to be superior to face-to-face instruction (Samuel, 2021). Only nine percent of faculty report preferring to teach primarily online compared to 51% preferring to teach in-person with some online components (Galanek & Gierdowski, 2019). A faculty member tends to be more successful in making the transition from in-person to online teaching when they possess a desire to teach online, a willingness to learn, openness to change, and view the shift as an exciting opportunity with the potential to teach virtually in the future (Horvitz et al., 2015; Martin et al., 2019; Naylor & Nyanjom, 2021). This growth mindset is crucial because teaching online tends to take more time, requires the faculty member to obtain new skills, and to assume additional roles beyond content expert such as course designer/manager, mentor, and facilitator of student engagement (Martin et al., 2019; Naylor & Nyanjom, 2021). Alternative attitudes in response to moving teaching online are resentment, decreased self-efficacy, and lack of control leading to disillusionment, ambivalence, and frustration (Naylor & Nyanjom, 2021).

Challenges to Shifting to Online Teaching During the Pandemic

Regarding the transition to emergency remote instruction, faculty perceptions differed according to discipline, online instruction experience, and participation in training programs (Ilgaz et al., 2023), however there were some universal challenges in these unique circumstances including the integration of technology, internet issues, lack of interaction, lack of motivation, external distractions, and increased workload (Seraj et al., 2022). Because faculty did not have the luxury of time to prepare for the overnight transition to an online format, many instructors opted to initially use many of the same activities they used in their typical face-to-face classroom, while simultaneously trialing some online tools such as online lectures, group activities, and discussion forums (Martinho et al., 2021). Faculty also reported taking on additional roles and responsibilities beyond being subject matter experts—such as counselor and facilitator—as they spent more time intentionally communicating with students to create personal connections and a sense of community (Egan & Crotty, 2020; Martin et al., 2019). Finally, despite spending an increased amount of time preparing for teaching online, faculty reduced their expectations of students related to the amount and quality of work in consideration of the challenges that the students were experiencing (Egan & Crotty, 2020).

Most faculty members and students reported negative views on the shift to emergency remote teaching and learning (Watermeyer et al., 2021). For many faculty, they experienced a loss of work/life balance as working from home blurred the lines between their personal and professional lives (Watermeyer et al., 2021). Faculty members, particularly those who were caregivers, felt overwhelmed as they navigated responsibilities and stressful life situations

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occurring in their personal lives while simultaneously making the transition to online teaching (Ensmann et al., 2021; Ramlo, 2021). Professional boundaries were challenged as faculty were working longer hours to prepare and modify their content, spending more time communicating with students, often sending individualized emails, and feeling obligated to be always available to students around the clock (Egan & Crotty, 2020; Watermeyer et al., 2021). The “boundless online classroom” (Egan & Crotty, 2020) led to stress, burnout, mental health strain, and isolation, especially as students became more dependent on their instructors in the absence of peer interactions and faculty felt disconnected from their academic communities (Egan & Crotty, 2020; Perrotta & Bohan, 2020; Ramlo, 2021). Additional negative outcomes from the shift to online teaching specifically related to tenure and promotion include the potential impact of decreased research productivity and poorer course evaluations, despite faculty devoting extra effort and attention to teaching and the students (Gonzalez-Ramirez et al., 2021; Watermeyer et al., 2021).

As faculty made the shift to emergency remote teaching, it was crucial for them to have training, available resources, and support from their institutions. Trainings on best practices for student interaction and engagement and course management ideas were needed early in the process so that instructors could focus on what would be most beneficial for students, particularly for those faculty members who were teaching online for the first time (Horvitz et al., 2015). Also, faculty found it more helpful to have technical support on demand, available anytime and anywhere, as opposed to workshops (Naylor & Nyanjom, 2021). Finally, depending on the institution, some faculty had access to well-established instructional technology departments who provided support for online teaching and tools; however, overall, due to the quick transition to online teaching, many instructors did not receive training and converted their classrooms with minimal support (Gigliotti, 2020; Martinho et al., 2021).

Finally, discipline and previous offerings of online programming may have also influenced a faculty member’s willingness to embrace online teaching (Horvitz et al., 2015; Watermeyer et al., 2021). Professional and graduate programs viewed online teaching more favorably as they had previously been offering distance learning and hybrid education (Horvitz et al., 2015). However, the quick shift without adequate time for preparation was particularly difficult for those in liberal arts, humanities, and disciplines that involved performance and practical skills such as labs, creative arts, and clinicals (Horvitz et al., 2015; Naylor & Nyanjom, 2021; Ramlo, 2021; Watermeyer et al., 2021).

While faculty from various institution types faced challenges during the emergency transition to online teaching, the literature suggests that faculty perceptions differed greatly depending on the faculty member’s level of preparedness to teach online, their confidence, and institutional support. Thus, the purpose of this study was to determine the impact on and process for transition of teaching/learning methodologies from a primarily face-to-face delivery methodology to that of all, or nearly all online during the recent COVID-19 global pandemic. The study adds to the literature by focusing on traditional institutions that primarily offered in-person instruction pre-pandemic and were not well prepared to make the shift to online teaching. Therefore, the research question for the project was: What was the process of rapid transition for faculty from face-to-face to online teaching at the university during the COVID pandemic?

Study Design and Methodology

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Research Design

The study authors employed Corbin and Strauss' (2015) qualitative grounded theory approach for this project. The methodology was chosen because grounded theory is best applied where little is known about a topic, and where there is an interest in an actual process (Corbin & Strauss, 2015). Little was known about the transition to on-line learning in institutions where the teaching primarily employed a face-to-face model. This may impact a faith-based institution to a greater extent, as strong faculty-student relationships are a hallmark of teaching pedagogy, and where a sudden shift in that pedagogy may threaten that environment. Since this was an area where little was known and since grounded theory is an excellent method for discovering process, it was chosen. Grounded theory allows for the narrative and graphic depiction of findings to help identify and explicate concepts and determine relationships that exist between them.

Recruitment

Following institutional IRB approval, faculty were sent an email inviting them to participate in the study. Participant inclusion criteria were faculty and adjunct faculty who had been employed and teaching at the institution since no later than fall of 2017. This particular inclusion criterion was employed to ensure that faculty members had served at the institution sufficient time to have become accustomed to the environment, culture, and expected pedagogical standards. Mid-way through the interviews, researchers realized that faculty members of diverse backgrounds were not well-represented, therefore, considering theoretical sampling, additional email invitations were sent targeting those faculty members, resulting in several more minority faculty members being recruited. Potential participants were emailed two consent forms (participation and recording), signed, and returned prior to the interviews. Three emails were sent to all faculty members, not including the additional email sent to faculty from diverse backgrounds.

Data Collection

The research was conducted at a medium-sized, faith-based university in the southeast. Interviews were conducted during the 2021-2022 academic year using the Zoom platform. While there were at least two research team members present during each live interview to ensure transparency among the research team and participants, the principal investigator posed the questions due to his expertise in qualitative research and interviewing. The primary interview questions posed were: 1) What was the impact of the transition from face-to-face to online teaching/learning on you as a faculty member, and on your students? 2) What was the process you used to make the change to online teaching? However, as the interviews progressed, it was clear that participants had strong ideas about techniques that did and did not work well. Therefore, after several interviews and through the iterative process of refining the interview, questions were posed to subsequent participants about what worked and what did not.

Interviews ranged from 20-45 minutes in length. Interviews were recorded and the MP4 files were uploaded into the NVIVO software, where transcription was performed. The combination of recording and transcription allowed researchers to return to original recordings when transcript fidelity was questioned.

Data Analysis

NVIVO software was used to organize and manage data for analysis and the interview transcripts served as the raw data. Data were analyzed using Corbin and Strauss (2015) methodologies. To increase credibility and improve transparency, all coding and analysis sessions

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included at least two research team members. In many cases three, and as many as five team members were present during analysis sessions. In keeping with acceptable qualitative research procedures, analysis was on-going, occurring after every two to three interviews allowing the team to determine developing patterns and reflexively ask additional questions suggested by the analysis.

Data were analyzed using an initial line-by-line analysis, and open-coded to name words, phrases, or larger sections. As more interviews were conducted, and thus more data available, incident-to-incident coding was performed to allow for comparison and contrast of like situations. As data became more voluminous, codes were sorted into larger groupings, and as necessary, a more abstract name applied to capture the intent of the larger data group. More than 500 open codes were managed. As greater numbers of codes emerged and relevance of codes determined, larger concepts emerged that became the building blocks of the final theory. Each of the large concepts was composed of properties (of the concepts) and the properties, as explicated by the interviewees, had dimensions which further described the properties. This method led to thick, rich description of the data. The final overall theoretical structure was developed from the eight large concepts with axial coding used to determine the relationship between the concepts.

Rigor

Adhering to Corbin and Strauss' (2015) methods and the principal investigator's extensive experience in qualitative research and grounded theory development, including contributing to the last edition of Corbin and Strauss (2015), improved the study rigor. Also, data management through the NVIVO software resulted in an excellently maintained audit trail and decision-making record. Because all recordings and transcription were uploaded into NVIVO, coding was completed within the software for a clear record of events and NVIVO's memo feature was utilized. After each coding session, and in some cases, during coding sessions, memos of agreed upon outcomes were documented, providing a clear and transparent trail of decision-making. Interviews and analysis were completed over a 10-month period to allow for immersion in the data and avoiding being rushed.

Results

Participants

A total of 24 faculty members participated in the research study. Demographics were captured and included age, ethnicity, identified gender, rank, college association, years teaching at any four-year institution, and years teaching at the current institution. Also, percentages of teaching online and face-to-face and knowledge-based vs. skill/application-based were collected. Refer to Tables 1 and 2 for extended demographics.

Table 1

Categorical Demographic Characteristics of Participants

<i>Categorical variables</i>	<i>n</i>	<i>%</i>
Race		
African American	2	8.3
Caucasian	20	83.3

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Chinese American	1	4.2
Hispanic American	1	4.2
Gender		
Female	15	62.5
Male	9	37.5
College		
Entertainment & Music Business	2	8.3
Business	2	8.3
Health Sciences	5	20.8
Science & Mathematics	8	33.3
Liberal Arts & Social Sciences	3	12.5
Pharmacy	1	4.2
Theology	3	12.5
Rank		
Adjunct	1	4.2
Instructor	1	4.2
Assistant Professor	8	33.3
Associate Professor	8	33.3
Professor	6	25.0

Table 2

Numerical Demographic Characteristics of Participants

Numerical variables	<i>n</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>	Range
Age	24	49	49.9	9.6	35 – 64
Yrs. Teaching 4-Year	24	16	17.1	10.2	5 – 42
Yrs. Teaching at Institution	24	9	13.9	9.5	4 – 34
Typical Percent In-Person	24	100	94.1	11.5	50 – 100
Typical Percent On-Line	24	0	5.9	11.5	0 – 50
Percent Knowledge-Based	24	75	72.1	17.8	40 – 100
Percent Skill/Application-Based	24	25	27.9	17.8	0 – 60

Major Concepts

Qualitative analysis is both described narratively and graphically depicted to allow the reader to follow the explanation for concept depiction and theoretical structure. Major concepts, along with any corresponding properties and dimensions conveyed in the narrative analysis are displayed individually (Refer to Tables 3-11), and collectively in the overall theoretical structure (Refer to Figure 1). Because the data were too voluminous to narratively describe, only major concepts, properties, and dimensions are explicated in the tables. However, a complete audit trail and decision-making memo set were maintained and could be made available upon request.

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Change in Mode

Participants referred to the change in teaching methodology from mostly face-to-face to completely online by describing a complete change in mode of the approach to and delivery of course content. The *Change in Mode* from the basic pedagogical culture of face-to-face classroom teaching to one of fully online in a matter of several weeks proved difficult for most participants (Refer to Table 3). Since the transition and mode change occurred over spring break, not only was there increased workload, but the purpose of spring break was negated and there was an incredible amount of “decision-making” that occurred in a short period of time. While faculty wanted to “maintain content integrity,” they found that the situation called for a “reassessment of assignments” and content could not be delivered in the same way. They felt they had to use “pre-recorded videos” in addition to real-time online teaching. They also felt “unprepared,” not preparing as they would have liked, and that the mode change was simply “draining.” One participant said, “I changed how I prepare for class every day, because I knew I had to have my dog and pony show ready to go.” One participant said, “I lost my enthusiasm for teaching.” Others found some benefits including some participants saying that having knowledgeable and experienced faculty allowed for helpful “collegial consults.”

Table 3

Concept of Change in Mode

<i>Concept</i>	<i>Property</i>	<i>NVIVO Exemplar</i>
Change in Mode	*Reassessment of Assignments *Maintaining Content Integrity *Collegial Consult Faculty Constrained by Tech Contract Fear of Evaluation Loss of Semester Break Unprepared Decision-Making Lack of Overwhelming Departmental Direction Collegial Consult Drained Unprepared	“It was chaotic. It was personally, emotionally draining.” “I changed how I prepare for class every day because I knew I had to have my dog and pony show together.” “I lost my enthusiasm for teaching.”

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“I love working with students. I love being in the classroom. I love office hours. I love engaging with this population. And you know, one email over spring break just kind of took that away from us.”

Online Teaching

Following *Change in Mode*, faculty commented on the actual *Online Teaching* process (Refer to Table 4). Participant comments under this concept provided for several properties. First, participants suggested that there was a “financial burden” that the faculty had to bear including setting up and providing for “home office needs,” with dimensions such as product licensing, improved internet service, and materials. Another property was “technology” with dimensions ranging from feeling that “Zoom” was a superior platform to others, that they “needed to practice,” and that they were “learning from colleagues.” An additional property of this concept was “pedagogical changes.” Dimensions of this property included needing to “target the audience” more specifically, to “engage quiet students” because the online format allowed them to disappear into the background, and to break instruction up into more sections.

Table 4

Concept of Online Teaching

<i>Concept</i>	<i>Property</i>	<i>Dimension</i>	<i>NVIVO Exemplar</i>
Online Teaching	Home Office Needs Use of Pre-Recorded Video	Materials/Licensing	“...without the nonverbal and oftentimes verbal feedback, I just really kind of felt out on a limb.”
	Financial Burden for Faculty Technology	Zoom Far Superior to Others	
	Pedagogical Changes	Bad Evals Related to Tech Issues Needing Practice Learning from Colleagues Targeting the Audience	“...this is about them; this is not

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about you right
now.”

Engaging Quiet Students
Chunked Instruction

Self-Efficacy

Participants felt that the degree to which they felt able to perform well was driven by several recurrent ideas that were expressed. The large category housing these properties and dimension was determined to be the faculty members’ *Self-Efficacy* (Refer to Table 5). There were several properties that made up this category. Since many faculty needed to make the change from face-to-face to online with little experience, they expressed the fact that their “lack of hands-on skills” made it difficult to jump in and be immediately effective. Some suggested that they were able to make this change only because they had experience teaching online and that “previous online experience matters” regarding being able to make the transition on short notice. The perceived lack of self-efficacy among participants many times revolved around the lack of teaching skills or the fact that they experienced a host of “tech issues.” The property of “tech issues” had several descriptive dimensions including being “comfortable or not” with technology. Participants expressed appreciation for the university instructional technology department as having been a big help in negotiating the increased technological environment. One participant suggested that there were cases where students intervened to help smooth out technical issues.

Other participants expressed psychological and emotional ramifications of feeling under-prepared, suggesting that the change caused a serious “loss of style” in their typical teaching that decreased the effectiveness of their teaching. One participant shared, “I just couldn’t do it, it was the worst teaching year of my career.” Others suggested that they simply had to let go of some of the angst by simply “accepting imperfection.”

Table 5

Concept of Online Teaching

<i>Concept</i>	<i>Property</i>	<i>Dimension</i>	<i>NVIVO Exemplar</i>
Self-Efficacy	*Previous On-line Experience Matters Lack of Hands-On Skills Loss of Personal Style Accepting Imperfection Tech Issues	Level of Comfort IT Helped Student Intervention	“I became a more compassionate teacher, leader, person,

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parent....because I saw not only what I was going through.....on a daily basis, but my colleagues – young faculty, older faculty, students”

“...just couldn’t do it...just worst teaching year of my career.”

Communication

Participants were clear that the need for *Communication* was important, and it emerged as a category (Refer to Table 6). They stated that there was a clear “change” in how communication was handled, including increases in “frequency” and the addition of “modes” including “email,” “phone,” “text,” “Zoom,” “Group Me,” “Blackboard,” (educational platform) and others. Participants stated that there was a greater need for “cohesion” and a greater “need for clarity” in communications. They also stated that they felt the need for “engagement” to the point of feeling “pressure” to do so, and to the extent that one participant felt she was “mothering” students. She said, “I became much more of a mother...and less of a teacher in the rest of that semester.”

Table 6

Concept of Communication

<i>Concept</i>	<i>Property</i>	<i>Dimension</i>	<i>NVIVO Exemplar</i>
Communication	Change	Modes – email, text, phone, zoom, Bb, Group Me Frequency and Volume	“I had PTSD with my phone ringing...dinging”
	Need for Clarity Engagement	Mothering	“...I became more of a mother...less of a teacher in the rest of that semester.” “So, I felt like there was a huge

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		need...to counsel students as much as its teach them during that time.”
Cohesion Connections	Pressure to Establish Maintain Encourage Check-In	“Initially, I think part of the process was just listening to students to understand their needs.”

Perception of the Transition

It was clear from participant comments that the *Perception of the Transition* involved whether the focus of the comment made by participants was from experiences encountered early, toward the middle, or later in the transition (See Table 7). “Early” comments generally seemed to be coming from circumstances at the outset of the transition to fully online teaching, which occurred in spring of 2020. Data that appeared to be coming from experiences in the middle of the transition were generally felt to be coming from experiences toward the end of spring 2020 through early fall of 2020. Later experiences were focused generally on the mid-fall 2020 to spring 2021. These timeframes are only estimates from the data. Another concept emerged that could not be easily placed into a clear timeframe. The concept of “student disengagement” was considered a stand-alone property of the *Perception of Transition* concept.

Early in the experience, faculty felt that the transition was “sudden” and very “anxiety-producing”, and it left faculty feeling like they were “scrambling” to plan the rest of the semester. Some faculty were “supportive of the administration” and its decisions during the transition, but some felt that decisions could have been conveyed in a timelier manner and were therefore “not supportive” of those decisions. During, or in the middle of the transition, faculty found teaching and interacting with students “very difficult” and experienced significant “reduced job satisfaction.” Later during the pandemic, faculty seemed to get their footing to some degree, with some faculty suggesting that it “wasn’t terrible” and that they “enjoyed the challenge.” Faculty also felt however, that subsequent semester performances suffered with one participant saying, “And the stress affected them more in the second year than it did that first spring.” Some administrative decisions that were made regarding student grading, however, were not supported by faculty. One such decision was to allow students to accept a pass/fail grade for their lowest grade to prevent undue impact on grade point averages.

The property of “student disengagement” could not be clearly linked to a timeframe under this conceptual heading. It nonetheless was clearly tied to the idea of the actual transition. Faculty felt that previously engaged students became disengaged because of the sudden and unexpected shift, especially because many students chose the university because it has traditionally relied on

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face-to-face teaching methods with classroom interaction. One participant said, speaking about the perceived engagement of students before and after the transition, "...feeling like students were engaged...in most of my sections...being very interactive, to being painfully not."

Table 7

Concept of Perception of Transition

<i>Concept</i>	<i>Property</i>	<i>Dimension</i>	<i>NVIVO Exemplar</i>
Perception of Transition (Early)	Sudden		"it was jarring in the sense of going from a face-to-face format which I'm very comfortable with, to a virtual format."
	Anxiety Producing		"...rocked my world." "It was very anxiety inducing."
(During/Middle)	Scrambling		
	Supportive of Administration	Preparation Time	
	Not Supportive of Administration	Communication of Decisions	
	Very Difficult		
	Reduced Job Satisfaction		"I was so tired of hearing the word "pivot"." "If I look back at it, it was just trying...tread water." "I've taught a long time, and the spring where we were finishing and the following semester were hands down the most stressful times for me professionally."
(Late)	Not Terrible		
	Not Supportive of Administration	Pass/Fail Allowance	"And that was so very irritating to me to communicate that. They weren't failing because of

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<p>Enjoyed the Challenge Student Disengagement</p>	<p>Watching TV</p>	<p>the pandemic; they were failing they weren't doing they're work."</p> <p>"...and the stress affected them more in the second year than it did in the first spring."</p> <p>"...feeling like students were engaged..... being very interactive, to being painfully not."</p> <p>"...so he was on the Zoom while skiing."</p> <p>"The engagement of students changed significantly, which influenced delivery. I felt more like I had to entertain them than I have ever felt in my teaching career."</p>
	<p>Running Errands/Driving Lower Expectations Unaccounted for Students Poor Subsequent Semester Performance</p>	

Impact on Faculty and Students

The first interview question generated data regarding the impact that the transition had on both the faculty and their students. What emerged from the data were points of impact that were mostly classified as falling into two categories: personal and professional. The data carry the labels *Personal/Professional Impact on Faculty* and *Personal/Academic Impact on Students* (refer to Tables 8 and 9). It is important to recall here that our interviewees were faculty members, and so the data that emerged related to student impact was completely from the view of the faculty members, because no students were interviewed for this study.

Though the impact on faculty and students was most easily sorted using labels of “personal and professional” (faculty) and “personal and academic” (students), the types of needs were different. Faculty professional issues included having been concerned about the suddenness of the need for transition, the short time to prepare for the transition, and the loss of instruction time. They were also quick to report the vast amount of time it took to make the switch mid-semester. Personal issues included physical, spiritual, and mental stressors, with one participant saying they

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were "...trying to help someone else, when I felt I fully couldn't help myself." There also was a financial burden that bled over into the concept of *Online Teaching* (refer to Table 4), mentioned by faculty regarding creating an environment at home conducive to teaching as well as having had to acquire some teaching materials on their own.

Challenges for students from the perspective of faculty included students feeling frustrated about various things; among them were the lack of materials and having technology issues. Regarding the lack of learning materials, the transition occurred during spring break, so many students had gone home and were not allowed to return to campus to retrieve their course materials. That posed a challenge to them. Faculty reported that students had family, personal and mental health needs during this time. Some students had returned home to find parents working from home, and schooling younger siblings, with whom they were required to help with schoolwork and caretaking. One faculty member suggested that trying to help students through this time of difficulty involved, "...hearing their horror stories, and their, kind of, cries of desperation and just kind of figuring it out."

Table 8

Concept of Personal/Professional Impact on Faculty

<i>Concept</i>	<i>Property</i>	<i>NVIVO Exemplar</i>
<i>(Professional)</i>		
Time	Required More Consuming Loss of Instruction Short Transition	
<i>(Personal)</i>		
Parenting		
Health Issues	Mental	"I had to basically go....to a psychologist and get help just to survive."
	Spiritual	
	Physical	
Financial		"My life was falling apart in every way. It was really important to me to be calm, ...and to appear....as if its somewhat of a controlled situation." "...trying to help someone else, when I felt I fully couldn't help myself."

Table 9

Concept of Personal/Academic Impact on Students

<i>Concept</i>	<i>Property</i>	<i>NVIVO Exemplar</i>
<i>(Academic)</i>		
Lack of Materials		

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Technology Issues
Feeling Frustration
(Personal)
Family Needs
Personal
Circumstances

“...hearing their horror stories, and their, kind of, cries of desperation and just kind of figuring it out.”

“I think that was a helpful reminder of how outside factors play a part in how they’re successful within a class.”

Mental Health Needs

During the early interviews, participants conveyed important information regarding strategies they employed during the transition and beyond. Some of those strategies were things that seemed to work very well in the transition to online teaching. Some of them so much so, that participants said that they began to employ them in non-pandemic times as well. Others, despite their best efforts, were simply failures. Therefore, since this seemed to be important, the research team reflexively began asking subsequent participants about *Things That Worked*, and *Things That Didn’t Work* (refer to Tables 10 and 11).

Things That Worked

Participants suggested that some online teaching techniques initiated because of the transition were so effective that they continued to use them even when they returned to in-person teaching (refer to Table 9). Things like, holding “virtual office hours” for student check-ins, use of external tools such as “Padlet,” “You Tube,” and “Grade Scope” proved to be helpful. Some participants suggested that sharing “faculty personal stories” seemed to connect with students and make them feel more comfortable sharing their own stories. Though the university had another online platform, faculty began using “Zoom,” which was eventually provided for them, and proved to be very effective. “Altered teaching techniques” such as “unfolding case studies,” “use of “shorter videos,” and because the classroom was virtual, one participant suggested that it was easier to get high quality “guest lectures.” Another faculty suggested that a “moment of silence” recognizing the extra stress that all involved were experiencing, allowed students and faculty alike to center before class.

Table 10

Concept of Things That Worked

<i>Concept</i>	<i>Property</i>
Things That Worked	
Zoom	
Zoom	Breakout Rooms
Pre-Recorded Lectures	
Virtual Office Hours	
Blackboard	

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External On-line Tools	Padlet Tablet White Board You Tube Grade Scope
Use of Faculty Personal Stories Altered Teaching Techniques	Quizzes Unfolding Case Studies Shorter Videos Lab Pre-Brief Student Feedback Hybrid Format Guest Lectures
Moment of Silence Increased Honor Code Vigilance	

Things That Didn't Work

Because new techniques had to be implemented to move from face-to-face to online teaching, some of those techniques were less than successful (refer to Table 11). The online virtual platform that the university was currently using proved to be ineffective. “Hyflex” teaching (half the students in the classroom and half online), proved to be clunky, technologically challenging, and ineffective by every participant who mentioned it. Other things like, “online group projects,” “asynchronous lectures” and allowing students “screen-off attendance” to virtual classes, failed in the eyes of participants.

Table 11

Concept of Things That Didn't Work

<i>Concept</i>
Things That Did Not Work
Blackboard Collaborate
Hyflex Teaching
Breakout Rooms
Online Testing
Online Group Projects
Asynchronous Class
Pre-Recorded Lectures
Screen-Off Attendance

Relationships and Consolidated Theory

Being true to the Grounded Theory process, following the development of concepts that emerged, the research team reviewed the data for the presence of revealing relationships that existed between the concepts in a process called axial coding (Corbin & Strauss, 2015). The conceptual relationships that were found to exist are depicted in the overall theoretical model (refer to Figure 1). It is notable that grayed out boxes in the theoretical structure are not considered data because the headings were imposed through the specific question asked.

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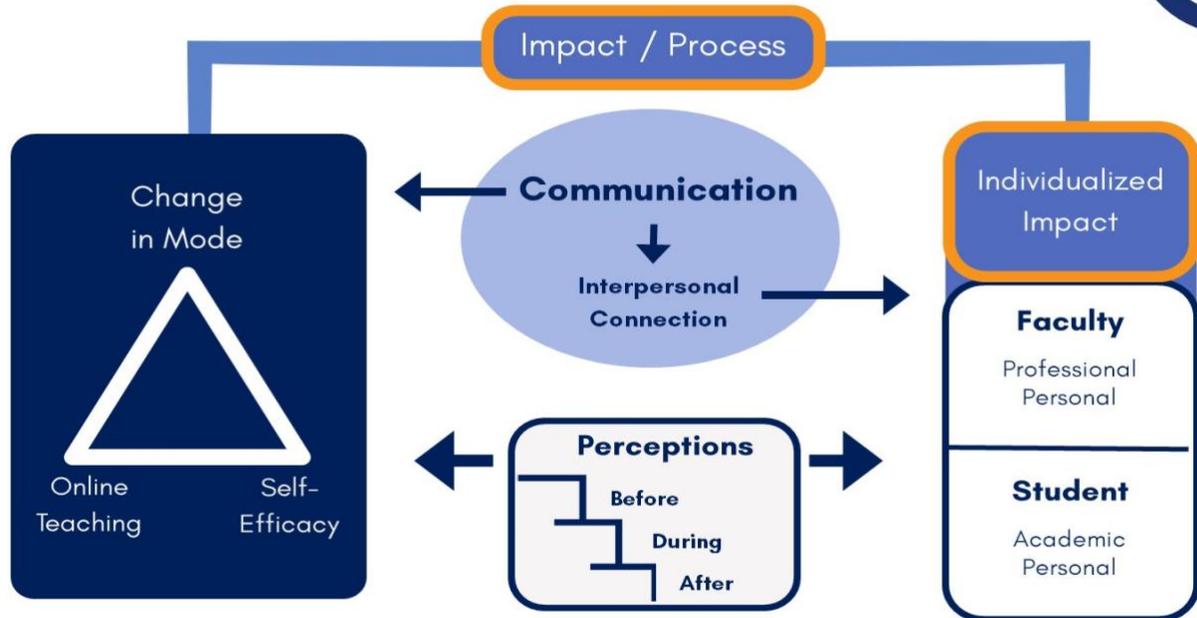
It was clear early on that *Change in Mode, Self-Efficacy, and Online Teaching* were highly related. The *Change in Mode* drove the move to *Online Teaching*. Participants felt they did that well, or not, based on the degree to which they experienced *Self-Efficacy*. This triangular portion of the model carried the most similar concepts and the tightest relationships. Because of the sudden change in teaching mode, the need to teach online and the degree of self-efficacy faculty felt, rapid changes were made in teaching pedagogy and plans. It was also clear that the connection between the impact on students and faculty and teaching portion of the model (*Change in Mode, Self-Efficacy, Online Teaching*), was bridged by an extensive (and unusually high) level of *Communication*. That *Communication*, however, required more than communication about classes, assignments, and due dates. Out of it flowed an increased need for inter-connectedness between students and faculty and the personal, professional, and academic impact that the pandemic, and change in teaching format had on them. The perceptions they had of the transition extended beyond the early part of the change to online teaching and were labeled as *early, during* and *late* perceptions. This created a fluid and on-going impact on the perceptions of faculty at different times during the pandemic. These changes in pedagogy, teaching style, technology use as well as to the environment one was teaching or learning in, in addition to the societal changes, had various types and levels of impact on both faculty and students.

Figure 1

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Theoretical Model

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Discussion

The pandemic prompted faculty at a private southeastern university using a primarily face-to-face educational model to rapidly reimagine and implement all or nearly all courses to online educational offerings. This study interviewed faculty to determine the impact of the transition from face-to-face to online teaching/learning on faculty members and their perception of the impact on their students. Interviews also probed into the process faculty used to make the change to online teaching, and their impressions of what worked and what did not work. A grounded theory approach was utilized to create abstract categories and determine social processes utilized by participating faculty during the pandemic. Results included *Change in Mode*, *Online Teaching*, *Self-Efficacy*, *Communication*, *Perception of the Transition*, *Impact on Faculty and Students*, *Things That Worked*, and *Things That Didn't Work*. These were then integrated into a theoretical framework identifying the different relationships (refer to Figure 1). Changes faculty made to their pedagogy, teaching style, use of technology, paired with the changes in teaching and learning environments and societal changes significantly influenced faculty and students.

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Scherer et al. (2021) identified three different profiles of teacher readiness for online teaching and learning, including low, inconsistent, and high readiness. Each level of readiness is dependent on the teacher's degree of self-efficacy and requires a different amount of institutional support. One of the key findings of the study that was consistent with Scherer et al. (2021) was the impact of self-efficacy on the faculty member's experience with the abrupt change in mode and transition to online teaching. Faculty struggled to meet the unexpected demands of transitioning to online teaching. Some faculty reported feeling unprepared to teach online because they lacked the necessary skills or were burdened by both hardware and software technology issues. However, faculty who had experience teaching online perceived the transition to be much less challenging and stressful than faculty who had less experience, and in some cases, no experience at all (Scherer et al., 2021). This confidence while transitioning was even truer for faculty who had training in online pedagogy in addition to simply having online teaching experience.

In addition to self-efficacy, timing also seemed to impact the faculty members' transition to online teaching. Developing an effective online course typically takes six to nine months (Baldwin et al., 2018; Hodges et al., 2020). However, in this case, faculty were provided far less notice (e.g., ten days) to make the transition, leaving them without the expertise to teach online or enough preparation days to successfully and seamlessly transition (Scherer et al., 2021; Singh et al., 2021). Some administrative decisions, including the timing and/or method of communication of those decisions led to faculty frustration and confusion. Therefore, in the haste to move courses online, not enough time was given for faculty to deeply contemplate and plan for the differences between online and face-to-face teaching, how to implement careful and intentional course design, and consideration given to the skills and knowledge needed by those new to online teaching (Gigliotti, 2020).

Online teaching requires different capabilities and expectations from students, teachers, and institutions and is best executed when the physical classroom is not mirrored (Gasevic, 2020). Unfortunately, this university had traditionally focused on in-person teaching and the physical classroom prior to the pandemic. Therefore, many of the faculty at this institution navigated the transition to online teaching mostly on their own, adopting a "do what you think is best" type philosophy, lacking the tools needed to make the transition successful (Schmidt et al., 2013). Faculty found that they were changing assignments, modifying teaching practices, and struggling with technology during this rapid transition. While most agreed that the university's Department of Instructional Technology (DIT) was instrumental in assisting faculty in feeling supported as they provided resources, some of the new technology faculty attempted to integrate into their courses was still not successful. Implementing new technology can be difficult in "normal" times, however, faculty at this institution were navigating the transition while worried about their own safety and the safety of their families and friends. Faculty challenges associated with the change in mode from face-to-face, in-classroom teaching to fully online teaching were not isolated to this institution. The speed of the transition, lack of online teaching experience, and redesigning courses in the middle of the semester were common challenges (Colclasure et al., 2021). Singh, et al. (2021) reported similar challenges and suggested that although higher education is past the quarantine and isolation of the pandemic, these same issues continue to impact teaching and learning practices.

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Despite the higher education institution and faculty's valiant efforts to continue course instruction amidst the pandemic, the sudden transition to online teaching impacted faculty and students at this institution, personally, professionally, and academically. While faculty experienced challenges and stress, students were also feeling distress during the transition. Faculty struggled with the lack of preparation and instruction time, changing their location, and acquiring the proper materials and settings needed to teach, while students struggled with a sudden return home, often lacking materials they needed for classes, and the need to navigate home environments uncondusive to academic activities. These challenges were echoed in the literature (Neuwirth et al., 2020; Singh et al., 2021).

For students, the sudden shift to online learning was disruptive and they perhaps received lesser quality of instruction compared to what would have been traditionally offered (Gigliotti, 2020). From the participants' perspective, for some students, they lost collaborative learning opportunities through student-to-student and student-to-faculty interactions, valuable discussions with a diverse population, and may not have received the most effective teaching practices (Dumford & Miller, 2018; Ensmann et al., 2021). Also, some students were less motivated, perhaps because of the loss of peer interactions and support and missing out on more hands-on learning experiences such as tools, labs, and studios (Egan & Crotty, 2020; Gonzalez-Ramirez et al., 2021).

There were also implications that extended beyond academics including social connections, living situations, finances, and mental health concerns. Due to online learning and being away from traditional campus life students experienced feelings of loneliness, isolation and disconnection from peers, professors, and the overall college community (Ensmann et al., 2021; Gonzalez-Ramirez et al., 2021; James et al., 2021). Participants also reported changes in living situations created challenges for students whether it be moving back home to less than ideal situations (Ensmann et al., 2021; James et al., 2021; Lederer et al., 2021), becoming caregivers and responsible for homeschooling family members (James et al., 2021; Lederer et al., 2021), lacking study space (Gonzalez-Ramirez et al., 2021; James et al., 2021), or experiencing technology issues such as unstable internet (Ensmann et al., 2021; Gonzalez-Ramirez et al., 2021). Other challenges included financial stress (Gonzalez-Ramirez et al., 2021; James et al., 2021; Lederer et al., 2021) and for minority students, some experienced discrimination and health disparities related to COVID-19 (Kee, 2021; Lederer et al., 2021).

While mental health concerns were already on the rise prior to COVID-19, participants speculated that student anxiety, depression, and stress were exacerbated by the pandemic and transition to remote learning and services became even more difficult to access (Ensmann et al., 2021; Kee, 2021; Lederer et al., 2021). According to Browning et al. (2021), students expressed stress and anxiety associated with changes in education mode during the pandemic. Fear of technology, limited knowledge of software, time management issues, and feelings of isolation were issues for both faculty and students (Singh et al., 2021), and were further exacerbated for students in disadvantageous situations (Neuwirth et al., 2020). Students experienced an increased lack of motivation and further isolation (Browning et al., 2021). These experiences strongly correlate with the experiences of students in this study based on faculty perceptions and resulted in faculty feeling disconnected from their students and questioning their desire to continue teaching. However, despite so many negative effects on students reported in the literature, participants suggested there were some positive aspects to transitioning to online learning for students including convenience,

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comfort, flexibility, increased resilience, and personal development as students increased their independent learning and technological skills (James et al., 2021).

While long-term outcomes from the shift to online teaching during an emergency are still to be fully understood, the literature describes preliminary positive and negative results specifically impacting future education, faculty members, and students. Specifically, as programs are shifting back to in-person learning, there are some positive outcomes related to how higher education is delivered from the emergency remote teaching experience that may be beneficial to institutions going forward (Watermeyer et al., 2021). Now that faculty have taught online and utilized new technology, they are overall less resistant and more enthusiastic to teach online, especially when they are the ones to decide which classes and determine how and what technology to use knowing that there is not a one-size-fits-all solution (Martinho et al., 2021; Ramlo, 2021). The transition to online teaching caused many instructors to reflect on their instructional practices and their assumptions about teaching online (Wargo, 2022). Further, because they have experience with using technology in remote teaching, as they transition back to face-to-face classes, faculty recognize that technology can complement their teaching, leading to continued, new, and innovative pedagogies (Egan & Crotty, 2020; Watermeyer et al., 2021). Finally, higher education institutions who solely or primarily delivered education through an in-person format, may be more open to making more permanent organizational and format changes including offering online or blended learning, therefore, making education accessible for more people (Galanek & Gierdowski, 2019; Martinho et al., 2021; Watermeyer et al., 2021). One consideration related to increasing online options could be that universities may see this as a cost-saving measure to eliminate the need for running a physical university (Watermeyer et al., 2021).

Recommendations

Now that faculty have navigated this experience successfully or somewhat successfully, there are several steps administration, faculty, and students can take to provide better community support and structure for improved online teaching and learning. One of the most important and jarring realizations during this study was the impact of the pandemic on faculty and student mental health. Study findings reinforce the need for universities to provide adequate resources, particularly online options, to help faculty and students maintain their mental health, which is critical for navigating any upheavals during a semester (Browning et al., 2021; Singh et al., 2021). One such resource is adopting a trauma-informed model of care for all community members (e.g., faculty, staff, students). A critical element of trauma-informed care is recognition of trauma. This recognition requires the use of care, compassion, contact, and understanding. Starting with recognition could lead administrators, staff, and faculty to not only take better care of their students, but also each other. While all community members could benefit from care and consideration, populations at increased risk include veterans, current and former youth within the foster care system, people who identify as Black, Latin American, Indian, Alaska Native, refugee or LGBTQ, as well as non-traditional adult learners (Davidson, 2017).

Trauma-based education and training, through Human Resources or specialty areas on campus, could take place for all community members. Faculty and staff would benefit from training on recognizing student struggles, such as difficulty focusing, attending, retaining, and recalling, missing a lot of classes, challenges with emotional regulation, anger, helplessness, or dissociation when stressed, and withdrawal/isolation (Davidson, 2017). Faculty relationships and expressed care

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for students is so important and could be pivotal in addressing student needs more quickly as faculty have regular interactions with students. Student Affairs and other associated areas could provide online resources and educate faculty/staff on policies and procedures to follow when a student is in peril. Additional resources that might be of value could include safe spaces staffed by individuals who are trained to provide support and care, and counseling, support for academic success, financial help, cultural humility training, and community-wide acknowledgement of how trauma and loss can impact work environments. In addition to having a trauma-informed model of care, additional activities that could be conducted virtually like group exercise, exercise challenges, recipes, book clubs, podcast sharing, movie nights, and community service might be beneficial in promoting mental health for all (Schlesselman et al., 2020).

Another recommendation is the development of a strong Department of Instructional Technology (DIT) and Teaching Center for colleges and universities that do not already have them. Both the Teaching Center and DIT at this institution were present and extremely active during the shift to online teaching. The Teaching Center focused on developing meaningful online pedagogy, however, unfortunately, the faculty's inexperience with online technology and varying student attendance and engagement made pedagogy challenging. The DIT was helpful in assisting faculty develop viable replacements for previously hands-on learning activities and suggesting ways to maintain online attendance that balances rigor and compassion (Neuwirth et al., 2020). However, both departments were understaffed. The DIT has since increased instructional design staff to coach and mentor faculty and added new resources such as video capabilities, instructional media production, curriculum development, technology integration, and technology-enhanced learning experiences. In addition to being fully staffed, it would also be helpful to have institutional assistance with faculty actively engaged in best practices for working and teaching from home and helping faculty transition to working online and providing online technology support, awareness, and education to students (Johnson et al., 2020; Singh et al., 2021), and ensuring that participation is encouraging and a means of professional development, and not punitive.

Finally, administration could work with faculty, staff, and students to best meet needs, especially for at-risk faculty, staff, and students who experienced increased stress and anxiety with the change in education mode (Browning et al., 2021). Shared decision-making, a clear process for communicating plans, and employing equitable support systems would be very helpful (Lederer et al., 2021). Additional benefits could include flexible work schedules and locations for faculty and staff, offering more online courses, online mental health services, assistance with childcare and childcare available on campus, improved and expanded technology offerings, improved technical security, and training to support colleagues and students.

Limitations

Faculty in this study represented a convenience sample and were not randomly assigned to participate, instead self-selecting. Also, to increase representation, follow-up recruitment emails were sent directly to self-identified diverse faculty. Therefore, the results of this study may not represent all faculty members' experience with the transition to online teaching. Additionally, this was a qualitative study where all responses were retrospective and limited by the memories of participating faculty. Finally, while participants reported increased levels of psychological distress, because this study focused on qualitative responses to the pandemic, no quantitative standardized measures of stress, anxiety, depression, or well-being were used.

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Conclusion

The time of the COVID-19 pandemic and subsequent semesters was personally, professionally, and academically challenging for faculty, students, and administration as they navigated uncertain times. A grounded theory approach was applied to this experience through interviews with faculty, enabling researchers to determine the impact of the transition from face-to-face to online teaching/learning on faculty members, their perception of the impact on their students, the process faculty used to make the change to online teaching, and their impressions of what worked and what did not work. Based on the results, the researchers then gleaned related concepts to inform recommendations that could be used by universities to better address not only the challenges that students and faculty faced during the pandemic, but also to prepare for future challenges. Support and understanding for faculty and student mental health along with adequate preparation for engaging and teaching in an online environment are of utmost importance. Although administrative policies were central to the struggles and successes of faculty and students during this time, future strategies that prioritize development of an engaged and caring community that actively looks out for one another is imperative.

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**Language Teacher Development in Technology
Integration: Exploration, Communication,
Collaboration, and Reflection**

Language Teacher Development in Technology Integration: Exploration, Communication, Collaboration, and Reflection

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Abstract

It is essential for second/foreign/additional language teachers to develop their digital competence in digital environments. This article explores language teacher development in digital technology integration in terms of exploration, communication, collaboration, and reflection (ECCR). It presents the results of a study that investigated how language teachers explore, communicate, collaborate, and reflect for technology-enhanced language teaching (TELT), how they approach ECCR, how much they engage with ECCR activities, and what support they need to improve their competence in TELT. Data were collected from an online questionnaire and semi-structured interviews with groups of in-service language teachers in Hong Kong and Taiwan. Findings indicate that the teachers in both countries are engaged with various ECCR activities with different interests and competencies in their contexts. They enhance our understanding of language teacher development and provide implications for professional development with ECCR.

Keywords: language teacher development, professional development, computer-assisted language learning, technology-enhanced language teaching, online activities

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Given that there is a great need for the use of digital technology in language learning and teaching (Carrier et al., 2017; Son, 2020), language teacher development in technology integration is undoubtedly an important issue to address (Cutrim Schmid, 2017; Hubbard, 2023; Son, 2018). It involves formal training (e.g., Son & Windeatt, 2017) and self-directed informal learning (e.g.,

Son, 2014). With a focus on self-directed professional development, the study reported in this article explores how in-service language teachers report the development of their professional knowledge and skills for technology-enhanced language teaching (TELT). Based on Son's (2018) Exploration-Communication-Collaboration-Reflection (ECCR) model, which incorporates various aspects of teacher learning in computer-assisted language learning (CALL) and guides teachers to develop and improve personal and professional competence in TELT, the study investigated how different groups of language teachers explore, communicate, collaborate, and reflect for TELT, how much they engage with ECCR activities, and what support they need in order to improve their competence in TELT. This article presents the results of the study and provides suggestions and implications for language teacher education and professional development in digital environments.

ECCR and Teacher Development

Language teachers' professional development in CALL has received considerable attention and has been widely discussed in a number of studies (e.g., El Shaban & Egbert, 2018; Gràcia et al., 2022; Kohnke, 2021; Latif, 2021). Through the published studies, the questions of what language teachers need to know about the use of technology in CALL and how they can improve their competence in CALL have been responded in diverse educational contexts. In this study, the ECCR model (Son, 2018) and digital language teacher development framework (DLTDF) (Son, 2020) are of particular interest. They served to shape the study's design and data analysis. When compared with the technological pedagogical content knowledge (TPACK) framework (Mishra & Koehler, 2006), DLTDF focuses more on ways of doing things rather than types of knowledge needed by teachers. The ECCR model guides teachers to engage in exploratory, communicative, collaborative, and reflective activities. It incorporates various aspects of teacher learning and suggests that teachers can develop and improve their knowledge and skills through "active exploration, interactive communication, professional collaboration and critical reflection" (Son, 2018, p. 59). In line with this, DLTDF shows teachers what competencies and activities they can have, what they can do, and how they can engage with its four interrelated components (i.e., exploration, communication, collaboration, and reflection).

Exploration is a basis for teacher learning and an essential element of the success of TELT (Son, 2018). Teachers are encouraged to explore pedagogies and find out what technologies and resources are available to them. They are also encouraged to observe themselves and other teachers (Gebhard, 2005) and autonomously and continually experiment with new technologies (Robb, 2006). In CALL teacher education, McNeill (2013) explored situated learning in real contexts and Comas-Quinn (2011) highlighted teachers' adoption of technologies for online language teaching. In a different context, Son (2014) found that CALL practitioners read journal articles or books and used web search engines, communication tools, and social networking sites to explore, acquire new knowledge and skills, and keep up to date with what is happening in CALL. In order to effectively identify features of pedagogies and technologies, teachers need to constantly examine their teaching environments with critical eyes (Meskill et al., 2022; Stockwell, 2009).

Communication is the process of interacting and exchanging information with others. Computer-mediated communication (CMC) has been significantly used to promote language teacher development (Son, 2018) as CMC presents language teachers with a wide range of opportunities for professional development (Wu et al., 2014). Related to online communication and

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online presence, for example, Arnold and Ducate (2006) reported that social and cognitive presence was found in asynchronous discussions between pre-service teachers at two different universities. Wu et al. (2014) also found social and cognitive presence in an online community in a study of the professional growth of three Chinese teachers of English as a foreign language (EFL). Similarly, Satar and Akcan (2018) looked at and analyzed interaction and social presence in online communication among pre-service EFL teachers and argued that, through participation in online communities, the teachers could experience online interaction and develop an awareness of behaviors and skills to facilitate their future students' participation in online learning. In addition, Haines (2016) supported the use of CMC tools, particularly for the development of teachers' practical knowledge, and stated that the practical knowledge includes personal and professional understanding of the relationship between technology and pedagogical contexts and developing abilities to enhance learning to use new tools.

Collaboration is a core of professional communities. It should be effectively encouraged and supported in teacher professional development programs (Darling-Hammond et al., 2017). Informal collaboration is considered as a driving force of continuing professional development (Kohnke, 2021). By collaborating with peers, teachers can co-construct knowledge about learning and teaching (Musanti & Pence, 2010) and develop professional identity (Kitade, 2014) and autonomy (Xu, 2015). Collaborative learning facilitated through CMC (Nami et al., 2018) evidently occurs in online communities of practice (Macià & García, 2016; Sheffield et al., 2018). It is also discussed in many studies of telecollaboration (e.g., O'Dowd, 2015; Viáfara González, 2019), which allows intercultural collaboration with partners online. In online teaching, specifically, Ernest et al. (2013) argued that teachers need to develop skills for fostering learner collaboration in virtual environments by experiencing online collaborative work themselves. In other words, teachers need to develop and improve their skills for supporting and facilitating learner interaction and collaboration (Hample, 2009; Oyarzun & Martin, 2023).

Reflection is a critical component of teacher development. It is crucial for reflective practices and teaching experiences. Guo et al. (2019) pointed out that reflection is considered as one of the most effective approaches to help language teachers develop pedagogical knowledge and skills while Bustamante and Moeller (2013) saw reflection as an effective strategy in designing professional development programs. In a study of reflective practices of students in a master's degree program in TESOL, Farr and Riordan (2015) examined the use of online chat, discussion forums, and blogs as reflective media and found that blogs fostered narration whereas chat and forums promoted emotional engagement. In another study of the effectiveness of a blended CALL preparation program for pre-service teachers, Liu and Kleinsasser (2023) reported that the pre-service teachers experienced ongoing reflections when they explored CALL. Teachers need to adopt reflective thinking to develop their professional competencies (Guichon, 2009) and take a cyclic approach of action and reflection (Wang et al., 2010). They also need to be encouraged to continue self-evaluation (Ernest & Hopkins, 2006; Li & Walsh, 2023) and reflective engagement through critical reflection of technology use (Chao, 2015).

The Study

Aims

Language Teacher Development in Technology Integration: Exploration, Communication, Collaboration, and Reflection

The study aimed to explore language teacher development with Son's (2018) ECCR model and investigate how in-service language teachers engage with their professional development in terms of ECCR. To address these aims, the following research questions were addressed:

- (1) How do language teachers explore, communicate, collaborate, and reflect for TELT?
- (2) How do they approach ECCR?
- (3) How much do they engage with ECCR activities?
- (4) What do they need in order to improve their competence in TELT?

Design

This article provides an in-depth examination and analysis of language teacher development in two different settings: Hong Kong and Taiwan. The same data collection instruments and the same procedures were used in both countries: a consent form—an online questionnaire—semi-structured individual interviews over Zoom. Four key elements (i.e., exploration, communication, collaboration, and reflection) of Son's (2018) teacher development model were used as main categories and questions to respond in the collection and analysis of data in the study. In each country, the data were collected from an online questionnaire, consisting of ten questions asking the teachers to indicate their background, prior experience, and engagement with professional development in TELT, and individual interviews, consisting of another ten questions directly related to ECCR activities. The questionnaire questions and interview questions were adapted from Son's (2020) DLTF. Appendix A shows categorized questions that were used for the interviews. Thematic analysis was conducted to analyze qualitative data collected from the interviews, which were recorded and transcribed at each site. The interview data were independently coded by two researchers who subsequently came out with common themes. The themes were then reviewed by a third researcher and finalized through an agreement among the three researchers.

Participants

Participants in Hong Kong were six in-service teachers (four females and two males; 26–38 years old) from primary schools ($n = 4$) and secondary schools ($n = 2$) in Hong Kong (see Table 1 for their demographic information). They all completed a master's degree program in English language teaching at a university in Hong Kong and had 3–15 years of experience in teaching EFL. They self-rated their level of digital literacy (ability to use digital technologies) as acceptable (3 teachers), good (1 teacher), and very good (2 teachers).

Table 1

Participants' Demographic Information—Hong Kong

Code	Age	Gender	Teaching context	Years of teaching
H1	28	Male	Primary	6
H2	38	Male	Secondary	15
H3	26	Female	Primary	4
H4	27	Female	Primary	4
H5	38	Female	Secondary	15
H6	26	Female	Primary	3

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Participants in Taiwan were another six in-service teachers (all females; 36–56 years old) from secondary schools ($n = 3$) and universities ($n = 3$) in Taiwan (see Table 2 for their demographic information). With 7–30 years of teaching experience, they were teaching English (4 teachers), English and Chinese (1 teacher), and French (1 teacher). They self-rated their level of digital literacy as acceptable (3 teachers), good (1 teacher), and very good (2 teachers).

Table 2

Participants' Demographic Information—Taiwan

Code	Age	Gender	Teaching context	Years of teaching
T1	54	Female	University	30
T2	47	Female	Secondary	18
T3	39	Female	Secondary	7
T4	36	Female	Secondary	8
T5	56	Female	University	20
T6	44	Female	University	19

In summary, a total of 12 in-service teachers (2 males and 10 females; age ranging from 26 to 56 years old) from two countries participated in the study. The recruitment of the participants was made based on their willingness and availability. According to ethical principles at each site in Hong Kong and Taiwan, the participants received an information letter explaining the research project and then signed a consent form confirming the protection of their confidentiality and privacy in the study.

Results

This section presents data collected from the questionnaire and interviews. Considering different backgrounds, experiences, and educational environments of the participants in the two countries, interview data are presented respectively for each country in connection with ECCR. They are combined and discussed in the Discussion section.

Data from the Questionnaire

The online questionnaire was administered in English. In response to the question of how they learn about new ways of using technology for language learning/teaching, the teachers in both countries were allowed to choose all options that applied to them. In Hong Kong, the teachers (H1–H6) chose colleagues (85.71%), workshops (85.71%), experts (57.14%), seminars (57.14%), and social networks (42.86%) in order. In Taiwan, similarly, the teachers (T1–T6) chose colleagues (83.33%), workshops (83.33%), social networks (66.67%), experts (50%), and students (50%) in order.

Most teachers in Hong Kong generally indicated that they were highly or moderately engaged with information collection; learning about CALL and how to use technology for teaching; trialing new technologies; interacting with colleagues; using CMC tools; sharing ideas and resources with other teachers; and planning, designing, and managing collaborative activities. Some teachers were less engaged with the following activities: interacting with researchers;

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examining teaching experiences critically; reflecting on one's own learning and teaching practices; thinking and practicing reflectively; and self-monitoring with critical and contextualized reflection. The teachers' responses in Taiwan were slightly different from the teachers' responses in Hong Kong. Most teachers in Taiwan indicated that they were highly or moderately engaged with interacting with students; using CMC tools; working together with others online; sharing ideas and resources with other teachers; and planning, designing, and managing collaborative activities. While some teachers were less engaged with learning about CALL and trialing new technologies, one teacher was not engaged with each of the following activities: interacting with researchers; facilitating collaboration with CMC tools; and self-monitoring with critical and contextualized reflection.

In an open-ended question about teacher development and TELT, most teachers in both countries showed their interest in teacher development and responded with several tools they used. Here are example responses:

I use Instagram, Google Classroom, WhatsApp, WeChat as well as Zoom to help in my daily teaching as they are user-friendly for communication with students as well as posting teaching materials and collaborating with colleagues. (H2)

I believe the potential of exploring technology-enhanced language teaching for professional development is huge. Especially at times when teachers cannot meet each other, using online platforms is the best choice to connect and exchange ideas among teachers. I personally use different online collaborating platforms, namely Google Suite and Microsoft Teams. (H5)

I think teachers should develop technology-enhanced language teaching ability not only to attract students' attention in class, but also to increase their motivation in learning. ... I joined in a Facebook group for sharing resources such as YouTube videos, Kahoot, and PowerPoint slides to increase visual attraction in class, and so on. (T3)

I think it is extremely necessary for teachers to learn and apply computer technology in language instruction. ... Usually, I play a video clip which is related to the lesson as a warm-up. As for vocabulary, Quizlet is a good idea to apply. ... Moreover, when it comes to teaching reading, I use Kahoot to help my students in reading comprehension. (T6)

These responses could be considered as a reflection of individual teachers' familiarity with and use of online tools available in their contexts.

Data from the Interviews

All teachers in both countries participated in individual semi-structured interviews online. The interviews were conducted in English in Hong Kong and in English and Chinese in Taiwan. The teachers' interview responses to the ten interview questions demonstrated how they explored, communicated, collaborated, and reflected as teachers. In this section, their responses are presented in respect of ECCR.

Responses from Teachers in Hong Kong

Exploration

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Out of the six teachers, two teachers (H1 and H5) identified themselves to be active in collecting information on technological options for their teaching. They said that they collected the information by surfing the internet and reading blogs and posts in online communities. They also indicated that the information affected their teaching in several ways, such as adopting a learning management system and using mind maps.

I have known them by surfing the internet, by reading blogs and also sometimes Facebook entries by following some e-learners, I mean, like e-learning teachers. (H1)

We can do mind maps and like students do brainstorming and then we can use it in our writing and speaking activities. (H5)

Four teachers identified themselves as being less active or inactive. The reasons for not being active given by them included relying on colleagues' sharing, the fast-changing nature of technology, and lack of opportunities. Among them, two teachers (H2 and H6) stated that they were being forced to become active online due to COVID-19 as their schools adopted online teaching. They admitted that their pedagogy has been influenced by the adoption of online teaching. One teacher's response below shows what she did:

We have been using some platforms like Google Classroom. ... We made use of the online platforms and in the very beginning we set questions to students, we sent teaching materials and exercises to the students, and they do them on the platforms, and the questions will be auto marked, and the students can see the results and see teachers' remarks after they have done the work. (H6)

When it comes to the selection of online tools for teaching, the teachers considered the following factors important: usability, accessibility, educational approaches, user-friendliness, and price. Here are example responses:

The first one will be how easy it could be implemented in the lesson, and the second one will be about how intuitive the learning tools, and lastly how versatile it can be. (H1)

First of all, it should be user-friendly ... Maybe I will just share those kinds of resources with my students and let them have a try by themselves. ... I also think that it's important that the resource is free, or the price is acceptable enough. (H3)

As iPads have been widely used in Hong Kong primary and secondary school contexts, the compatibility of online tools with iPads was also a concern to one teacher: "Our school uses iPads ... so obviously I think the main concern will be whether the iPad is compatible with specific applications" (H4).

These responses imply that the teachers' technological options for their teaching were mainly influenced by their own interest, preference, need, and accessibility in their contexts.

Communication

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All teachers recognized the importance of communication and made comments on skills and strategies to promote learner interactions online (e.g., facilitating cooperative environments, providing learners with step-by-step procedures to perform online tasks, motivating learners, turn-taking in communication). For example:

I try my best to make it cooperative where students can get together to work on one thing instead of working individually. (H1)

I think it's really about increasing motivation, and also using that motivation for good use, and not just motivating them to be interested in the English lesson but motivating them and directing that motivation to proper use. (H4)

One teacher underlined the significance of nonverbal skills such as facial expressions and turn-taking strategies for more constructive interactions online:

For my students, I think that they need to have a body language because when I have Zoom speaking lessons with my students, they all speak but it's too small to observe their facial expressions like their body language. ... I think that turn taking is, yeah, maybe it works a bit on that, but my students are weak in turn taking. (H5)

All six teachers also mentioned that they use WhatsApp, LINE, Facebook, and/or Zoom to communicate with other professionals. Taking advantage of such online tools, the teachers adopted self-driven professional development by attending various online workshops/seminars and special interest groups and following some professionals through YouTube channels. They also actively participated in school-driven professional development as each school offered regular online workshops to its in-service teachers. Their views are reflected in the following example responses:

I think more and more professionals are sharing more resources online. So just like some very famous teachers, they will have their blogs or their own webpage to share what they explore or what they find from their aspects. Also, some YouTube channels, yeah. I think they are useful. (H3)

Every school has got an IT department, and the IT department is more proactive in a sense ... and they share to the class, how to make use of online tools that we have never come across and they even made some short videos, teaching us how to use the platforms as well, and then some other colleagues from different departments shared their experiences. (H6)

It appears that the teachers were actively involved in communication with others while using a range of online tools. This finding demonstrates that communication is a key of online teaching in their contexts.

Collaboration. The teachers pointed out that learners' willingness and positive attitudes are critical for working in a team environment. Example situations were given as follows:

If the students need to work as a team and then they need to communicate with each other, but for some online, during the school suspension, it is difficult for students to have the

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teamwork in online learning. Because they are too shy to share their voices over Zoom, they don't like to speak in Zoom. They think that's embarrassing. (H2)

When using Zoom, some students are reluctant to turn on their camera. It would be so difficult, you know, without face-to-face communication seeing the other person face-to-face, it would be, it will be, it might be an obstacle for people to communicate. (H6)

They also mentioned that it is beneficial to work in a team with other teachers as collaboration with the teachers offers models of growth, strategies, and experiences. For example:

Yeah, because every teacher has a different perspective on teaching the same item. By asking them to take a look at what you have prepared, they may have some new insights and maybe they can inspire me to do some other things or just to do the other way around to help the students. (H1)

There was also one teacher who preferred working by herself: "From my experience, I just do more by myself. For a team, we just share useful platforms" (H3).

Regarding tools for collaboration, the teachers indicated that they use email, Google Drive, Google Docs, Google Slides, Microsoft Teams, WhatsApp, Zoom, and/or Facebook. For example:

To collaborate with colleagues online, I would use, make use of platforms like Google Suite and also Microsoft Teams. These platforms allow teachers to upload files and store them online. And they allow teachers to work on the same file collaboratively. (H1)

The teachers showed their understanding of collaboration and how they could use online tools for meaningful collaboration. This finding shows their ways of working with others in online environments.

Reflection

The teachers listed several common challenges of using online tools in their teaching contexts such as budget issues, technical issues, and administrative issues.

In my school context, number 1 is that we don't have enough iPads, you need to book the iPads in advance, and sometimes, if I don't have enough, two students have to share one iPad. (H2)

First of all, we always meet technical problems no matter how and no matter when. So yeah, it's a really struggling thing. (H3)

Sometimes because some applications require you to log in, but because it's the school iPad, you don't have even as a teacher, because there's only one administrator who can update the iPad. (H4)

Five teachers thought that they were not competent enough in TELT, as exemplified below:

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I am not competent because I don't use it a lot, like I don't use it every day. I use it only sometimes. (H5)

I think I'm not proficient in doing that. But at least I could try. I think after you know this year actually the outbreak of the coronavirus is actually a good opportunity for every one of us to improve our IT proficiency. (H6)

On the other hand, one competent teacher said: "I am a facilitator of learning in the classroom. But with another job title, a bit like a technician as well" (H1). These teachers' reflections demonstrate how the role of the teacher is important in facilitating TELT.

Approaches and Needs

The most common approach the teachers took to learn about TELT was self-directed professional development while attending workshops or seminars, joining special interest groups, and/or doing online searches. It is exemplified by the responses below:

I can get that knowledge and also for colleagues, we will share. Yeah, I will also try websites one by one and also pick some websites, which are suitable for me and also for the students. (H3)

I would try to attend some more seminars about the use of different online platforms in really practical situations. Um, so that you know I can get some inspiration from other professionals. Attending seminars is one of them, and then self-directed learning is another thing. (H6)

Another approach mentioned by one teacher was a formal degree program:

I started my study for a master program. I think this is one of the first steps of the professional learning about technology-enhanced language teaching. (H4)

The teachers expressed that they needed to seek more new online tools and relevant pedagogy and wanted more opportunities to apply technology into teaching. They also commented that support on hardware, software, and training from schools can help teachers improve their competence in TELT. Here are example responses:

I think it's the opportunity to apply on it, like if the school policies, if the principal is open-minded to let me try, I think that's most needed. (H2)

Another thing is about support from the school, the support in terms of hardware, and also the sharing software, the sharing sessions from the IT department or other colleagues who are more professional in the use of that can help as well. (H6)

These responses indicate that the teachers had a high interest in formal and informal learning for their professional development and in the use of new online tools and resources for their teaching. This finding shows the teachers' willingness to develop and improve their TELT knowledge and skills.

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Responses from Teachers in Taiwan

Exploration

Out of the six teachers, five teachers indicated that they were active in collecting information for technology-enhanced instruction. For example:

I started to teach online two years ago, and I started to search for more technological options for my teaching. (T4)

I feel that I am quite active. Yet too many software applications spring up like mushrooms, and I really could not catch up with learning or using all of them. I am still using some I am familiar with and share them with students. (T6)

Although one teacher confessed that she was not very active compared with other colleagues, she stated that she made use of PowerPoints, websites, and YouTube videos:

Several websites and some YouTube video clips are quite useful. They could serve as supplementary materials. For instance, we recently talked about an article related to Formula 1 car racing. Formula 1 is not that popular in Taiwan, and students are not familiar with it. So, I found some videos and photos online to build their background knowledge. (T5)

The teachers mentioned various factors affecting the selection of online tools for their teaching. The factors included: relevance to teaching objectives/contents (T1, T2, and T5); game-based, entertaining, interesting, and fun components (T2, T4, and T6); user-friendliness concerns (T2 and T5); relevance to language training (T1 and T3); grammar-checking functions (T3); and cooperation among students (T6). For example:

It's up to my students and whether the teaching objective focuses on listening, speaking, reading, or writing. Also, whether it's about presenting what I am telling them or about how they could apply the language. These will all affect my selection of tools. (T1)

It should be easy and practical. ... The first one is a user-friendly issue, and the second is content in accordance with my teaching unit. (T5)

These responses reveal the teachers' motivation to explore, find, and select potential online tools for their teaching. Contextual factors they encountered at respective workplaces seemed to contribute to active or inactive engagement in TELT. This finding signifies the relationship between teacher exploration and school teaching culture in promoting online instruction.

Communication

The teachers said that they applied various pedagogical practices and online tools to interact with their students. The prevalent strategies they used were related to teacher-student interaction in teacher feedback (T2, T3, T5, and T6), quizzes (T1 and T2), and online games/activities (T2 and T3). For example:

As to interaction, for example, I present some online content during class sessions. I have language classrooms in which I always put some thematic YouTube videos for students'

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review. Links to these videos are in my course syllabus, and I show them the videos in class as well. (T1)

However, four teachers (T1, T2, T4, and T5) indicated that they did not fully facilitate the interaction with and between students during online activities as noted below:

Comparatively, I have very little interaction with students online. I usually post quiz items on Kahoot or Quizlet and students immediately complete for quick answering to the items. So, the interaction between the teacher and students is quite limited. (T2)

I use limited online learning activities and communication strategies. ... I would set up a LINE group for each class to increase student-student interactions. (T5)

There were several communication channels the teachers tried to build and maintain while taking advantage of online tools and platforms. The channels included: colleagues sharing either face-to-face or via LINE/Facebook (T2, T3, T4, T5, and T6); workshops organized by schools or departments (T2, T4, and T5); experts or university faculty (T1, T3, and T4); teacher associations or research teams (T1 and T2); or academic conferences (T1 and T4). For example:

I will attend workshops with my colleagues and share the information with university faculty. (T4)

We have our own Facebook group where we interact, communicate, and exchange teaching experience among each other. In particular, some new teachers are not familiar with our teaching environment, not so familiar with students. They would often raise questions and we offer them some suggestions or share something with them. (T5)

All teachers were engaged with different levels of interaction while employing a range of communication channels for different groups of people. They intended to communicate with their students by referring to specific pedagogies, yet most of them appeared not ready for facilitating online teacher-student and/or student-student interaction. This finding implies the necessity of offering relevant teacher training to trigger meaningful technology-enriched communication.

Collaboration

All teachers highlighted the significance of teamwork promoting mutual learning and professional growth. For example: “I feel like learning a lot of novel teaching methods and how others would apply technology into classroom instruction” (T2).

Two teachers stressed that team members need to have similar teaching ideas to have teamwork in a more efficient way:

I think working in a team environment is helpful. However, I think this depends on team members. I think as a teacher the teaching idea has to be similar. (T4)

In a team, teachers with similar teaching ideas will be able to inspire each other and come up with more ideas. (T5)

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There were also comments on ways of online collaboration they had:

I have more collaboration with colleagues via LINE. ... We directly post some application methods, websites, or the latest news each other got. That is, our teaching team shares useful information via LINE interaction. (T2)

My collaboration with students often happens via Google Docs. For example, if I start a new task today, I'd present what I would teach via Google Docs, or give them a template or a format. Then, I will send them the link and have them finish the rest of it. (T6)

One teacher reported that she had a time issue in collaborating with others: "It's actually about a time issue. If I could have enough time, I would like to work together with others or collaborate with my colleagues and students" (T1). Another teacher, on the other hand, mentioned a dynamic process she had when working with colleagues:

It's a dynamic process because we have to do our best to show understanding, sympathy, and consideration. If the other colleague could not accept your ideas and insist on his/her own teaching philosophy, I then will lower my own expectation. (T5)

These responses outline the teachers' acknowledgement of and expectations on collaboration and their approaches to online collaboration. Time issues or the nature of dynamic process of teamwork seemed to hinder few teachers from effective collaboration. These teachers' actual practices in professional collaboration are noted in this finding.

Reflection

The teachers reported infrastructure issues in using online tools in their teaching contexts. For example: "They ask their classmates to share the internet with them. So, they can email to me. Or, if they have some relatives that can share with them, so they can email to me" (T3).

A couple of teachers pointed out issues on student motivation and attitudes:

First of all, students are too passive or rely too much on group members, so you could not see the progress they made. (T2)

Whether students are active is challenging. Sometimes you have given them tools, yet some of them never would like to give it a trial. (T6)

Other comments included implementation issues related to time and teachers' knowledge and skills:

For my online teaching, the challenge is to make them focus on me when teaching. If I have to use online tools, like Kahoot and Quizlet, I also think it's time consuming. For Quizlet, I have to type all of the vocabulary and for English translation and maybe photos for low level class. (T4)

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It's because my lack of knowledge and skills. Other teachers may be very familiar with Zoom and iLearn, and they could face and deal with urgent situations. Yet, I could not make it to fix the problem and will spend a lot of time. (T5)

Five teachers regarded themselves somehow competent in the implementation of TELT:

I become a mediator to make students and technology information go together. (T1)

I am a curriculum designer and helper, as technology is just a teaching aid rather than the main focus. (T2)

I think I'm the person who picks up what kind of technology students use or what kind of media I want to use in class. It makes me like a gatekeeper in terms of technology-enhanced language teaching. (T3)

I think I have the potential to be competent and confident in TELT. But it really takes time. ... Actually, I'm now using them to organize class schedule and create practices and design after-class practices. (T4)

I feel I am now more like a guide. It's because nowadays there are too many self-study websites, yet students may not know how to use them. Then, my role is to have them know how to maintain their English learning after they leave the classroom setting. (T6)

One teacher, on the other hand, felt incompetent in TELT:

I feel like I don't know anything about live broadcasting software. In comparison with other colleagues who are technology natives, I am just an immigrant without any sense of the technology. Except for easy applications of PowerPoint and the internet, I am not confident in using others. (T5)

Regarding plans for TELT, four teachers described communicating with students online as a priority (T2); applying more online activities (T3); learning more about an online platform (T5); and having self-study via YouTube videos (T6). For example:

If possible, I would like to improve what you mentioned about communication with colleagues and students. (T2)

I will check YouTube videos or learn from new younger teachers who are good at using some software. (T6)

Two other teachers did not state specific future plans, but one of them mentioned that she would consider trying more online tools: "I have to try out some online tools. Then, also for creating practices, I think it's on the content level, so I also need to spend time to create class practices" (T4).

Through reflection, the teachers pointed out infrastructure, student engagement, and implementation issues in online environments. While they indicated their self-assessed

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competencies in TELT with plans for using online tools and activities, few teachers reflected on personal weaknesses and desire to improve the status quo. This finding seems to be related to limited online instruction promoted in their workplaces before this study was conducted.

Approaches and Needs

The Taiwanese teachers voiced learning about TELT from online resources or workshops offered at their workplace. For example: “I will pay attention whether there is any new teaching approach or method online. I am quite quick to get the new ideas and start my research on them, and pick something suitable for my students, Taiwanese students” (T1).

Other approaches mentioned by the teachers included learning from colleagues, conferences, research papers, or communication with previous classmates. Here are example responses:

I will approach my professional learning about TELT by accumulating people’s experiences, using tools on my own in my teaching, and reading research papers. (T4)

I am checking some journals in a regular manner. Perhaps two or three times per semester. (T5)

Five teachers highlighted the need to participate in teacher training workshops to improve their TELT competence. For example:

For now, workshops and articles about the effectiveness of online tools are most important. The articles can be from blogs, news, Facebook groups, or research journals. (T4)

We senior teachers could not handle new technology very well, and it is really exhausting to us. Yet, those new junior colleagues are different from us when infusing technology into designing learning activities. ... If possible, we could mutually offer workshops or have more communication. (T5)

These responses reflect the teachers’ engagement with and willingness to learn from workshops, colleagues, and/or online resources. This finding highlights the importance of and need for teacher learning and training in technology integration.

Discussion

The results of the questionnaire indicate that most teachers in both countries tended to actively learn about TELT from colleagues and experts or through workshops and social networks while collecting information, trialing new technologies, interacting with colleagues and students, and using CMC tools. The teachers used several online tools for their teaching, including Google tools, Microsoft Teams, Zoom, WhatsApp, Facebook, Kahoot, Quizlet, and/or YouTube. In terms of the four components of the ECCR model, there were few teachers who showed relatively less engagement with reflection than exploration, communication, and collaboration. This indicates that reflective practice needs to be encouraged and improved through reflection for action (Prieto et al., 2020).

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Through the interviews, the teachers in both countries provided further elaboration regarding what and how they do for their professional development in TELT. The analysis of qualitative data from the interviews reveals that individual teachers explore, communicate, collaborate, and reflect with different levels of engagement and approaches to professional development in their teaching situations. Out of the twelve teachers in the study, seven teachers (two in Hong Kong and five in Taiwan) stated that they were active in collecting information on technological options while exploring the web and online communities. This finding is congruent with Son's (2014) study, which found that web search engines, communication tools, and social networking sites were frequently used for exploration by CALL practitioners. In selecting online tools for teaching, the following factors were mentioned by the teachers in both countries: usability, accessibility, teaching objectives, enjoyment, and user-friendliness. These factors seem to affect the use of online tools not only for their teaching but also for their professional development.

All teachers in the study agreed that communication is vital for their professional development, and they need effective communication skills and strategies for their learning and teaching. They showed similar engagement with professional communication, but they had a slightly different interest: the teachers in Hong Kong talked more about communication tools, whereas the teachers in Taiwan talked more about communication strategies. They also showed a great interest in collaboration with others and their involvement in collaborative activities offering opportunities for their professional development. This finding supports the value of peer collaboration discussed in Meskill et al. (2022). Collaborative learning seemed to be facilitated through CMC, as similarly reported in Arnold and Ducate (2006). When they were asked to reflect on their own teaching with technology, the teachers pointed out several challenges such as infrastructure issues, technical issues, administrative issues, and implementation issues. They also indicated that they would welcome professional development opportunities for effective collaboration and reflection. Hence, it is important for teachers to create or join context-specific teacher learning communities through peer communication and collaboration, along with hands-on experiences with the use of technology, which can facilitate teacher preparation for technology integration (García-Martínez et al., 2022; Yurtseven Avci et al., 2020).

In self-assessments of their own competence in TELT, interestingly, five teachers in Hong Kong said that they were not competent enough, whereas five teachers in Taiwan said that they were competent. This difference seems to come from different individual experiences with TELT in actual language classrooms. Based on their TELT experiences, the teachers played different roles and commented on things they could do with their students differently. In response to their approaches to professional learning about TELT, they mainly mentioned self-directed professional development activities, workshops, colleagues, and online resources. This finding supports the ideas of autonomy in teacher development discussed in Robb's (2006) study and situated learning for teachers discussed in McNeill's (2013) study.

There were also contextual factors to consider. In Hong Kong, sudden transition to online teaching during the COVID-19 pandemic seemed to provide a great challenge for the teachers. At the same time, it provided a great opportunity for them to explore online tools for online teaching by exploring the web and communicating with other professionals. For the implementation of online teaching activities, they stated that they needed effective communication skills, which are required to be competent in TELT. In Taiwan, the secondary school teachers appeared to have

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more motivation in enhancing their TELT competence than the university teachers, due to the impact of curriculum guidelines promoted by the Taiwanese Government. The university teachers, comparatively, seemed less active in TELT because of no specific requirement of their workplace, except for the urgent need to deliver online teaching under the impact of the COVID-19 pandemic (for discussions on online language teaching and the pandemic, see Cheung [2021] and Moser et al. [2021]). Yet, they said that they would like to develop and improve their practical knowledge and skills for TELT if possible.

Conclusion

There is a critical need for professional development that supports teachers to integrate technology into their teaching effectively (Howell et al., 2021). Without adequate professional development, it is difficult for teachers to be competent in CALL and keep up to date with new knowledge and skills for TELT. In light of this, ECCR-based activities can be considered and recommended for formal and informal learning. Also, the ECCR-based professional development framework (i.e., DLTF) can be adapted to support language teachers to identify and improve their CALL competency levels. While responding to Son's (2020) call for research on language teacher development in digital learning and teaching environments, this article offers a better understanding of language teachers' ECCR. It makes a unique contribution by presenting a study using the ECCR model to document language teacher development in technology integration.

Most participants in the study explored technological options, communicated with colleagues and students, collaborated with others, and reflect themselves for their learning and teaching while they had individual differences in the levels of ECCR and TELT competencies. This finding encourages further examination of additional aspects of ECCR. For example, what types of ECCR activities would support teachers more in improving their TELT competencies? How would teachers engage with ECCR better in hybrid or online learning environments? How would teachers use ECCR to develop context-specific approaches to CALL? How would CALL teacher training programs or workshops facilitate ECCR for teachers' professional growth? How would teachers use DLTF in their continuing professional development?

The study involved a small number of in-service language teachers and relied on self-reported data to investigate individual teachers' engagement with ECCR. Despite these limitations, the study has specifically investigated the teachers' professional development and practices by exploring their ECCR and TELT competencies. The findings of the study offer some insights into what and how in-service language teachers do for their professional development in TELT and contribute to our understanding of CALL teacher development. They recommend continuing professional development for teachers to explore, communicate, collaborate, and reflect themselves in their contexts. For example, teachers are recommended to develop and improve their knowledge and skills for selecting useful online tools and resources while being active in collecting information on technological options for their teaching; have interpersonal communication skills and strategies that are needed to increase online interaction; develop constructive ways of collaborating with others in online communities; and continue reflecting on their own learning and teaching practices in online environments.

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For future research, researchers may recruit a larger sample of participants in various contexts and conduct peer assessment together with self-assessment. They may also consider collecting data from observations and recordings of online activities and behavior in the long-term. In addition, as suggested by Liu and Kleinsasser (2015), they may make follow-up inquiries to examine and document language teachers' continuing process of professional development in technology integration. While it is challenging to examine teachers' experiences and practices, it is necessary to keep addressing the questions of how teachers can integrate technology effectively and how they can improve their knowledge and skills for TELT in continuously changing educational environments.

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**Appendix A
Interview Questions**

[Exploration]

1. Are you active in collecting information on technological options for your teaching? If yes, how do you collect the information and how does the information affect your pedagogy? If no, why not?

2. What factors do you think are important in the selection of online tools for your teaching?

[Communication]

3. What communication skills and strategies do you think are needed in increasing student interaction during online learning activities?

4. How do you build and maintain your communication channels with other professionals?

[Collaboration]

5. What do you think about working in a team environment for online learning activities?

6. How do you think you can collaborate with your colleagues and students online?

[Reflection]

7. What are the challenges of using online tools in your teaching context?

8. Do you consider yourself a teacher who is competent in technology-enhanced language teaching (TELT)? If yes, how do you see your role in the technology-enhanced language classroom? If no, why not? Any plan for TELT?

[Overall]

9. How do you approach your professional learning about TELT?

10. What do you think you need most to improve your competence in TELT?

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Abstract

This exploratory qualitative study investigates the obstacles, local support, and learning outcomes for adolescent learners in Nepal taking massive open online courses (MOOCs). A convenience sampling method was employed, and a total of thirteen individual interviews were conducted with K-12 Nepali students. Utilizing thematic analysis, this study revealed that the major difficulties these learners faced were a lack of scaffolding, language barriers, limited technology and internet access, and unmatched learning capacity and MOOC learning objectives that were designed for adults originally. To address these challenges, a local community of teachers, peers, schools, and families played a significant role in inspiring learning, providing scaffolding and guidance, fostering a collective and open local learning environment, instilling motivation, and offering both emotional and technical support. MOOC learning increases the independence of these adolescent learners, supplementing school learning, supporting their career paths, providing practical skills beyond theories, and achieving mental well-being. The aim of this study is to address the existing research gap pertaining to the role of local communities in blended learning with MOOCs, especially within communities situated in the Global South.

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Keywords: Massive open online courses (MOOCs), local community, K-12 learners, blended learning, Global South

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During the COVID-19 pandemic, while efforts were made to transition society into the digital learning age, massive open online courses (MOOCs) have been significant resources for learners to access rich learning materials and engage in diverse learning activities with esteemed professors and leading experts in various fields (Alamri, 2022). When first enacted, MOOCs were designed to provide unrestricted access to a large number of students in an online learning environment (Deng et al., 2019; Guggemos et al., 2022). Though MOOCs were initially designed for adult learners who can take classes for free and potentially receive certificates upon completion of the course, instead of receiving college credits (Impey & Formanek, 2021), there are also a growing number of K-12 students participating in MOOCs (Guo & Reinecke, 2014; Stoltzfus, Scragg, & Tressler, 2015). However, the majority of MOOCs are currently still geared toward adult learners, which frequently fail to align with the needs of K-12 students (Koutsakas et al., 2020). As a result, there is an urgent need to study how K-12 learners engage in MOOC learning (Guggemos et al., 2022).

Ghimire (2018) reported the phenomenon that thousands of high school students in Nepal had completed at least one MOOC. Ghimire and Gautam (2020) further suggested that some MOOC completers in Nepal share their learning experiences with more people in their local community as well as other nearby communities by facilitating workshops that include presenting and sharing materials. Existing studies gave heavy attention to the social and collaborative aspects of online MOOC communities (e.g., Antonaci et al., 2019; Crane & Comley, 2021; Ruipérez-Valiente et al., 2021), blended learning (e.g., Bralić & Divjak, 2018; Bruff et al., 2013; de Moura et al., 2021), and localization in terms of content and design (e.g., Che et al., 2016; Godwin-Jones, 2014; Liu et al., 2020); however, there is scarce research on how local learning communities are formed as a result of MOOCs. In fact, many studies suggest that social connections significantly impact students' attitudes and overall engagement in MOOCs and other forms of online learning experiences. Notably, the lack of social interactions and feelings of isolation have been among the major reasons for dropping out of MOOCs (Gamage & Whitting, 2021; Wang et al., 2019.)

This study was designed in response to the unique MOOC learning context described in Ghimire and Gautam (2020), wherein hundreds of Nepali adolescents earned certificates of English via MOOCs prior to the pandemic. The present study explores the specific phenomenon of Nepali adolescent learners expanding local learning communities beyond MOOC learning. There are three questions that guided this research:

1. What difficulties and challenges do Nepali adolescent learners face when learning with MOOCs?
2. What types of local resources are available and beneficial to Nepali adolescents to facilitate their MOOC learning?
3. What are the learning outcomes and impact of Nepali adolescent learners taking MOOCs?

Literature Review

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Blended Learning with MOOCs

Blended learning is commonly known as an approach that integrates the advantages of face-to-face and online learning components (Rasheed et al., 2020). Blended, hybrid, mixed-mode, and flexible learning are frequently used interchangeably (Müller & Mildenerger, 2021). There has been a growing research interest in how MOOCs can be integrated into face-to-face higher education classrooms for possible blended learning experiences (Albó & Hernández-Leo, 2020; Alghamdi et al., 2019; Bruff et al., 2013).

A blended approach is commonly used when MOOCs are used in K-12 education, because their implementation has to coincide with pedagogical methods that best fit the learning experiences, capabilities, expectations, and needs of K–12 students (Briggs & Crompton, 2016; Koutsakas et al., 2020).

MOOCs in K-12 Education

Research on MOOCs has been centered around postsecondary education. In fact, before 2013, there was a complete absence of literature on MOOCs in the K-12 context (Yin et al., 2015). Graham et al. (2014) suggested that open learning practices in K-12 situations are often structured and monitored by teachers due to the nature of the K-12 environment, which is highly controlled by curricula and policy in the educational system. Such a unique context makes open learning integration in K-12 much harder than it is in the adult learning environment.

Panyajamorn et al. (2016) studied the effectiveness of the MOOCs hybrid learning model among 182 rural school students from grades 7-9. That study took place in Thailand and also utilized a quantitative method of pre- and post-test with students' satisfaction questionnaires to examine how students' learning is influenced by a proposed MOOCs hybrid model, which used a chemistry MOOC designed for adult learners to combine with a flipped learning approach. Study results suggested the model is effective in improving learning for all ages, even with students who lack significant e-learning experience.

Research on how MOOCs that are designed for adult learners are implemented in K-12 settings is extremely limited. Not surprisingly, there are more studies available on MOOCs that are specifically designed for K-12 learners. Koutsakas et al. (2020) conducted a qualitative narrative systematic review of K-12 MOOCs that covered the literature published between the years 2013–2020. They only identified 21 studies on K-12 MOOCs. Of those, 16 of them were about MOOCs that were specifically designed for K-12 audiences, and five were not. Notably, three different ways to integrate MOOCs into current K-12 infrastructures were recognized, namely, serving: (a) as a preparation for advanced placement AP towards higher education, (b) as supplementary to the school curriculum, or (c) as extracurricular activities. This systematic review claimed that the existing literature on K–12 MOOC implementations demonstrated positive effects for both teachers and students. The presence of teachers as well as social interaction and guided learning in

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a blended learning setting were found to be particularly critical components that contribute to the success of K-12 MOOC learning.

Research on MOOC implementation in the K-12 education context is still limited (Guggemos et al., 2022; Koutsakas et al., 2020). There is a need for future research to discover potential opportunities, benefits, risks, uses, and practical values of using MOOCs in K–12 educational settings (Yin et al., 2015).

Local Learning Communities and MOOCs

Siemens and Downes (2005, 2009) proposed the Connectivism theory to explain how learning occurs in some types of MOOCs. Connectivism posits learning as a social process within a group setting. Siemens and Downes advocated for a shift in educational courses from closed, highly structured formats to open networks fostering self-directed learners, aligning with the dynamics of the digital learning age. Similarly, Cormier (2008), another early advocate of connectivistic types of MOOCs, stressed the collaborative construction and real-time negotiation of the curriculum through active engagement, highlighting the significance of learner social participation in the learning process.

MOOC learners often struggle with isolation and disconnection from other learners; therefore, cultivating peer interactions and creating a sense of belonging can be critical in cultivating a community of practice (Gamage & Whitting, 2021). A community of practice (CoP) is a community of individuals who share a common concern or enthusiasm for what they do and collaborate regularly to learn to do it better through interactions (Wenger, 2011). According to Wenger (1998), “We all belong to communities of practice. At home, at work, at school, in our hobbies—we belong to several communities of practice at any given time. In fact, communities of practice are everywhere” (p. 6).

Some studies suggested that learning from MOOCs in collective groups would result in better learning outcomes and also assist students in overcoming challenges, such as a lack of motivation as well as issues around understanding the topics (Firmansyah & Timmi, 2016). Li et al. (2014) studied 54 engineering students watching MOOC video lectures and collaboratively working together on quizzes. Their study reported high satisfaction in studying within groups because learners gained a sense of connection and interaction.

Interestingly, Firmansyah and Timmis’s (2016) study suggested that fostering on-site collaborative learning in local communities is particularly significant for MOOC learners whose primary spoken language is not English. Such on-site learning can help them more effectively learn from MOOCs such as by making their MOOC learning relevant to the local context. Therefore, additional research which investigates approaches to forming and maintaining local learning communities is critical for a better understanding of K-12 MOOC learners’ adaptations, collaborations, and overall successes.

Challenges in MOOC Learning

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Mendoza et al. (2017) classified three major barriers to adopting MOOCs into various learning contexts, namely, environmental, personal, and design. The environmental barrier is shared with all forms of online learning, such as unstable network infrastructure (Mendoza et al., 2017). More specifically, Ma and Lee (2019) pointed out that internet and technology access caused a usage challenge for MOOC students, especially for those in developing countries. Second, personal barriers are those related to personal variables, such as individual learning styles, learning capacity, and anxiety levels (Mendoza et al., 2017). In addition, de Waard et al. (2014) suggested that language issues, low self-esteem, lack of previous knowledge, and limited ability to operate technology may restrict people from actively participating in learning from MOOCs. It is plausible that using virtual communities with physical learning communities may support learners from these vulnerable groups to be more engaged. Third, design barriers, such as a lack of learning support or clear information, can cause more challenges for MOOC learners (Mendoza et al., 2017). Yilmaz et al. (2022) suggested that because MOOCs are structured for a massive audience and often lack personalized learning features, students in MOOCs often need scaffolding support, especially for courses requiring problem-solving skills rather than just memorization and learning from lectures.

In summary, integrating MOOCs into K-12 learning presents a distinctive challenge due to the highly structured nature of K-12 education. To address the isolation experienced by MOOC learners, local learning communities are necessary. These communities facilitate peer interactions and a sense of belonging. Collaborative learning within local communities, particularly for non-English speaking MOOC participants, emerges as a valuable approach to enhancing the pertinence of MOOC learning within local educational contexts.

Method

This study used a qualitative exploratory interview research approach, which does not seek confirmation of theories but rather discover a little-known area (Swedberg, 2020). This type of research requires researchers to maintain a flexible and curious attitude to collect information while seeking clues to reveal what is happening (Stevens & Wrenn, 2013). Therefore, when employing a qualitative exploratory interview approach, researchers should be capable of following up with questions towards unanticipated answers and be willing to investigate information that deviates from the original interview protocols. All the researchers conducting interviews for this study were experienced in interviewing and comfortable asking follow-up questions, thus maintaining a natural conversational flow. To ensure consistency in the interview process, one researcher led all the interviews, while one or two additional researchers facilitated the process.

Individual interviews were conducted with thirteen adolescent MOOC learners in Nepal to explore their MOOC experiences and local community engagement in their MOOC learning. The interviews were semi-structured, which allowed for open-ended responses and a natural flow of

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conversation. For example, for the purpose of gathering data related to students' engagement with diverse learning resources and support, a set of questions was employed, such as:

- 1) Do you share your MOOC learnings with others (e.g., classmates, friends)? If so, in what manner? If not, what are the reasons for refraining from sharing?'
- 2) What do your parents feel about you taking all these MOOCs? Did any specific MOOC that you took or passed impress them? If yes, which ones and why?
- 3) Have your teachers provided support in your MOOC learning experience? If so, in what ways?

Each interview lasted approximately 60 minutes and was video-recorded through Zoom and auto-transcribed through Kaltura. The auto-transcripts were reviewed and corrected by the researchers in a verbatim approach.

Participants

In this study, a convenience sampling method was employed for participant recruitment. Participants were recruited through a Nepali high school teacher who toured many different schools and communities in Nepal to promote MOOCs. Importantly, he assisted in the distribution of interview information to students in various regions of Nepal. His criteria for selecting participants included the following: students who had taken quality MOOCs, were capable of effectively communicating in basic English with researchers, demonstrated approachability based on pre-established connections, and were located in widespread geographic locations in Nepal. Additionally, he provides us with information about the students' English proficiency levels.

As depicted in Table 1, it is evident that the students possessed at least a B1 English level according to the Common European Framework of Reference for Languages (CEFR). This classification signifies that the students were intermediate English learners, capable of describing experiences and expressing opinions effectively in a wide range of situations. This information provides assurance that interviews could be effectively conducted in the English language. Furthermore, it is worth noting that one of the researchers on our team had established prior connections with certain participants through their involvement in an educational podcast show. Consequently, this pre-existing relationship afforded our team valuable insights into the typical English-speaking competency and background knowledge of these participants. Moreover, all members of our research team possessed extensive experience in conducting international research. This experience equipped us with the capability to effectively communicate and elucidate concepts with English learners while also being cognizant of potential cultural and linguistic disparities. Eventually, 13 students agreed to participate in interviews, and their ages ranged from 12 to 18 years old. Detailed demographic information can be found in Table 1.

Table 1

Interviewees' Demographics from Li et al. (2023). Copyright permissions have been obtained.

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Interviewees	Gender	Age	Location	School	English level	Age started taking MOOCs	# of MOOCs completed
Aange	M	18	Gulmi	Resunga Secondary School	B2	13	More than 50
Binsa	F	16	Pokhara	Motherland Secondary School	C1	14	23
Chaha	F	17	Pokhara	Motherland Secondary School	C1	13	Around 50
Daxa	F	13	Kirtipur	Creative Academy	B2	11	12
Ehani	F	14	Kirtipur	Creative Academy	B2	11	15
Faneel	M	17	Syangja	Ranbir Janahit Secondary School	B1	13	120
Geetu	F	16	Pokhara	Motherland Secondary School	C1	13	More than 40
Hartaj	M	14	Kirtipur	Creative Academy	B2	13	21
Imay	M	17	Syangja	Ranbir Janahit Secondary School	B1	13	Around 50
Juddha	M	15	Kirtipur	Creative Academy	B2	12	9
Nugah	M	14	Kirtipur	Creative Academy	B2	12	21
Saudis	M	17	Nawalparasi	Janata Secondary School	B1	14	Around 90
Palisha	F	16	Kailali	Gurukul Academy	C1	11	75

In accordance with IRB guidelines and ethical considerations, we could not collect or publicize sensitive socio-economic information from participants. However, the local teacher provided us with certain contextual information. He mentioned that the 13 interviewees come from varied socio-economic backgrounds, including three from urban areas, four from semi-urban areas, and six from rural areas. Additionally, only four out of the 13 students have a guardian who has earned a university degree.

As part of an extensive study investigating the learning approaches of Nepalese adolescents in the context of MOOCs, our findings indicate that approximately half of the participants (n=6) set their learning goals with a focus on personal growth (Li et al., 2023). Additionally, nearly all of the participants (n=12) were highly motivated by their inherent curiosity for learning, although obtaining certificates from MOOCs was identified as a crucial motivating factor by 11 participants. Self-monitoring was highlighted as a significant aspect of the learning process by six interviewees. Hence, they actively tracked their learning progress, set reminders for their MOOCs studies, and recorded their learning experiences in notebooks or diaries. Information regarding students' approaches to learning in MOOCs was initially extracted from interview recordings and

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subsequently validated through follow-up email responses. Details are summarized and reported in Table 2.

Table 2

Students' Approaches to Learning in MOOCs—Extracted from Interview Recordings and Follow-up Email Responses

Interviewees	External motivation (e.g., certificates)	Internal motivation (e.g., curiosity, self-growth)	Goal setting	Time management (e.g., set schedule for MOOCs)	Seek material resources to complement MOOC learning (e.g., YouTube)	Seek support from the local community	Evaluate learning
Aange	✓	✓	✓	✓	✓	✓	
Binsa	✓	✓	✓	✓	✓	✓	✓
Chaha	✓	✓	✓	✓		✓	✓
Daxa	✓	✓		✓	✓	✓	✓
Ehani	✓	✓	✓	✓	✓	✓	✓
Faneel	✓	✓		✓	✓	✓	
Geetu	✓	✓		✓		✓	✓
Hartaj	✓	✓		✓		✓	✓
Imay		✓		✓	✓	✓	
Juddha	✓	✓			✓	✓	✓
Nugah	✓	✓	✓	✓		✓	
Saudis	✓	✓		✓	✓	✓	
Palisha	✓	✓	✓	✓	✓	✓	✓

Data Analysis

Thematic analysis was used for data analysis (Braun & Clarke, 2012; Terry et al., 2017). Data was coded through Nvivo 12. To enhance the validity of qualitative coding through triangulation, two of us coded the transcripts and conducted a comparative analysis of their coding outcomes. At first, we organized the raw data for analysis by correcting the interview transcript. We independently employed an inductive open coding approach to code three transcripts, which involved assigning codes to segments of data based on themes. After independently coding three transcripts, we noticed discrepancies in their coding. In a subsequent meeting, we discussed these differences to reach a consensus on the initial codebook categories. For example, one of us used the code "transform into practical meaning" for instances where participants mentioned applying knowledge from MOOCs to hands-on practice, while another used "life changing" for similar

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instances. During the discussion, we shared our interpretations of these codes for segments related to transferring knowledge to hands-on practice. We realized that both codes essentially captured the same theme but used different terminology. To resolve this, we engaged in a dialogue, reached an agreement, and modified the theme to "provide practical skills beyond theories." Subsequently, we updated our coding scheme to include this agreed-upon code, ensuring consistency in our analysis. Then, to ensure the consistency of coding and the trustworthiness of the study, one of us coded the rest of the transcript alone, and the other reviewed and confirmed the final code.

In the initial coding phase, we assigned specific codes to segments of data, identifying recurring patterns, concepts, and ideas. This step constitutes the foundational level of coding to create codebook categories. Subsequently, we organized these categories into sub-themes, where related codes with commonalities were grouped into clusters. This represents an intermediate level of abstraction, allowing for a more focused analysis. Finally, at the highest level of abstraction, themes were derived by synthesizing and interpreting the sub-themes. The themes and sub-themes are presented in Table 3.

Table 3

Themes and Sub-Themes

Themes	Sub-themes
Struggle and challenges	Access to technology. Base-language of the courses is difficult. Course design. Need guidance. Unmatched levels.
Teacher support	Inspire initial engagement in MOOCs. Provide scaffolding and guidance. Offer emotional support.
Peer support	Discuss content questions. Provide advice on what classes to enroll in. Support the financial application process. Resolve technical issues. Expand local learning community.
School support	Post students' certificates from MOOCs on social media. Offer small incentives. Organize guided workshops and presentations on MOOCs. Offer access to technology and the internet.
Family support	Provide internet and technology support. Provide emotional support. Inspire family members to learn new things.
Learning outcomes and impacts	Improve independence and time-management skills. Supplement in-school learning.

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	Support career path selection. Provide practical skills beyond theories. Achieve mental well-being.
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Findings

Struggle and Challenges

The most reported challenge by eight of the 13 interviewees is that they lacked guidance on how to operate these MOOC websites in the beginning, so they were often lost. For example, Chaha mentioned the difficulty for an adolescent learner to figure out how to navigate the basic features like creating an account as well as logging in and out on platforms like Coursera. Chaha stated,

When we applied for the first time for online courses, [sic] I was pretty much confused because since it seems we weren't [sic] training for it and most of the things were pretty complex, so it was for us like how to log in how to log out. Because of those problems, even my friends, they tend to [lose] their interest in MOOCing but I continued.

Ehani also mentioned that even though her teacher introduced MOOCs to them initially, she was not fully aware of what she was supposed to do. As she described, "Firstly, when we were using MOOCs, we didn't have much idea [on] what should we be doing, when we started doing [MOOCs]."

Another major challenge reported by six participants was the language barrier. The base language of these major MOOC platforms was English, which was not the first language for these Nepali adolescent learners. Daxa admitted, "I couldn't understand everything being said." Hartaj also mentioned that certain MOOCs instructors employed English in a manner that exceeded the scope of what they had learned in Nepalese schools, such as using specific terminology or slang, posing challenges for adolescent learners to fully understand the content. He observed, "What some people speak English, it was a little difficult for me to understand the English that they were speaking of some speakers in the video." Saudis provided more context that, "MOOCs was very challenging for me because I'm from a public school to know English is very, very basic for us." However, for certain MOOCs that heavily relied on videos, the inclusion of captioned video content could be beneficial. Nugah claimed that "[when I] listen to those native speakers that they speak quite fast. I couldn't get them at all. I need the subtitle."

Five interviewees discussed limited access to digital devices (e.g., computers, smartphones, etc.) and the internet restricted their learning from MOOCs. Aange genuinely stated, "There was no internet connection to us, and there were no computer resources to us, and it was at that time in 2017, 2018, we were not able to join those courses." Even though the school labs may provide some devices, the demands for devices to take MOOCs often exceed the supplies available in school. As Aange explained,

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We used to have six computers in our class, [but including] I with my friends, [there] were more than 20 [students] in the class, so we need to manage six at one time to take those MOOC courses. And in the beginning, everyone was fully interested in taking those courses, and then we used to have a time limit of 20 minutes or 30 minutes to do those courses, and if one doesn't feel finished in this time gap, then the other friend used to come, and there used to be a kind of you can say quarrelsome time.

Four interviewees also mentioned that because MOOCs were not designed for adolescent learners at their ages, some of the courses were too advanced and difficult for them. Juddha gave one example,

I remember one of our friends was [sic] enrolled in a course that was not meant for us either, so it was a course that was for the level of bachelor's. And so those courses we [sic] skipped pass the course, because we are not able to understand it, and it does not allow everyone to understand it either.

In summary, the major struggles and challenges that these Nepali adolescent learners experienced include a lack of guidance to start MOOCs, language barriers, unmatched levels between their ability and MOOC content, and limited access to technology.

Local Resources and Support

Teacher support

All thirteen participants claimed that local resources and support are crucial in their learning experience with MOOCs, particularly teacher support. All the participants were inspired and encouraged by their schoolteachers to start their MOOC journeys, and teachers provided scaffolding and emotional support along with their learning. For example, Ehani stated, “Firstly, when [my teachers] introduced about Coursera they encouraged us to get involved in one of the easiest courses first try from easy then we'll get to learn new things again and again.” Palisha also mentioned that her teacher forwarded her a link to a list of 75 free MOOCs and so it served as a guide that directed her to complete these courses before she explored MOOCs on her own. In addition, Binsa noted that her teacher encouraged her to do MOOCs as COVID-19 impacted education across the world, and they needed alternative ways to keep learning. She explained that,

My English teacher introduced me to MOOCs. It was kind of obvious that we were going to [get] into a lockdown after our 9th-grade class ended, and so my English teacher called me and told me everything [about] how I could engage [in] MOOCs, and why it was important, and what you can get through it, how you can learn. And he really encouraged me and he kept asking how many MOOCs have you completed, and he [reacted] to my stories [on social media] about the certificates, and he recommended me [of] some courses and asked me how my journey in MOOCs was going.

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Apparently, teacher support plays a pivotal role in initiating MOOC learning on a large scale, guiding students through difficulties that they experienced in their learning process, and providing emotional support in this specific Nepali local community.

Peer support

Twelve of the thirteen interviewees reported their experience either supporting or being supported by their local friends in their MOOC learning experiences. Peer support is efficient in discussing content questions in MOOCs, providing advice on what classes to enroll in, supporting the financial application process, resolving technical issues, and expanding this local learning community, which can be achieved through in-school activities, personal connections, and social media. For example, Palisha mentioned in the following quote that her local friends have study groups to support each other in solving questions regarding the content. She explained that,

Actually, we had a study group of my friends in which we used to share really like doing the same courses, and sometimes someone was having problems with some quizzes or some [of] the tasks given by the current courses, so we used to help each other in that so we had those [sic] [questions correct].

Hartaj also used friends as resources to help her make decisions on which course to take. As he put it, “We have a group of friends who were taking these courses they suggested me to take this course, as they told me that it was really fun so I took it.” Likewise, Geetu described how she and her friends would suggest interesting courses to each other. As Geetu stated,

When I take a MOOC, I also inform about it to my friends, and if they are interested, they also take those MOOCs. And when my friends I've been with, they also informed me that they are doing such courses, and then, if I'm interested in that I also think [about taking] that [course].

Aange even suggested that having a peer who is experienced in MOOCs learning can significantly contribute to their learning experience. He noted that it was common to make mistakes when taking MOOCs. Whether it's during logging in, handling financial aid, or other things, mistakes can lead to trouble. So he suggested it's a good idea to keep someone in touch who can guide them through these situations. As the following quote details,

The last thing I would suggest to the beginners is if you just keep someone who is experienced or if he or she knows something about MOOCs previously, then keep someone in contact, so that you can ask for someone, because in many of the cases, while doing more courses, we do it, and we just make mistakes, while being those things, why even why logging in, not even by logging in and to from financial aid. And many more things we may have made mistakes and we may have fallen into trouble. So you can just keep someone in touch.

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All these interviewees mentioned that social media and other technology have been incorporated into sharing and facilitating MOOC learning, which even leads to an expansion of the learning community. For example, Binsa described her MOOC sharing process as follows,

I just take some videos of it and upload it to my story [in social media], I take the screenshot of the certificates and upload it to my story and, story in Facebook and Instagram and that leads people curious about what I'm doing so they asked me about how they can engage in it also so I have directed many people towards it, and it really makes me happy.

School support

Nine of the participants mentioned their schools encourage their MOOC learning by posting students' certificates from MOOCs on social media, providing small incentives, organizing small workshops on MOOCs, and offering access to technology and the internet. For example, Chaha said, "I still remember our school's page posted about my certificates, our certificates through the engagement of MOOCs in Facebook, and thousands of people saw that and many people messaged me about how they can engage in that." Apparently, her school used social media to promote MOOC learning by displaying students' achievements; in turn, it encouraged students to engage actively. Similarly, Daxa mentioned that her school promoted such self-directed learning on MOOCs and so it motivated them with rewards. She argued,

You know it's like actually had my school it was even be rewarded, if you are trying to learn yourself like learn for yourself more than you [do] for completing of your courses, you would even get a reward. I think that is a great way of encouraging students...we all are excited when we hear about prizes for completing something like they have been encouraging us. Just don't be limited to the textbook.

Schools also support students' MOOC learning by providing an active learning environment with guided workshops and presentations for teachers and students to share tips on MOOC learning, which was claimed to be beneficial. As Ehani described,

In our school, there is a big conference hall, and we sat down together and was big audiovisual and they showed us how to get enrolled in college courses and how to [sic] to write financial aids then we learn from them and [sic] our teachers taught us how to get enrolled by using financial aids and that helped a lot.

While students struggle with limited technology and internet access, some schools open computer labs to support students' MOOC learning. For example, Juddha observed, "We were given the permission to use the school lab in order to continue our [MOOCs] courses."

Family support

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Twelve of our participants indicated that their MOOC learning was greatly supported by their families in various ways; their learning also positively inspired their family members to engage in learning new things. Aange pointed out that his mother was extremely proud of his MOOC learning, and so she always took time to observe his learning and see the certificates that he gained through MOOCs. As he stated, “Even though she is uneducated, [sic]she sits behind me and she observes what I am doing, how I am learning through the computers, how I am learning through the internet, and she feels so good.” Chaha also mentioned that her learning experience inspired her family members to start MOOCs. She noted that,

...even my younger brother [and] sisters and the other ones as well, they also asked me how we could do some courses, how we could be involving MOOCing and even I help them to be engaged in such activities and they felt that it was really amazing.

Interestingly, many parents did not like their kids staring at laptops for a long time before they realized that they were learning from MOOCs. For example, Faneel admitted,

In the beginning, my parents are not so supportive. And my parents told me not to use laptops, not to use mobile phones; but after I did more than 10 courses and I showed them that I have done it and my parents are so much so proud of me, and they also share it on social media, “my son did that. I'm very proud” in social media and they are very proud of me.

After seeing the achievement of their kids' MOOCs learning, many parents even brought internet and technology access to their homes to support continuous learning. For example, Saudis observed, “My parents really supported me for that. Like others were dedicating games, but my parents supported me [by] providing me ICT tools which really like encouraged me from the inside to do MOOCs.” Similarly, Faneel exclaimed that his parents were so proud of him that they got him Internet service and a computer so that he can take MOOCs at home on his own.

Learning Outcomes and Impacts

Interview data indicated that Nepali adolescent learners taking MOOCs leads to many positive learning outcomes and impacts, including improving their independence, supplementing school learning, supporting their career paths, providing practical skills beyond theories, and achieving mental well-being. Several quotes listed below exhibit these benefits.

Among all the key outcomes mentioned above, learning with MOOCs leads to the development of practical skills was most reported by 10 of the 13 interviewees. For example, Geetu mentioned that she took MOOCs about mental health, and what she learned through these courses transformed into a practice even to support people with mental health locally. She observed,

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In my community, so many people are suffering from mental health illness. [The MOOC course on mental health] has developed confidence in me and I can help the people in my community, because I have learned at least some things on that topic and I have my people in my community even my own friends [who] were suffering from depression. In today's sense, I'm helping them to overcome by giving them the knowledge that I've gained.

She further explained that she took several MOOCs related to COVID-19 education which greatly benefits her community in real life. As she explained,

...our Nepal is a [sic] developing country, many of my relatives are illiterate and they don't know how to care [of themselves] during COVID-19 and I have done several courses [on] COVID-19 and I have told them about the measures that need to be followed once infected and they are taking care of their health... I've also advised people [using] knowledge that I gained.

Eight interviewees also indicated that learning via MOOCs contributes to their life-long well-being. Faneel declared that “the benefits of MOOCs are that it builds up our personality.” He elaborated on that by noting,

I think my English language listening, writing, reading skills, and computer skills, personality development skills, leadership skills have increased to a great extent, and it helped me to be prepared for a better future. And it assist[s] me a lot for my society, for my expose in my present time.

Similarly, Ehani said that the design of MOOCs often allows her to make mistakes and learn from mistakes, which reinforced a positive attitude towards mistakes in life. As she explained,

But like when you start doing and trying it even if you do mistakes, you can get to re-attempt at like the problems, in our life also there are so many problems going on and, we once we do mistake we get to learn from that mistake and we can keep on going on, so it has improved my habit and it has improved those skills.

About half of the interviewees also claimed that MOOCs can supplement their school learning by providing relevant information or including content not typically offered in formal schooling. For example, Aange explained,

I've taken the course of sustainable development goals from MOOC[s] and I just take that thing with my regular classes. I have the sustainable development goals in my syllabus too. I have learned sustainable goals in my MOOC, and I have already done that, so it makes very easy [sic] to transform that knowledge [into] my regular classes, into writing to express my thoughts, to express my learning outcomes here so. MOOC[s] ha[ve] directly

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made change and it has influenced the learning of regular classes and regular schools and colleges and the syllabus of my college.

Even if some courses are not offered by formal schooling, MOOCs can provide complementary knowledge to support adolescent learners' exploration. For instance, Binsa talked about how she took classes not taught in school, such as astronomy, because "they really benefit me and make me [sic] interest[ed] and satisfied."

Three interviewees also indicated that MOOCs supported their career selections by broadening their views and providing career-related courses. In the following quote, Binsa discussed her new perspectives on possible fields of study and her newfound career prospects,

We've been brought up in a society where you're either [a] doctor or engineer... If you could not be either one of them, so you were unsuccessful. So learning about so many different fields through massive open online courses was really a huge eye-opener and has made me believe in many different subjects and many different fields, growing my interest in those fields.

A few participants also indicated that learning MOOCs improved their independence, especially in terms of self-managed learning time. Ehani reflected on this situation: "It was kind of difficult to manage time for myself before, but as I started taking MOOCs, I started to give time for myself, I started to learn by myself, which before [I took] help from others."

As a result, adolescents learning from MOOCs have the opportunity for immediate academic or practical skill improvement. These adolescents can also experience substantial long-term benefits, including enhanced mental well-being, expanded career options, and a heightened sense of independence.

Discussion

This study aimed to explore a less-discovered MOOC learning experience of adolescent learners from Nepal to better understand the learning challenges and needs of K-12 MOOC learners. It was also designed to reveal local support and resources that have proven useful through their learning experiences. With this design, it is possible to provide some tentative suggestions for improving MOOC design to adapt to the growing needs of young learners.

The biggest challenges reported by the interviewees are struggles without sufficient guidance and scaffolding, language barriers, and limited access to the internet and digital devices. Issues that were also noted include misaligned levels with younger learners. According to Mendoza et al. (2017), these are three key barriers to adopting MOOCs for learning. Apparently, three of the four major challenges (i.e., lack of scaffolding and guidance, language barriers, and mismatched levels in terms of course content) that we found in this group of Nepali adolescent learners were

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caused by a combination of design barriers and personal barriers as classified by Mendoza et al. (2017). However, technology and internet access issues fell into the environmental barrier category.

As MOOCs were originally designed for adults (Impey & Formanek, 2021), the design barrier and personal barrier are largely influenced by the mismatch between the level of knowledge of K-12 learners and the learning objectives defined for adult learners. Though these learners demonstrated a high capacity for self-directed learning (Li et al., 2023), they, nevertheless, still needed some scaffolding and guidance to familiarize them with the MOOC platforms and efficiently locate available resources and useful information.

To resolve the various challenges and frustrations reported above, the findings suggested that the support from local learning communities was particularly critical and effective. As indicated by Siemens and Downes (2005, 2009), learning takes place in a social context surrounded by peers, teachers, family, and school. Our study reinforces that various stakeholders play distinct roles in supporting learning. For example, in our case, teachers in local schools played a significant role in introducing MOOCs to a broad student body locally, providing timely information and technology-related support to students, and fostering an encouraging and positive learning environment. Local peer support was also critical for this group of Nepali adolescent learners because it served as a resource to resolve issues regarding MOOC learning, whether content-related or technical, and allowed them to share learning experiences and advice with each other. While teachers and peers helped students to identify and suggest courses that matched their learning capacity and school learning, learning became relevant, effective, and meaningful for these young learners, in particular, given that these learners' primary language was not English.

This finding is consistent with Firmansyah and Timmis' (2016) statement that face-to-face local learning communities are crucial for non-native English speakers who enroll in MOOCs to learn more smoothly. Moreover, as participants indicated, their choice of MOOCs is constrained by their language proficiency. Even if they wish to take MOOCs in a specific field of study, the challenge of not fully understanding English spoken in video lectures can discourage and hinder their participation. The implications of this finding point towards the need for future research to delve into the intricate interplay between language challenges and their influence on participants' engagement, comprehension, and overall learning outcomes. Such exploration is paramount not only for understanding the complexities of language barriers but also for addressing the associated issues of equity and accessibility within the MOOC landscape (as indicated in Adam, 2019; Breslow et al., 2013; Colas et al., 2019; Duru et al., 2019; Lambert, 2020).

Furthermore, school and family support are also very valuable, particularly in regard to providing and sustaining students' motivation. As participants indicated, some schools provided incentives, posted their achievements on social media, and offered space and technology for students to access MOOCs and organize MOOC-related activities. Such support significantly motivated students to engage in MOOC-based learning and develop confidence in navigating the

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self-directed learning process. Students were also highly motivated by encouragement from their families. Some families even installed home technology and the internet in order to support students' MOOC learning. While many people and resources supported their efforts, this group of young learners also, in turn, inspired their family members to engage in active and lifelong learning as well.

As the findings of the study showed, support from local learning communities (i.e., teachers, peers, school, and family) towards this group of adolescent MOOC learners in Nepal has powerfully contributed to an open learning environment where everyone can start and participate in such online learning and expand it to local communities. Starting with teachers promoting MOOCs to students, students were brought into the learning community formation. Then, as some students became experts in this community, they brought more peers and family members into the community and shared knowledge and experiences with them, and eventually formed a social learning community across teachers, peers, schools, and families. During the time learning together, learners in this local CoP grew strong relationships within and out of the learning context, and fulfilled their need for affiliation (Lemme, 2006). These study results reinforced the view that learning sustains and nourishes knowledge obtained from community practice, and collective knowledge contributes to the development of personal histories and shared identity in the context of the community (Wenger, 1998). Our findings also coincided with major literature reports that collective learning within groups contributes to satisfying MOOC learning experiences (Firmansyah & Timmi, 2016; Li et al., 2014).

While few studies have been conducted with adolescent students learning from MOOCs; even fewer have explored the impact of such MOOCs on career aspirations and ambitions to pursue higher and further education. As mentioned, Koutsakas and his colleagues (Koutsakas et al., 2020) published an important review of 21 studies found in the literature related to K-12 MOOC studies. Those studies indicated that, in general, MOOCs can be successfully incorporated into pre-tertiary education and that they tend to have a positive effect on learning when certain conditions are put in place. MOOCs can effectively function as a supplement to traditional education or, in effect, work in a blended fashion, such as when using MOOC video materials to flip the typical classroom-based learning model (Cohen & Magen-Nagar, 2016; Ferdig, 2013).

Koutsakas et al. (2020) also noted that research shows that MOOCs are effectively being used in K-12 education both for remedial instruction as well as for students to complete advanced placement courses (Koxvold, 2014; Briggs & Crompton, 2016). The articles reviewed by Koutsakas et al. (2020) indicated that students increased their subject matter knowledge as indicated by classroom performance and improved test scores (Canessa & Pisani, 2013; Grover et al., 2016; Najafi et al., 2014) and were quite positive with their experience with MOOCs (Staubitiz et al., 2019). Not too surprisingly, students enjoyed the self-paced nature of the courses and the ability to review the materials at any time and place (Canessa & Pisani, 2013); such personal control and empowerment are often lacking in traditional K-12 education.

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Similarly, our findings also indicated that MOOCs brought significantly positive learning outcomes and impacts to these Nepali adolescent learners, such as enhancing their independence, and complementing their education. However, the findings further revealed that MOOC learning for this group of young Nepali learners also significantly expanded their career options, affording them a skillset beyond theory, and supporting their mental health. Clearly, while there are several significant issues and challenges still to be overcome, there are myriad potential opportunities and benefits for adolescents learning from MOOCs and many more that will likely be revealed in the coming decade.

Limitations and Future Research

The study has several limitations. First of all, data collected are from self-reported interviews, which may introduce biases and limit the validity of the learning outcomes and processes. However, given the exploratory nature of this study, the findings hold the potential for providing valuable information to inform the development of specific research questions for future research. In fact, as an expanded study, we are conducting teacher interviews to further enhance the validity of the study. Secondly, our interviewees' first language was not English; as a result, some of the researchers' questions could have been misinterpreted. Moreover, because this research used a convenient sampling method through a Nepali high school teacher, the learners who were reached were more likely to receive better support from teachers than those unreachable learners who self-initiated MOOC learning without community support. Additionally, while thousands of adolescent learners in Nepal K-12 education were learning from MOOCs, our findings were limited to this exploratory study that was based on only 13 interviews. Hence, the findings might not be generalizable to a wider population. A future study that collects data with a large sample population may help both in screening participants and in producing a more comprehensive view of this special learning situation among Nepali adolescent MOOC learners.

Conclusion

This exploratory qualitative study examined challenges, local support, and learning outcomes of adolescent students learning from MOOCs. The study found a variety of challenges that adolescent learners in Nepal experienced, including the lack of scaffolding, language barriers, restricted technology and internet access, and mismatched learning capacity and MOOC learning objectives that were initially targeted for adult learners. The support from local teachers, peers, schools, and families helped to resolve those challenges by offering the necessary scaffolding and guidance (e.g., providing lists of free MOOCs, hosting workshops, sharing resources), encouraging and motivating open learning among everyone, sharing learning advice (e.g., content-related, technology-related, navigating MOOC platforms), and providing technical and emotional support. Findings further suggested that MOOC learning increases the independence of these adolescent learners, supplementing school learning, broadening their professional paths, offering practical skills beyond theory, and achieving mental well-being.

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This study uncovered the significant life impact of MOOC learning among adolescent learners that were not previously reported by other studies. It offers extensive insights into the less-researched K-12 MOOC learners in developing countries. The results reported here might inspire other disadvantaged communities to use MOOCs to expand learning opportunities to make learning more open, connected, and online. It may also inform MOOC instructors and designers of adolescent learners' struggles to design MOOCs that can better support their special needs.

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Ethics Board Approval

This study was conducted in compliance with the ethical standards of the Indiana University Institutional Review Board. The study protocol, including the informed consent process and data collection procedures, was reviewed and approved by the Ethics Board under the reference number 10983. Informed consent was obtained from all participants involved in this study. Any potential ethical concerns, including those related to data confidentiality and participant anonymity, were addressed in accordance with the guidelines established by the Ethics Board.

Conflicts of Interest

The authors declare that there are no conflicts of interest related to this research. This study was conducted with full transparency and impartiality, and the authors have no financial or personal interests that could influence the research findings, analysis, or interpretation.

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Automatic Detection of Metacognitive Language and Student Achievement in an Online STEM College Course

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Abstract

Metacognition is a valuable tool due to its role in self-regulated learning. However, online learning settings bring new challenges for engaging in metacognition given the unique opportunities and challenges presented by the online space, especially for diverse populations and students underrepresented in STEM (UR-STEM). Thus, we investigated whether a relationship existed between college STEM students' metacognition—measured by their spontaneously produced metacognitive phrases in online course discussions forums—and their success in an online STEM college course—measured by their final course grade. Using Bayesian generalized linear models, we examined whether this relationship differed for UR-STEM compared to non-UR-STEM students and whether related course behaviors (i.e., engagement and verbosity) and prior knowledge predicted variance in course grade. Metacognition plausibly predicted course grade and no plausible differences between UR- and non-UR-STEM students were found, suggesting that the online space could afford students from diverse groups the capacity to engage equally in a critical aspect of self-regulated learning: metacognition. Implications of the results for teaching and learning STEM content in the online space are discussed.

Keywords: metacognition, online, college, STEM, underrepresentation

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Overview

In this paper, we explore how college students, in an online, asynchronous science, technology, engineering, and mathematics (STEM) college course, spontaneously express metacognition—i.e., awareness of their own thinking—without experimental manipulation or prompting. Metacognition is useful to college students' learning and can be necessary for academic success (Baumeister & Vohs, 2007; Garrison, 2022). We specifically focus on metacognitive language that is produced spontaneously because doing so can eliminate some biases that occur in experimental conditions (e.g., observer-expectancy effect; Nichols & Maner, 2008) and because automated assessments of online learning can be of practical usage to instructors by relieving the burden of constant monitoring. In doing so, instructors can have a more accurate understanding of who needs extra assistance than if they were to assess students' learning without automated assistance. We also address whether students who are underrepresented in STEM (UR-STEM) demonstrate differential production of metacognitive language compared to non-UR-STEM peers because of the limited work on metacognition in diverse populations (Anyichie & Butler, 2017), possibly resulting in understandings of metacognition that are not generalizable across populations. Finally, we measure constructs adjacent to metacognition to understand the moderating role of prior knowledge and how engagement and verbosity might mediate the relationship between students' metacognitive language and their course grades. We examine these issues in the context of an online course, given the importance of metacognition in the online context where students typically must take large responsibility for monitoring their own learning (Chen & Bogachenko, 2022; Rovai & Downey, 2010).

Background: Why Metacognition?

Metacognition has a strong relationship to students' learning outcomes (Azevedo & Cromley, 2004; Cardelle-Elawar, 1995; Dent & Koenka, 2016; Hadie et al., 2018; Nietfeld et al., 2005; Schuster et al., 2023). Weinstein et al. (2011) described metacognition as an element of self-regulated learning (SRL) that is “both the glue and the engine that helps students manage their strategic learning” (p. 47). Hart (1965) suggested that “metacognition mediates between reflection and action” (p. 186), making it a necessary step in students' process of becoming critical thinkers and effective learners (Snyder & Dringus, 2014). Thus, metacognition is a crucial component of learning.

Having SRL skills means that students take active control of their learning, viewing learning not as something that happens external *to* them, but *by* them; thus, these students exhibit motivation to set goals, reflect on progress, and use metacognitive strategies to ensure comprehension and understanding (Parkes et al., 2015). We care about metacognition skills in particular because these skills directly translate to college achievement; for example, university students who use metacognitive strategies effectively, as an aspect of self-regulated learning, are less likely to drop out than students who use metacognitive strategies less effectively (Park et al., 2019). Students who use metacognitive skills have knowledge about their own information processing skills, the nature of cognitive tasks, strategies for coping with such cognitive tasks, and executive skills related to monitoring and self-regulating their own learning process (Schiender & Lockl, 2002).

The evidence that metacognition supports student learning is overwhelming: even slight prompting of metacognitive behaviors is highly related to comprehension of and performance on academic material (Stanton et al., 2015; Tsai et al., 2018; Zimmerman et al., 2011). These results suggest that metacognition can be a signal of impending learning (e.g., Perry & Lewis, 1999) and thus makes it an important target of investigation. Additionally, students who engage in metacognition strategies tend to be more inclined to try novel approaches when they are faced with academic struggle; whereas students who do not regulate their own learning tend to be defensive in their reactions to their performance and may avoid productively challenging situations to preserve their self-image as a learner (Andrzejewski et al., 2016). Thus, detecting the presence of metacognition unveils information regarding students' learning process. For example, a student engaging in metacognition might monitor their learning by asking themselves whether they understood what the instructor explained and if they did not understand, they would know which resources to draw from to ensure they attain their learning goal. In these ways, metacognition can play an important role in supporting student learning.

Metacognition in the Online Context

Metacognition is important in many learning contexts, but may be especially crucial in online learning environments (Akyol & Garrison, 2011; Garrison, 2022; Zhang et al., 2023). For example, Andrade (2012) found that students who are most successful in online courses exhibit high levels of self-regulation skills like metacognition (also see Bernacki et al., 2011; Fielding et al., 2008). More generally, with the increased freedoms and reduced structures in online settings (e.g., many online courses are offered asynchronously, leaving students to choose when—and sometimes even how—to access course information), metacognition is likely to be integral to success (Azevedo et al., 2019; Xu & Jaggars, 2011; Xu & Jaggars, 2014). Throughout the twenty-first century, online learning for college students has been—and will likely continue to be—commonplace (Allen et al., 2016). One reason that the online space became so pervasive as a medium for learning, even prior to the COVID-19 pandemic, is that it provides college students with increased opportunity for access, allowing students to take courses independently of their physical location and time of day (e.g., Means et al., 2009). In general, online learning environments allow students more control and flexibility in accessing instruction and instructional resources than in traditional in-person courses (Greene et al., 2019), making student activation of metacognition essential in many online academic contexts.

In this investigation, we assess metacognition expressed in online discussion forum posts, where metacognition is socially situated but unprompted. Metacognition that is used in a social setting for critical thinking has been studied through a Community of Inquiry (CoI) framework (Sadaf et al., 2022). The CoI framework captures the shared and collaborative meaning-making of students' learning experience in the online environment (Sadaf et al., 2022). In this sense, metacognition can be seen as a medium between one's internal knowledge and collaborative activities (Garrison, 2022; Sadaf et al., 2022). In their study, Sadaf and colleagues (2022) used online discussion forums to explore students' metacognition (self-regulation and co-regulation) in relationship to their perceived social presence (i.e., online presence). Their results suggested that students with higher perceived social presence tended to possess higher metacognition (Sadaf et al., 2022). Because metacognition has ties to the CoI framework (Garrison, 2022), this is a useful theoretical framework for situating our investigation. However,

we also interrogate whether these issues play out similarly or differently for students who are UR-STEM compared to their non-UR-STEM peers.

A Focus on UR-STEM Students

Success in online STEM courses is of particular concern for students underrepresented in STEM (UR-STEM), such as Black, Latine, Indigenous, women, and first-generation students (Means & Neisler, 2023; National Center for Science and Engineering Statistics, 2023). UR-STEM students have identified various concerns—including lack of social context in the online environment, lack of collaboration, and feeling isolated from other students as barriers to success (Gardner & Leary, 2023). Prior to COVID-19, Wladis et al. (2015) reported that Black and Hispanic students, who are underrepresented in STEM, were significantly less likely to enroll in online STEM courses compared to white students and that online STEM courses presented challenges to UR-STEM students not faced by majority students. Clearly, there is a need to understand UR-STEM college students' learning in online courses, given the concerning findings regarding online learning's differential impacts on UR- and non-UR-STEM students.

Of particular concern to this investigation is the learning behaviors of students in the “S” portion of STEM, science, as the course under investigation was a natural science course. Students with science identities participate in “normative scientific practices,” which Carlone and colleagues (2011) defined as practices that a student engages in when striving to be considered competent in a scientific setting. Normative science practices consist of asking and answering scientific questions, sharing scientific tools and ideas, communicating scientifically, making scientific inferences, and conducting scientific observations (Nealy & Orgill, 2019). Hence, scientific discourse in a group setting, like the discourse from discussion forums, is a powerful tool for developing a UR-STEM student's science identity as it is a main way that a science identity is communicated and recognized by others (Carlone & Johnson, 2007). It is during a scientific discursive exchange in a group setting that a UR-STEM student may gain valuable information about how others view their scientific identity, which in turn, impacts how they view their own scientific identity (Nealy & Orgill, 2019), promoting successful academic behaviors and learning strategies.

Based on the understanding that metacognitive skills are imperative to success in STEM (e.g., Al-Gaseem et al., 2020; Park et al., 2019) and on research describing UR-STEM students' lack of engagement in successful learning behaviors like metacognition (Bernacki et al., 2020; Nacu et al., 2015), findings in this area could be used to understand and support UR-STEM students' use of metacognition. However, to analyze metacognitive regulation in an online environment with UR-STEM students, traditional methods of measuring metacognition may not be effective for capturing metacognition as it naturally occurs, especially in the online setting.

Measuring Metacognition

Although researchers have agreed on the importance of metacognition as an index of self-regulation in online courses, its measurement is often difficult (Veenman et al., 2006; Winne et al., 2010). Traditionally, metacognition is studied through self-report surveys that rely on students' recollection of strategies they had previously used (i.e., their recollection of their

metacognitive control; see Harrison & Vallin, 2018). However, Winne and Jamieson-Noel (2002) found significant discrepancies between students' self-reports and trace data of student online SRL behaviors like metacognition. Thus, just because students do not report metacognitive activity does not necessarily mean that they are not engaging in metacognitive activity. Although its adaptive role is most useful when it is conscious, metacognitive monitoring may occur at a non-conscious level (Reder, 1996). Metacognition is dynamic, multifaceted, perhaps subtle, and may not be entirely obvious to the learner when it is in progress (Rovers et al., 2019). A related issue with relying on self-reports of metacognition is that, even when these processes are conscious, memory can still be fallible or biased. For example, a student may report using a particular metacognitive strategy because they use it often, even though that strategy was not used during the time of investigation (Winne et al., 2002). These are some of the well-known problems with measuring metacognition.

Issues with measuring metacognition become even more complex when considering the context of learning in an asynchronous online course. To deal with some of the aforementioned problems with measuring metacognition, we reason that it is possible to assess metacognitive behaviors in the online context, as they naturally occur. Online assessments have promising potential in supporting and improving online learning outcomes (Heil & Ifenthaler, 2023). 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" (Heil & Ifenthaler, 2023; p. 188). Thus, as a solution to avoiding self-report measures, several investigations have ascertained metacognition from students' written and spoken language. For example, Akyol and Garrison (2011) captured metacognitive knowledge, monitoring, and regulation (i.e., control) in online discussions. After hand-coding the text from three weeks of discussion posts of 16 graduate students, albeit in a non-STEM course, the researchers found that metacognition in online discussion forums could be categorized similarly to metacognition in face-to-face contexts (e.g., Nelson & Narens, 1994). Following this work, Snyder and Dringus (2014) developed a priori codes derived from Akyol and Garrison's (2011) metacognition construct and Garrison and Akyol's (2013) metacognitive questionnaire and then developed additional categories that were generated by the data. They found that metacognitive knowledge, monitoring, and regulation (i.e., control) could be detected from text. Given the demands of the online space and the issues with intrusive methods of measuring metacognition, we also chose to identify metacognition as it naturally occurs in text written by students taking online courses. Online discussion forums hold much information about students' learning processes (Ahif & McNeil, 2023). Therefore, online discussion forums are ripe for measuring and assessing metacognition students express when working toward a conclusion or learning goal. Measuring metacognition from these forums alleviates potential biases that arise from experimental procedures that influence learning experiences, and which may confound interpretations of findings and therefore understandings of metacognition. As in these studies cited here, we define spontaneous production of metacognitive comments as metacognition that appears in students' posts to the course discussion forum, where the post is required, but the metacognition is produced without being prompted (also see Lehmann et al., 2014).

Although prior investigations have examined spontaneously produced metacognition, we recognize that the contexts under which those studies occurred (i.e., small, graduate-level courses in non-STEM fields, with only subsamples of all available online posts) may limit the generalizability of this prior work. To avert some of these issues, we chose to rely on Huang et al.'s (2019) metacognitive language detection tool, which automatically identifies metacognitive language from online forum posts based on a metacognitive phrase dictionary (i.e., phrases and parts of phrases that indicate metacognition).

An advantage of Huang et al.'s (2019) tool is that it permits large-scale analysis of metacognition in online-learning contexts and avoids the problems of time-intensive methods where either the researcher conducted post-activity inquiries to analyze metacognition (Cardinale & Johnson, 2017; McCarthy et al., 2018) or participants are required to self-report their metacognitive awareness (e.g., Vrugt & Oort, 2008). By employing a tool that allows automatic detection, we can now examine large-corpus datasets, which was previously impractical given the burden of manual coding. Given that Huang et al.'s (2019) tool avoids the problem with self-reports and can be used on large-corpus text data, we employ this tool in the current study.

Measuring Constructs that Might Impact the Relationship Between Metacognition and Success in an Online Course

To contextualize students' metacognitive language, we included important constructs that might be related to metacognition. To account for some of these related behaviors and characteristics, we chose to consider how students' engagement, verbosity, and prior knowledge might relate to their metacognition to impact their performance in an online STEM course.

Engagement is important to academic success because students who are more active in a course tend to have better course outcomes than students who are less active (Greene et al., 2019; Rioch & Tharp, 2022). In general, those who participate more in online course forums are more likely to achieve success than those who participate less. This finding is consistent with the results from other investigations, especially in Massive Open Online Courses (MOOCs; e.g., Crues et al., 2018; Castaño-Garrido et al., 2017; Nieuwoudt, 2020; Sharma et al., 2020). Moreover, Waters and Gasson (2015) theorized that engagement in a community can yield a "community-oriented form of metacognition" (p. 93), in which the metacognition is shared among and promoted by the community members. Because of this likely connection of engagement and metacognition, and the likely connection of each of these with outcome in the course, we included a measure of engagement—number of forum posts—in this investigation.

A construct that is closely related to engagement and often presents itself as engagement, is *verbosity*. According to Akyol and Garrison (2011), "metacognition is inherent to communicating, explaining, and justifying one's thinking" (p. 189). Online discussion forums are organized to be socially situated and therefore involve community (Vally Essa et al., 2023); this in turn can encourage the expression of metacognition and facilitate discourse (Akyol & Garrison, 2011). For this reason, we might anticipate that those students who are more likely to be metacognitive may be more communicative and thus may produce posts to the class

discussion forum that contain more words. It is also possible that producing metacognitive comments in forum posts may be an epiphenomenon of being highly verbal: it may be that those students who have more to say also produce proportionately more metacognitive comments than students with less to say. To explore this possibility, we included a measure of students' verbosity—students' average word count per online forum post—and examined its relationship to students' production of metacognitive comments and examined its relationship to course success

Finally, students may engage more with classmates and do so more verbosely because they have more *prior knowledge* in that domain. Having prior knowledge about course content may also relate to the likelihood of engaging in metacognitive regulation. The positive relationship between prior knowledge and metacognitive monitoring accuracy may be explained by the idea that students with more prior knowledge have a more developed and vast knowledge base to use as a reference point for monitoring their cognition compared to students with less prior knowledge about a subject, which leaves low-prior-knowledge students with limited reference points to monitor their learning and understanding (Nietfeld & Schraw, 2002). It may be that students who are generally better prepared academically are also generally more metacognitive, and thus students who perform well on college entrance exams (e.g., SAT or ACT, as an index of background knowledge) are more reflective about their own learning (e.g., Ross et al., 2006). Thus, we included ACT scores as an index of prior knowledge and as a potential moderating factor on students' course success.

Current Investigation and Research Questions

We anticipated that there would be a plausible relationship between students' posts to the discussion forum that contained unprompted metacognitive comments and their course grades, beyond possible effects of engagement, verbosity, prior knowledge, and UR-STEM status. We also anticipated that the relationship between this spontaneous production of metacognition in their posts to the course discussion forum and their course grades would be moderated by their UR-STEM status and prior knowledge. Furthermore, we anticipated that the relationship between students' posts that contained unprompted production of metacognitive comments and their course grades would be mediated by their engagement in the course discussion forum and by the verbosity of their posts. In summary, the current study was designed to identify spontaneously produced (i.e., unprompted) metacognition in posts to an online STEM course and to address two research questions. Specifically, we asked:

- RQ1: What is the relationship between students' spontaneous production of metacognitive comments in their course discussion forum posts and their course grades?
- RQ2: Is the relationship between students' spontaneous production of metacognitive comments in their course discussion forum posts and their course grades moderated by their UR-STEM status or prior knowledge, and is this mediated by their engagement in the course discussion forum or the verbosity of their posts?

Method

Participants and Data Sources

Data were obtained from all 217 students enrolled in one semester of an online advanced natural science college course at a large Midwestern public university in the United States after the course was completed. Of the students in the sample, 41% came from UR-STEM groups (15% African American/Hispanic/Indigenous, 17% first generation, 24% non-male) and 59% were non-UR-STEM groups (i.e., white or Asian, non-first generation, male). We note that although Asian students are a minority in the United States, they are not underrepresented in STEM—and are actually overrepresented in STEM (Fry et al., 2021)—and thus were not included in our sample of UR-STEM students. Note that the total percentage of UR-STEM subgroups is greater than 41% because some students belonged to more than one UR-STEM group. We do not report the intersectional group-level findings of students who fit multiple minoritized STEM categories to comply with the Family Educational Rights and Privacy Act (FERPA) regulations that protect students' identities. More specific information about the course itself is not included to further protect student privacy.

Data for analysis come from three main sources: (1) all of the students' discussion forum posts ($n = 7,340$); (2) background data (i.e., race and ethnicity; parental college completion information; gender identification; and ACT scores or SAT equivalents if no ACT was available); and (3) course grades, provided by university data curators as letter grades. Although all the prompts for students to post to the forums were open-ended, the prompts had a common theme dealing with the estimation of a mathematical formula that was central to the course. Every week the students were to respond to the same prompt, and it was assumed that with each week of the course, students would have more—and more insightful—estimations based on the knowledge they were attaining from the course. Posting to the forum constituted 25% of the students' course grades. The remainder of students' grades were determined by their project (25%), exams (17%), homework assignments (16%), and other small assignments, each worth less than 5% of students' total grades.

Identifying Metacognition

We relied on Huang et al.'s (2019) tool for identifying metacognitive language. This tool applies a simple pattern-matching algorithm (i.e., an expert system for natural language processing) to find phrases that exemplify metacognitive regulation beginning with a first-person pronoun (i.e., I, we) and ending with a word or phrase indicating metacognitive knowledge, monitoring, or control. The tool searches for words that appear between a pronoun and metacognitive indicator and accounts for negations within phrases. Here, we present an example of a forum post with the metacognitive terms italicized:

I didn't include binary systems as well because *I think* there are way more binary systems that don't include life as well. *I do think* metallicity is important though. We need metals in order for it to be a life liking planet. But as the book stated *we are not sure* how much we need. *I think* this is the most important factor that you failed to include. I got a way lower answer than you.

For this particular post, the automatic detection tool flagged the metacognitive phrases “I think” and “I do think” because these phrases provide evidence that the student acknowledged their own thinking and their arrival at a conclusion (i.e., metacognitive knowledge), both defined as types of metacognition. “We are not sure” was also identified as metacognitive language because it indicates that the student provided information about the task demand and their feeling of knowing, or lack thereof, sometimes defined as a metacognitive experience (Efklides et al., 2018). Details of metacognitive words identified by the tool can be found in Huang et al. (2019).

Data Analysis

All statistical analyses for this study were done using R version 3.6.2 (R Core Team, 2019). To address RQ1 and RQ2, we applied Bayesian regression, investigating the relationship between students’ final course grades as a function of average number of metacognitive comments (RQ1), ACT scores, post counts, and word counts (RQ2). Independent variables were centered and scaled to unit standard deviation. We labeled variables that related to students’ activities in the course (i.e., engagement and verbosity) as mediation variables and labeled non-malleable variables that preceded the existence of the course (i.e., prior knowledge) as moderating variables.

We used Bayesian estimation and fit the models using the *brms* package (Bürkner, 2017) in R. We chose a Bayesian approach to estimate the indirect effects because of the complexity added due to the discrete nature of the moderators and our measure of academic performance. We used 4 chains, 2,000 warmups, 2,000 iterations, and non-informative priors for the regression. Parameters were estimated using the cumulative function, which specifies a logit link function and a lognormal distribution (see also: Bürkner & Vuorre, 2019). For reproducibility of the results, we specified a random seed. To assess model convergence, we examined the potential scale reductions (“R-hat” or shrink factors), Geweke statistics, trace plots, density plots, and autocorrelations. All metrics indicated that the reported models converged. We also performed posterior predictive checks to ensure that the models fit the data.

Results

Before addressing the two research questions for this study, we provide descriptive statistics.

Descriptive Statistics

Descriptive statistics and correlations among variables can be found in Table 1. The 217 students produced a total of 11,637 metacognitive comments across their total of 7,340 posts during the 8-week term. On average, each student posted to the forum 34 times, ranging from 1 to 346 posts, $SD = 23.5$. The distribution of posts had little-to-no positive skew, with a median of 32 posts. On average, each student produced 54 metacognitive phrases ($SD = 25.8$). The distribution of metacognitive comments had a slightly positive skew, with a median of 50 metacognitive comments. The highest grade in the course was an A and the lowest grade in the

course was a D. Eighty-one percent of students earned As, 10% earned Bs, 4% earned Cs, and 6% earned Ds. The students' mean ACT score was 30 ($SD = 4.19$).

RQ1: What is the relationship between students' spontaneous production of metacognitive comments in their course discussion forum posts and their course grades?

We used a Bayesian regression model to fit a proportional odds model where course grade (i.e., ordered categorical) is predicted by the total metacognitive comments produced by students. We also included students' UR-STEM status, the number of posts, average number of words in these posts, and their ACT scores to control for confounding effects these variables might have had. We found that metacognitive comments ($\hat{\beta} = 2.82$; 95% CI¹: 2.04 to 3.69) were predictive of course grade². In terms on confounding effects, we found that prior knowledge (i.e., ACT score) ($\hat{\beta} = .43$; 95% CI: .02 to .85) was predictive of course grade, but UR-STEM status ($\hat{\beta} = -.30$; 95% CI: -1.12 to .50), number of posts ($\hat{\beta} = -.23$; CI: -.51 to .13), and the average number of words in these posts ($\hat{\beta} = .27$; CI: -.24 to .81) were not.

¹ The 95% CIs reported are Bayesian credible intervals that can be interpreted as a 95% probability that the true value is in the interval. This is different from frequentist CIs with +/- 1.96 standard errors.

² Because the CI lower bound for ACT was so close to 0, ranging from -.02 to .02, we also conducted a simulation with a range of 100 different seeds. As a full disclosure to the reader, 47% of the time ACT was plausible.

Table 1

Correlation Table ($n = 217$ students), including means, standard deviations, and confidence intervals

Variable	<i>M</i>	<i>SD</i>	Variable				
			1	2	3	4	5
1. Course Grade	3.65	0.81					
2. Meta-cognitive Comments	53.63	25.84	.52** [.42, .61]				
3. Forum Posts	33.82	23.50	.07 [-.06, .20]	.18** [.05, .31]			
4. Average Word Count	108.06	31.26	.29** [.17, .41]	.48** [.37, .58]	-.00 [-.14, .13]		
5. ACT Scores	30.00	4.19	.13 [-.01, .26]	.05 [-.08, .19]	-.05 [-.19, .08]	.08 [-.05, .22]	
6. UR-STEM Status	.41	0.49	-.10 [-.23, .04]	-.05 [-.19, .08]	-.06 [-.20, .07]	-.01 [-.15, .12]	-.18** [-.31, -.04]

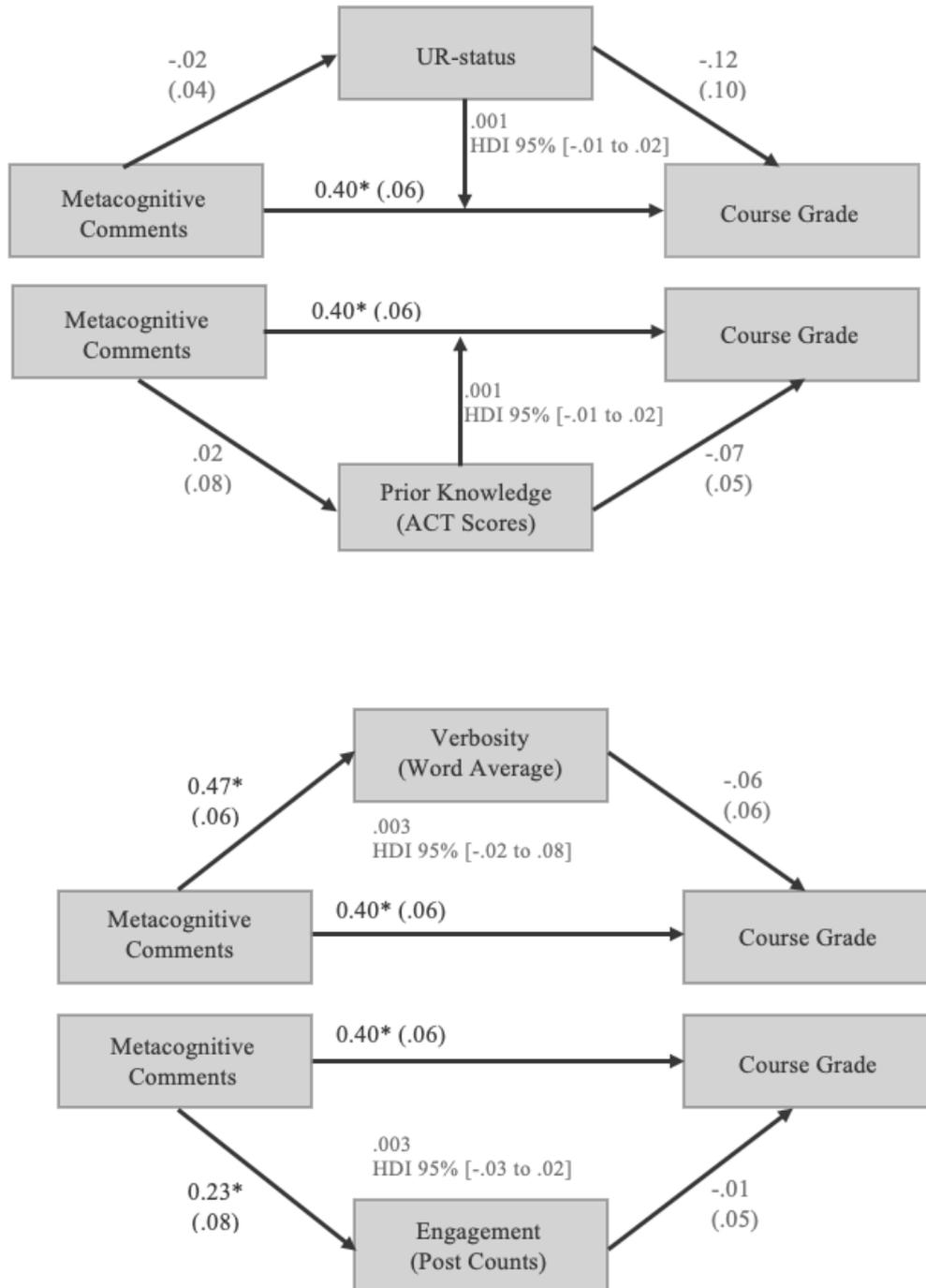
Note. ** $p < .01$

RQ2: Is the relationship between students' spontaneous production of metacognitive comments in their course discussion forum posts and their course grades moderated by their UR-STEM status or prior knowledge, and is this mediated by their engagement in the course discussion forum or the verbosity of their posts?

We tested the moderators and mediators under the specified Bayesian generalized linear model framework. Each moderating or mediating variable was tested separately to ensure full variance to be modeled between metacognitive comments and students' course grades. By testing these variables as moderators and mediators, rather than simply direct relationships, the coefficients describe whether the variables mediate or moderate the relationship between metacognition and grades. In other words, the analysis for RQ2 describes the indirect effects of the relationships tested, not a direct effect as in RQ1. As theoretically predicted, our results revealed a plausible relationship between metacognitive comments with the number of posts ($\hat{\beta} = .23$; 95% CI: .08 to .39) and the average number of words in these posts ($\hat{\beta} = .47$; 95% CI: .35 to .59). However, neither UR-STEM status, number of posts, mean number of words, nor ACT scores helped to explain the relationship between metacognitive comments and students' course grades (see Figure 1).

Figure 1

Regression Coefficients from the Moderation and Mediation Models Examining the Relationships between Metacognitive Comments and Students' Course Grades



Note. Values in parentheses denote standard errors. Asterisks based on 95% Credible Intervals

(CI). Each moderating or mediating variable was tested separately to ensure full variance to be modeled between metacognitive comments and students' course grades.

Discussion

We begin by summarizing and discussing the results and the implications. We then consider how this study adds to the body of knowledge about metacognition in online contexts, and then focus more specifically on UR- and non-UR-STEM students in online STEM courses. Finally, we consider some of the limitations of this investigation and entertain suggestions for future research before sharing concluding remarks.

Summary of Results

For the first research question, students' spontaneously produced metacognitive phrases plausibly predicted their course grades, suggesting that students who produced more metacognitive comments in their forum posts were more likely to achieve a better course outcome than students who produced fewer metacognitive comments, above and beyond the contribution of prior knowledge. This finding aligns with previous research that documented a positive relationship between metacognition and academic success (e.g., Mata et al., 2013). We also found that prior knowledge, as measured by ACT scores, plausibly predicted final course grade, based on our Bayesian regression model measuring direct effects. This suggests that although prior knowledge and metacognition are, indeed, related, their relationship to learning might be different. Unexpectedly, we found that engagement, as measured by the number of each student's discussion forum posts, was not plausibly related to course grade. Recall that students' forum posts constituted a substantial percentage of students' grades, which may have possibly put engagement, which we measured by posting, at a ceiling.

For the second research question, we found that the production of metacognitive comments had a plausible relationship with both engagement and verbosity. This suggests that those who were more engaged in the online forum and were more verbose were also more likely to produce metacognitive comments than those who were less engaged and less verbose. This finding replicates results from other investigations, especially in MOOCs (e.g., Crues et al., 2018; Phan et al., 2016).

We found that a student's status as a UR-STEM or a non-UR-STEM student did not moderate their metacognitive comment production and did not predict course grades. Because metacognition is closely related to SRL, these findings echo results from Park et al.'s (2019) study, which found minimal differences in SRL behaviors between UR- versus non-UR-STEM students.

Metacognition Research in Online Learning

Although metacognition has been a popular topic at least since the 1980s, now that online learning is so pervasive, it is imperative that educational researchers effectively adapt metacognition research to the online space. By analyzing metacognitive language relating to metacognitive monitoring in an online STEM course as it occurs spontaneously, we attempted to uncover information about metacognition's role in online learning. Exploring how metacognition is expressed spontaneously reveals important information about signals of impending learning and thus makes it an important target of investigation.

Although already noted, we want to emphasize that the findings from this study align with previous work highlighting the strong and positive relationship between metacognition and learning (e.g., Azevedo & Cromley, 2004). However, this relationship has rarely been

studied in the online context (e.g., Akyol & Garrison, 2011; Guo, 2022), making our investigation an important contribution to the conversation about metacognition in the online context.

Furthermore, the automatic metacognitive language detection tool represents a methodological innovation to metacognition research. By looking at spontaneously produced metacognition in students' online forum posts, we avoided the problems with commonly used self-report measures, such as students reporting using a metacognitive strategy, when they indeed have used that strategy at some point but did not actually use that strategy for the specific window under investigation (Winne et al., 2002).

We add to the body of research examining students' expressions of their metacognition in a way that may be practical for instructors to use during their courses. Recall that Akyol and Garrison (2011) found that metacognition in online discussion forums could be categorized similarly to metacognition in face-to-face contexts. From this premise, and with the facility of using the automated metacognitive detection tool, identifying students who are struggling using metrics other than grades, when perhaps it is too late to intervene, could be valuable in online settings where instructors are not afforded traditional indicators of struggle like body language. Thus, the current study can serve as a preliminary step in understanding metacognition's role in complex and authentic educational contexts, without the obvious presence of a researcher.

UR- and Non-UR-STEM Students in Online STEM Courses

Given that we found no differences between UR-STEM and non-UR-STEM students, this study suggests what is likely *not* contributing to inequities in STEM, specifically at the post-secondary level. We embarked on an exploratory analysis of students' spontaneous production of metacognitive comments as an indication of successful learning strategies, in one online STEM courses' discussion forums. We paid special attention to students' demographic backgrounds due to a lack of research directed at how metacognition manifests in populations other than white students. It is important to understand how all students, but especially those from groups underrepresented in STEM disciplines, make use of this crucial SRL strategy to support their learning in the online context. The current study suggests that UR-STEM students and their non-UR-STEM peers may be equally likely to engage in metacognition in college STEM courses and not likely to differ from each other in terms of their grades in these courses.

However, this work challenges previous studies that have pointed to differences in metacognition use between types of students (e.g., Siegel & Castel, 2019; Stanton et al., 2021). Although little work to date has been done analyzing the use of metacognition among UR-STEM students, our findings echo results from Park et al.'s (2019) study, which found minimal differences in self-regulated learning behaviors, metacognition included, between racially minoritized and majority students.

Researchers have paid little attention to metacognition and its role in the online space at the university level for UR-STEM students. Given that we did not find a significant relationship between UR-STEM status and metacognitive language suggests that students, independent of their underrepresentation in STEM, can express metacognition in their online STEM courses. It is also possible that the online context contributes to ameliorating the

negative effects that come with being underrepresented in STEM. Along these lines, research (e.g., Henricks et al., 2021) shows, for example, that women and men did not differ in their language use along traditionally gendered lines when posting to an online course forum. These findings suggest that there must be other differences, other than differences in metacognition as a facet of effective learning behaviors, that explain differential outcomes (Wladis et al., 2015; Xu & Jaggars, 2014).

Limitations and Future Research

This study relied on Huang et al.'s (2019) tool to detect metacognitive phrases automatically from online forum posts. We acknowledge the possibility of this tool's inherent limitations, some of which may lead to potential errors in assigning metacognition. For example, phrases that this tool considered as metacognitive knowledge or metacognitive experiences, such as "I think," may have indicated some figure of speech or rhetorical modes (e.g., irony, litotes, accismus) other than metacognition (Callaway et al., 2009). Perhaps phrases like "I think" (Chen & Zhang, 2017) were considered metacognitive but, in reality, could have indicated that the students were simply being polite. It could also be the case that metacognitive language might be subtler and more difficult to tag than what was possible by relying on the dictionary of metacognitive words used by Huang et al.'s (2019) metacognitive detection tool.

Future research can focus on attempting to model additional predictors to verify the true explanatory power of the role that metacognition plays on grades. We make this suggestion because issues of restriction of range might exist within the study reported here. For example, the metacognition tool only detected the metacognition that students expressed in their forum posts, thus restricting the forms of metacognition that were analyzed. There may have also been a restriction of range in the outcome measure, course grades, given that most students received an "A" in this course. It is also possible that the data from online forums contain an inherent amount of variability because students' comments are unpredictable in nature, making detection a difficult task. Assignments that are structured (e.g., guided reflections) might increase the consistency with which students engage in and describe their metacognitive processes and serve as a comparison to metacognition detection in unstructured settings. However, the current method of analyzing spontaneously produced metacognition (i.e., in text from activities not exclusively intended for self-assessment) may be advantageous in terms of measuring metacognitive regulation during typical learning activities where students are not necessarily prompted to engage in metacognition.

In future research, it will be important to assess the extent to which our findings replicate in other online STEM courses. Replication will be important to determine whether the robustness and generalizability of the current results are characteristic of the types of STEM courses studied here and perhaps whether these results are characteristic of a wider range of STEM courses.

Conclusions

We examined spontaneously produced metacognitive comments in one online STEM course. This work contributes to understanding the relationship between metacognition and students' success in the online context. We also analyzed constructs that are adjacent to metacognition, further informing which aspects are related to the expression of metacognition

by college students online. We found a plausible relationship between the production of metacognitive comments and course grade.

The current study further suggests that longstanding differences in STEM success are not attributable to measurable (meta)cognitive differences between UR-STEM and non-UR-STEM students, which is an important finding regarding our understanding of SRL. This work not only used a scalable method to identify and measure metacognition without researcher presence, but also helps to describe SRL as it naturally occurs through written language, potentially informing various theoretical models of metacognition. Thus, this work contributes to understanding how metacognition plays a role in STEM learning online.

Declarations

The authors declare that there is no conflict of interest in this study.

The authors received approval from the Institutional Review Board of the University of Illinois Urbana–Champaign to conduct this study.

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A Meta-Analysis of Self-Regulated Learning Interventions Studies on Learning Outcomes in Online and Blended Environments

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Abstract

Self-regulated learning interventions influence students' learning outcomes in online and blended environments. A review of the literature about self-regulated learning strategies reveals both significant and non-significant effects on learning outcomes in online and blended environments. The aim of this study was to calculate the common effect size of empirical studies conducted between 2017 and 2022 that investigated the effect of self-regulated learning strategies on learning outcomes in online and blended environments, and to determine whether the common effect size shows a significant difference in terms of course type, self-regulated learning strategy type, school level, and learning context. A meta-analytical review method was employed to combine the outcome of independent empirical studies. The studies included in this review were collected from Scopus, IEEE Explore, and ERIC databases. A total of 15 studies were included in this study. Cohen's d coefficient was calculated for the effect size in this study. As the heterogeneity among the effect sizes of the studies was high ($Q > \chi^2$, $p < .05$), the common effect size was calculated following the random effects model. As a result of the meta-analysis, it was decided that self-regulated learning strategies had a "moderate" effect ($Q = 0.65$) on learning outcomes in online and blended environments. Moreover, the calculated common effect size showed no significant difference according to the type of self-regulated learning strategy, course type, school level, and learning context.

Keywords: Blended learning, online environments, learning outcomes, online learning, self-Regulated learning

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Both scientific understanding and technological advancement are progressing at breakneck speeds in today's world, creating an environment where students must adapt and learn independently to keep up with these rapid changes. As a result, they must develop the habit of independent study. Students who can self-regulate their learning do so because they are aware of what and how they have learned and their gaps in knowledge and abilities. As a result, students do better in school (Baker et al., 2019) and develop the habits necessary to continue learning throughout their lives. "Self-regulated," in this context, refers to the level of control an individual exerts over their thoughts, feelings, and actions to achieve a desired outcome (Lanaj et al., 2019). Self-regulated is the act of guiding and controlling one's actions (Karekla et al., 2019).

Blended or online learning can be an advantage for students to explore their knowledge by various methods (Alexa et al., 2022). Blended or online learning is learning that can emphasize the student's understanding of the material with several techniques, namely video learning, virtual learning, and others (Venkatesh et al., 2020). The characteristics of this learning can be used by students to learn independently because, in that learning, students can research to solve their problems before discussing or asking other people, including teachers (Rizaldi & Fatimah, 2020).

Albert Bandura and Dale Schunk are just two of the academics who have studied self-regulation since the 1980s (Elcin & Şahinkarakaş, 2021). According to this school of thought, people learn from their own experiences and by seeing and mimicking the actions that earn them positive and negative reinforcement (Bandura, 2021). This strategy involves focusing on the behavior, remembering it, being open to contemplating it and, finally, acting on what one has contemplated (Hensley, 2020). During this process, people can monitor their habits, evaluate them using their standards, and adjust their conduct accordingly (Dontre, 2021). A growing body of research on student self-regulation in the classroom has led to the development of self-regulated learning (Chumbley et al., 2018).

Self-regulated learning (SRL) occurs when an individual chooses their learning goals, regulates their attention, interest, and effort, and is directed and constrained by their own objectives and the features of their immediate environment (McCardle et al., 2019). As a result, they develop a sense of self-awareness, sagacity, and educational agency (Suleman et al., 2020). Students' efforts to better understand themselves are linked to developing metacognitive abilities, integrating new information with existing knowledge, cultivating intrinsic motivation, and acquiring practical environmental management skills. Hence, the four sub-categories of the self-regulated learning model are: cognitive, metacognitive, resource management, and motivational techniques (Koivuniemi et al., 2021).

Students' cognitive strategies encompass the actions and mental processes they apply when studying to accomplish a goal or complete a task related to a specific academic topic (Teng, 2020). Rehearsal, elaboration, and organizing are all examples of cognitive techniques (Zheng & Zhang, 2020). Predicting, planning, monitoring, and evaluating are all examples of the metacognitive procedures that assist people in managing their thought processes (Teng et al., 2022). Strategies for managing one's resources include organizing and prioritizing one's time and studying space, putting forth the consistent effort, collaborating with one's peers, and asking for assistance when stuck (Bergmark, 2020). The final component of self-regulated learning is motivational methods, which address students' intrinsic values, sense of competence, and test-taking anxiety (Fukuda, 2022).

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Self-regulated learning plays a crucial role in determining learning outcomes in the context of online education (Jin et al., 2023). Students' ability to watch, control, and regulate cognitive processes, motivation, and behavior has a significant impact on their success in online learning environments. In online environments, where students often have greater autonomy and flexibility, they will excel. SRL strategies and supportive online behaviors mediate achievement, goal orientation, and academic expectations (Yeh et al., 2019). To thrive in online courses, it is important to set goals, plan learning strategies, and monitor one's own progress, as students with these skills are more likely to remain engaged and persist in their online courses (Martin et al., 2022). Additionally, self-regulated students are better prepared to adapt to various challenges in online learning, such as effective time management, dealing with distractions, and seeking help when needed. Therefore, developing self-regulated skills becomes a crucial design aspect of online learning experiences, ultimately impacting student success and satisfaction in the digital education landscape. Overall, self-regulated learning plays a critical role in the success and adaptability of learners in the online learning environment (Zhang et al., 2023).

In blended learning, where traditional face-to-face instruction is integrated with online components, self-regulated learning continues to have a significant influence on learning outcomes (Morris, 2019). The hybrid nature of blended learning demands a certain level of autonomy from students as they navigate face-to-face and virtual environments. Individuals who possess strong self-regulation skills, including goal setting, time management, and metacognitive awareness, are better positioned to leverage the advantages of blended learning. This includes effectively using online resources, engaging in collaborative activities, and adapting to diverse teaching modalities. Students with strong self-regulated learning abilities are more likely to feel ownership of their learning experiences, transition smoothly between face-to-face and online components, and thus enhance their overall academic achievements in blended learning environments (Kintu et al., 2017). Therefore, fostering self-regulated learning becomes an integral component in optimizing the effectiveness and success of the blended learning model.

Globally, numerous academics have explored the idea of self-regulated learning through a wide variety of variables. Multiple studies have found that students' academic success is enhanced when they exercise self-control over their studying (Perry et al., 2018). Meta-analyses of self-regulated learning are few and can only be found in academic journals published in other languages. There is some evidence from meta-analyses to suggest that using self-regulated learning strategies has a positive effect ($d= 0.50-0.80$) on students' motivation, reading comprehension, and overall academic achievement (Theobald, 2021).

While there has been much primary research on self-regulated learning, the results need to be more consistent. Therefore, a meta-analysis of this research is necessary for more definitive findings. The purpose of this study is twofold: to quantify the size of the effect of studies that have looked at the impact of self-regulated learning on learning outcomes and to see whether self-regulated learning strategies vary significantly across course content, grade level, and learning environment. The purpose of this meta-analysis is to provide a foundation for further studies of self-regulated learning.

This study looked at how various types of self-regulated learning strategies, levels of education, research methodologies, and types of courses can moderate the positive impact of self-regulated learning on student learning outcomes. It is generally agreed that practitioners must know which self-regulated learning method works best for which grade level and which

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subject to best support students in achieving their academic goals (teachers or academicians). Equally important is finding out how different types of research studies affect students' performance in the classroom, as this will direct future studies. In this context, the following questions were considered:

1. What is the overall effect of SRL interventions on learning outcomes in online and blended environments?
2. Does the effect of SRL interventions on learning outcomes in online and blended environments show a significant difference according to SRL strategies, course type, learning context and school level?

Literature Review

Self-Regulated Learning

Controlling and directing one's efforts to complete challenging learning activities is what self-regulated learning (SRL) is all about (Lemmetty & Collin, 2020). Using the iterative SRL process, students can track their progress in metacognition, cognition, motivation, and behavior (Järvelä et al., 2020). SRL has been conceptualized in various theoretical models and frameworks (Cuyvers et al., 2020). Some SRL models have four components (Du & Hew, 2022), but most can be broken down into three (preparation, performance, and evaluation).

Learners use many SRL tactics during these stages. The current study's SRL strategies were primarily categorized using Pintrich's (Cervin-Ellqvist et al., 2021) conceptual and operational framework, one of the most influential models in this field and containing the most extensive SRL strategies (Li, 2019). We began by classifying SRL methods into three categories: cognitive, metacognitive, and resource management (Callan et al., 2022). Students' cognitive methods include mental rehearsal, in-depth thought, and critical analysis as they engage in academic work. Planning, monitoring, and regulating are all examples of metacognitive practices that help students become more self-aware and in charge of their learning. Strategies for managing and regulating resources include managing time and the environment, controlling one's effort or motivation, asking for aid, and learning from one's peers. We included emotional regulation as a fourth type of SRL technique since it is an integral part of SRL processes (Ben-Eliyahu, 2019).

Many empirical investigations (Thomas et al., 2019) have shown favorable correlations between SRL and academic success. Academically successful students tend to make better use of SRL methods (Broadbent & Fuller-Tyszkiewicz, 2018). Learners who take responsibility for their education are more likely to use effective cognitive techniques, leading to more impressive academic growth (Altan et al., 2019). The effectiveness of students' metacognitive methods is also strongly connected to their grades (Chytrý et al., 2020).

SRL Interventions Online or Blended Learning Environments

Interventions to aid students' self-regulated learning (SRL), particularly in virtual classrooms, have garnered a lot of attention because of SRL's positive impact on students' ability to learn. Students in online classrooms have greater access to materials and possibilities for collaboration than their counterparts in traditional classroom settings (Gupta & Pathania, 2021). Online education expands access for students who might otherwise need help attending traditional classes due to their busy schedules (Ramírez-Hurtado et al., 2021).

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Additionally, online education often transfers power from traditional educational institutions to solitary students (Sadeghi, 2019). Students motivated to learn independently will have higher success in online courses (Rahiem, 2021).

It has been proven that students' SRL can be encouraged in an online classroom. The usage of digital assets can aid SRL in many ways. Huang & Lajoie (2021) created a digital training package to help students effectively implement SRL methods in their STEM classes. Students had to read and perform exercises as part of the Science of Learning to Learn training incorporated into the course learning system site to gain exposure to and practice SRL methods in the context of STEM subjects.

Supporting students' ability to SRL may be facilitated by computer-based scaffolds that offer continuous diagnostics and calibration, and dynamic support (Lim et al., 2023). In the study conducted by du Boulay (2019), students engaged in SRL in a hypermedia environment where human tutors offered adaptive scaffolding to help students organize, monitor, and evaluate their learning. Ten domain-specific learning objectives were offered to students in the fixed scaffolding condition. Prompts are another potential SRL intervention. The questions and suggestions modeled effective metacognitive and cognitive strategies for online learning (Wong et al., 2019).

SRL interventions vary in their ability to boost student performance (Núñez et al., 2022). There has been minimal debate regarding what makes SRL interventions effective in online or mixed learning environments, despite researchers having discovered various features that modulate their effectiveness (Lane & D'Mello, 2019). As such, the current meta-analysis also looks to explore aspects of SRL interventions in different kinds of educational settings.

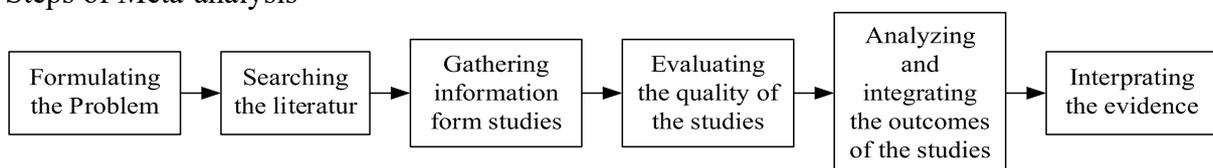
Method

Research Design

This study used a meta-analysis approach to investigate the effect of self-regulated learning on learning outcomes (Panadero et al., 2017). Meta-analysis, which involves combining the findings of multiple research, consists of the following steps Figure 1 (Cooper, 2015):

Figure 1

Steps of Meta-analysis



Undertaking a meta-analysis as per the structured approach delineated by Cooper (2015) involves a systematic progression through six essential stages. The first step encompasses formulating the problem, requiring a precise definition and articulation of the research question or issue at hand. Subsequently, the literature search becomes pivotal as the second stage, involving a comprehensive exploration of existing studies to ensure an exhaustive understanding of the subject matter. Moving forward, the third stage involves the meticulous gathering of information from selected studies and combining relevant data for later analysis. Quality assessment of the chosen studies is undertaken in the fourth stage,

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critically evaluating their rigor and reliability. The fifth stage involves the analytical synthesis and integration of outcomes derived from the selected studies, using statistical methods to distill meaningful patterns and insights. Finally, the sixth stage is dedicated to the interpretation of the evidence, where synthesized findings are contextualized and translated into meaningful conclusions. This sequential progression through the six stages of meta-analysis ensures a methodical and rigorous approach to distilling knowledge from a diverse range of studies, contributing to a nuanced and comprehensive understanding of the researched phenomenon.

Literature Search Procedure

This study included studies collected from Scopus, IEEE Explore, and ERIC databases. The database search was conducted between January 2023 and February 2023. These search terms were entered in both English and French during the search: “self-regulated learning” OR “self-regulated learning intervention on learning outcomes” AND “online learning” OR “blended learning.” The report also details that the collected papers were searched for further relevant literature. The research on the impact of self-regulated learning on learning outcomes collected a total of 513 studies. After restricting the subjects and objects of research, 15 studies remained.

The didactic method is used to analyze the selected journals by applying meta-analysis related to SRL following the previously described criteria. This didactic method involves systematic steps to compile, organize, and analyze relevant data from the selected journals (Tejedor et al., 2019). First, journals that met the inclusion criteria were carefully selected based on the topic of SRL, reliability, and relevance. Subsequently, relevant data from these journals were extracted and coded according to predetermined variables, such as the observed types of SRL strategies, level of education, and learning context. Then, meta-analysis was conducted to combine the findings from the selected journals and generate integrated effect estimates. This analysis enabled us to statistically conclude the relationship between SRL and learning outcomes in online and blended environments. By using the didactic method, we can gain a deep understanding of the role of SRL in the learning context and provide valuable insights for the development of self-regulated education.

Study Inclusion and Exclusion Criteria

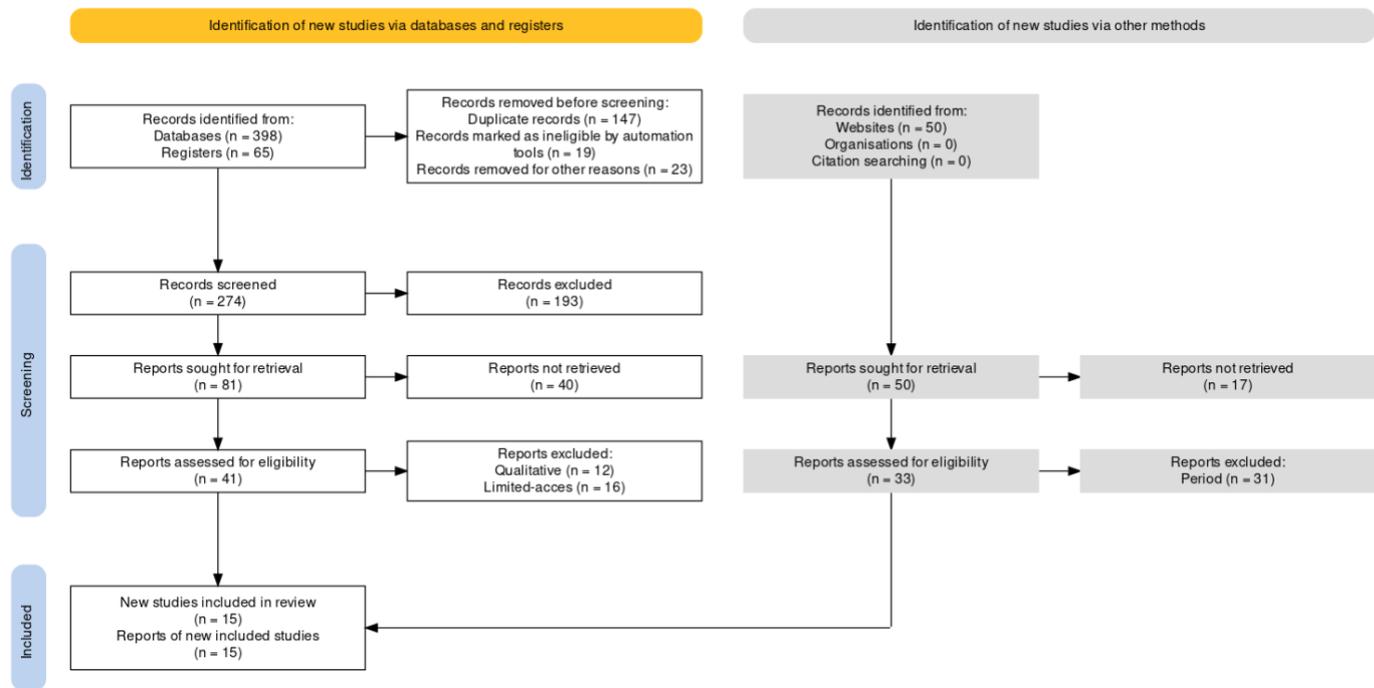
In this study, we looked at quantitative research conducted between 2017 and 2022 that assessed the impact of self-regulated learning on learning outcomes. These were the conditions for inclusion: (i) an article using an empirical approach that was published between 2017 and 2022. (ii) We are compelled to investigate how self-regulated education influences student performance. (iii) Both empirical and relational research require a sample size (N), mean score (X), and standard deviation.

Using the above criteria, we identified 398 studies and screened 274 of them. Ultimately, 15 studies were included after reviewing reports sought for retrieval and assessing their eligibility. These studies examined the effect of self-regulated learning on learning outcomes or its association with learning outcomes. Figure 2 shows an outline of the steps needed using the PRISMA protocol by adopting Page et al. (2021) to include the papers found in the literature review in the meta-analysis.

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Figure 2

Flowchart of Inclusion and Exclusion of Studies



Referring to the coding template used in the systematic review and coding general information for all 513 studies, fifteen eligible studies were identified through the screening process. By discussing discrepancies, the authors and coders resolved those differences and modified the original coding scheme. Finally, the authors also validated the coding of 50 articles with new studies via other methods using a more established coding scheme. Specifically, we extracted information about the authors, year of publication, course type, self-regulated learning strategy, learning context, as well as the level of education and number of research subjects. Information was collected regarding the sources and perspectives of learning from the coding scheme used in the included studies.

As a first step, we filtered and identified coding indicators related to self-regulated learning strategy and learning context from the existing coding scheme based on two principles proposed in both online learning and blended learning. Subsequently, an analysis was conducted regarding specific educational levels presented and the year of publication. Finally, according to data processing, empirical data were selected, particularly from non-limited access journals. This categorization was performed to investigate the influence of self-regulated learning strategies on learning outcomes in online and blended environments, as well as to explore significant differences in terms of course types, types of self-regulated learning strategies, school levels, and learning contexts.

Codes for Self-Regulated Learning

In this analysis, we employed a coding scheme including four primary strategies (metacognitive, motivational, cognitive, and mixed) to examine self-regulated learning (SRL) within the contexts of online learning (OL) and blended learning (BL). In this analysis, we employed a coding scheme including four primary strategies (metacognitive, motivational, cognitive, and mixed) to examine self-regulated learning (SRL) within the contexts of online learning (OL) and blended learning (BL). Specifically, online learning involves the delivery

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of instruction through electronic means, which requires students to utilize self-regulated learning strategies to effectively engage with a range of multimedia tools, internet platforms, and applications (Maddison et al., 2017).

In the metacognitive (Me) dimension, our analysis focused on strategies such as self-monitoring, learning planning, reflection, and goal setting utilized by students (Altiok et al., 2019). These processes are vital in self-regulated learning, enabling students to watch progress, set goals, plan study activities, and engage in reflection for improved understanding and performance. Examining these strategies provided insights into cognitive and metacognitive processes, enhancing our understanding of effective learning strategies and interventions in educational settings.

In the motivational (Mo) dimension, we focused on intrinsic and extrinsic motivation, interests, and relevant values within the learning context (Sahade et al., 2022). Understanding these factors is crucial for promoting effective self-regulated learning, as they affect student engagement and persistence. By exploring the interplay between intrinsic and extrinsic motivation and considering self-confidence, interests, and values, we inform instructional strategies that enhance motivation and create a positive learning environment. Our examination of these motivational aspects contributes to understanding the factors influencing self-regulated learning and promoting student motivation and engagement.

In the cognitive (Co) dimension, we analyzed the strategies and cognitive skills used by students in information processing, concept acquisition, and problem-solving (Scherer & Beckmann, 2014). Through this analysis, we gained insights into how students engage with and understand learning materials. This involved examining codes related to time management, information organization, and the effective implementation of learning strategies. By exploring these aspects within the Co dimension, we contribute to understanding the cognitive factors that influence self-regulated learning and inform instructional practices for promoting effective cognitive engagement and mastery of content.

In the mixed (Mx) dimension, we examined the interplay among the metacognitive, motivational, and cognitive dimensions. By exploring diverse subjects and educational levels, we aimed to understand how these dimensions interact in SRL. This holistic approach identified commonalities and variations in self-regulated learning processes, providing insights for educators and researchers. We saw the interplay among these dimensions and sought patterns of findings across diverse subjects (language (Lag), social science (SoSc), science (Sc)) and educational levels (primary (Prm), secondary (Sec), high school (HS), undergraduate (Und)). By employing this coding scheme, we were able to systematically investigate the impact of self-regulated learning in OL and BL within various educational contexts.

Data Analytic Strategy

Cohen's effect size measure, which is the standardized mean difference, was used in this study. The standard deviation is divided by the difference between the raw means to get Cohen's *d*. As stated by Cohen et al. 80 (2013), 'no effect' represents a *d*-value of less than 0.20, 'low' if the *d*-value is between 0.20 and 0.50, 'moderate' if between 0.50 and 0.80, and 'large' if more than 0.80.

The meta-analysis approach involved calculating a combined effect size by first adding up the effect sizes from separate studies. Both the fixed and random effects models were used

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to derive the average effect size. Amidst the debate over which model to employ, two options present themselves: The first is a check for diversity, which shows how much the measured difference in effect sizes (Q) differs from the difference caused by sampling error (Cooper, 2015). The second is to assess the consistency of effect sizes across studies to determine whether the fixed effects or random effects model is more appropriate.

Based on the analysis of the effect sizes, the Q -value needed to be decided and compared to the value of the degree of freedom ($df=n-1$) in the χ^2 table. If $Q < \chi^2$ ($p > .05$), effect size in different studies is thought to be the same, so the fixed effects model is used to put them all together. In the case that $Q > \chi^2$ ($p < .05$), the effect size is heterogeneous, and the random effects model is used instead. The researcher's needs in this study are better served by the random effects model. However, a heterogeneity test was conducted because the aim of this meta-analysis is to generalize the findings to a broader context, and a literature review was used to identify the original studies.

The studies used here can be broken down into distinct subgroups. Some of these studies reported on the cumulative impact of self-regulated learning on achievement, while others looked at the impact of self-regulated learning strategies in isolation, whether they be cognitive, metacognitive, mixed, or motivational. Because of this, the studies should be treated as wholes rather than as parts when doing analyses. Studies that reported solely the combined effect were disregarded. The common impact size was also compared among subgroups to see if there was a statistically significant difference between the various forms of self-regulated learning strategies. In addition, a categorical moderator analysis was used to see if there was a statistically significant difference in the effect size of self-regulated learning on learning outcomes across course type, school level, and learning setting. Under the random effects model, the significance level of the $Q_{between}$ value was used to assess the moderator's role. Publication bias and its implications were investigated using moderator analysis, a funnel plot, and the Egger's Regression Intercept test. Data analysis was performed using JASP.

Results

A total of 5519 participants sampled from the empirical research were included in this analysis. Table 1 provides summary statistics and study characteristics for all included studies in the meta-analysis.

Table 1

Substantive Features of the Included Studies

Study ID	APA Citation	Course type	Learning Context	SRL Strategies	N	School level	ES	SE
1	Song & Kim (2021)	Lag	OL	Me	56	Und	0.41	0.14
2	Ariel & Karpicke (2018)	SoSc	OL	Me	60	Und	0.87	0.13
3	He (2022)	Sc	OL	Mx	370	HS	0.80	0.05

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4	Anthony samy (2020)	Lag	BL	Mx	563	HS	0.15	0.04
5	Anthony samy (2021)	Sc	BL	Mx	563	Und	0.15	0.04
6	Khurshid (2020)	SoSc	OL	Mo	28	Und	0.34	0.20
7	Öz dal (2022)	Lag	OL	Mo	384	Und	0.20	0.05
8	Karacan (2022)	Lag	OL	Mo	112	Und	0.56	0.10
9	Hong (2021)	SoSc	OL	Mo	541	Und	0.77	0.04
10	Wan Yunus (2021)	SoSc	OL	Co	40	Prm	0.50	0.16
11	Boykin (2019)	Sc	OL	Mx	69	Prm	1.32	0.12
12	García Botero (2021)	Lag	OL	Mx	52	HS	0.84	0.14
13	Cai (2020)	SoSc	OL	Mx	2536	Sec	0.71	0.02
14	van Alten (2020)	SoSc	BL	Mx	115	Sec	0.51	0.09
15	Lai (2018)	Sc	OL	Mx	30	Prm	1.82	0.19

Table 1 shows 15 articles sampled for detailed analysis related to the type of subject, self-regulated learning strategies, school level, and learning context. The effect size obtained from all articles had an average of 0.66 and the standard error has an average of 0.098. These results will be analyzed again through Table 2.

Table 2

Subgroup Analysis

Grouping Factor	Subgroup	Frequency	Percentage
Course Type	Lag	5	33.3%
	SoSc	6	40%
	Sc	4	26.7%
Self-regulated Learning Strategies	Co	1	6.67%
	Me	2	13.3%
	Mx	8	53.3%
School Level	Mo	4	26.7%
	Prm	3	20%
	Sec	2	13.3%
	HS	3	20%
	Und	7	46.7%

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Learning Context	OL	12	80%
	BL	3	20%

Table 2 shows that out of all the fields of study, 33.3% (f=5) were devoted to linguistics, 40% (f=6) to the social sciences, and 26.7% (f=4) to the natural sciences. There was a significant difference between the types of strategies used for self-regulated learning: 6.67% (f=1) of the methods were cognitive, 13.3% (f=2) were metacognitive, 53.3% (f=8) were mixed, and 26.7% (f=4) were motivational. Twenty percent (f=3) took place in elementary schools, 13.3 percent (f=2) in junior highs, 20 percent (f=3) in high schools, 46.7 percent (f=7) in colleges and universities. Eighty percent (f=12) of the studies cited online learning as the context for learning, while twenty percent (f=3) cited blended learning.

The purpose of the moderator analysis was to consider any distinguishing factors between course type, self-regulated learning approach, and learning context on the impact of self-regulated learning on learning outcomes. Table 3 displays the outcomes of the moderator analysis.

Table 3

Moderator Analysis

Moderator Name	Heterogeneity			
	Qw	Qb	df	p
Course Type	257.12	173.87	2	1.75
Lag				
SoSc				
Sc				
Self-regulated Learning Strategies	427.9	3.098	3	0.21
Co				
Me				
Mx				
Mo				
School Level	303.36	161.69	3	7.90
Prm				
Sec				
HS				
Und				
Learning Context	196.60	234.39	1	6.55
OL				
BL				

Table 3 shows that no statistically significant variation exists in impact size across groups defined by course type, self-regulated approach, school level, and learning setting ($Qb < \chi^2; p > .05$). In other words, little difference is demonstrated between the language, social studies, and science classes where self-regulated learning happens. Neither cognitive, metacognitive, mixed, nor motivational strategies differentiate in students' ability to improve learning self-regulation. The average effect size of the research comparing online and

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blended learning in elementary, secondary, and university settings also indicates no statistically significant difference.

One of the best ways to summarize the findings of a meta-analysis is via a forest plot. This review includes 15 studies, and their combined meta-analysis results are displayed in the following forest plot:

Figure 3

Forest Plot of Meta-analysis Results

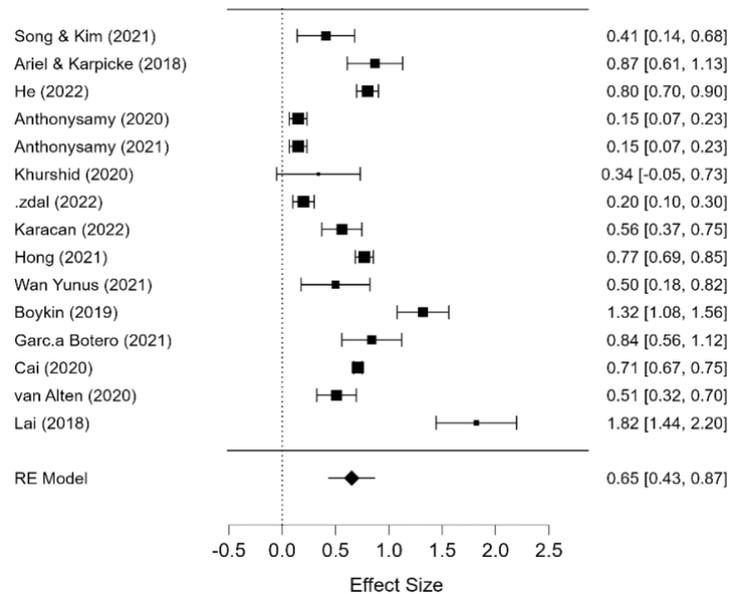


Figure 3 shows that a random effects model (RE Model) with a value of 0.65 was found. This means that self-regulated learning intervention studies affect learning results in online and blended environments by 65%, while other factors account for the remaining 35%. According to Cohen et al. (2013), five of these studies had a 'low' effect size, nine had a 'moderate' effect size, and seven had a 'large' effect size.

If the average effect of each study does not show substantial variation, this could be a sign of press bias. To do this, a moderator analysis was done. Using a random effects model, it was found that the effect of self-regulated learning on learning outcomes remains relatively consistent regardless of the author of the study. Additionally, a funnel plot can reveal bias in the reporting of results. If there is no publication bias, the effect sizes of the included studies will be symmetrically distributed around the average effect size in the funnel plot. In the presence of publication bias, the effect sizes will be concentrated towards the middle or the bottom of the plot. Figure 4 shows the study's funnel plot.

Figure 4

Funnel Plot of Publication Bias

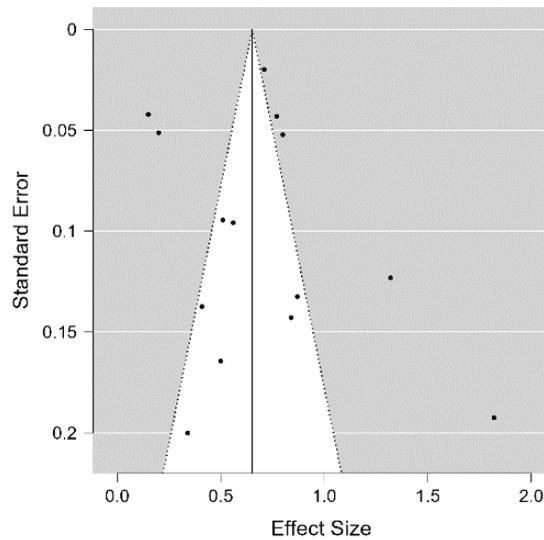


Figure 4 shows that direct funnel plots cannot be used to assess whether or not the funnel is symmetrical, highlighting the requirement for the results of Egger's Regression Intercept test. Egger's regression intercept test yielded a value of 0.691 for the intercept. These findings suggest that publication bias is unlikely to account for the observed consistency in impact size across studies.

Discussion

The results of this meta-analysis study show that most of the self-regulated learning seen from online learning has a percentage of 80%, and in the random effect model obtained 0.65, which means that the effect of self-regulated learning in intervening with students to improve learning outcomes is still at the "moderate" level ($Q = 0.65$). The results of heterogeneity show that self-regulated learning strategies have better results than course types, school levels, and learning contexts, meaning that the strategies of SRL are indeed very decisive for the results of learning outcomes obtained by students, so that the determination of these strategies is very influential in improving learning outcomes in learning.

The results are supported by Machmud & Ramadhan (2022) who conducted a meta-analysis on the effect of self-regulated learning practices on learning outcomes. Additionally, Panadero et al. (2017) found that the choice of self-regulated learning procedures has a significant impact on the effect size observed in enhancing learning outcomes. Although the effect is still considered moderate, SRL strategies can decide good results in improving learning outcomes that can be obtained by students, which further explains that the provision of online learning by considering SRL strategies understands the learning outcomes obtained by each student.

This meta-analysis provides new evidence that SRL strategies influence learning outcomes because many of the interventions use a combination of cognitive and metacognitive strategies, as well as cognitive and motivational and metacognitive with motivational components. This is supported by the fact that $Q_b = 3.098$ and $Q_w = 427.9$. These findings prove that SRL practices can have a positive effect on students' final grades.

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The resulting data does not show bias, meaning that the data analyzed is symmetrical and meets the adequacy criteria. Although the results show no significant difference in the between-group effect ($Qb < \chi^2; p > .05$), this indicates that improvements in learning outcomes may be influenced by factors other than SRL. However, among all the factors studied in relation to learning outcomes, SRL strategies proved to be the most influential. The use of SRL interventions with a well-integrated mix of metacognitive, cognitive, and motivational components had the greatest impact.

This study, revealing a moderate effect of self-regulated learning strategies on learning outcomes in online and blended environments with no significant differences based on various factors, forms a solid foundation for understanding the broad implications of such strategies. In contrast, Jansen's (2019) study suggests that while SRL interventions were effective, moderators failed to explain significant variance in effect sizes, indicating a need to delve deeper into the conditions influencing the efficacy of these strategies. Vaculíková's (2018) While this study provides a comprehensive overview, these other studies offer nuanced insights into specific interventions, contextual factors, and learner characteristics, collectively contributing to a more holistic understanding of optimizing SRL in diverse educational settings. Meanwhile, Theobald's (2021) findings highlight the relevance of course design characteristics and feedback, factors not explicitly explored in this study. The research of Dent and Koenka (2016) emphasizes the importance of considering specific factors such as process, academic subject, and grade level, offering additional dimensions for exploration. As a recommendation for further research, a comprehensive investigation into the role of moderators, an exploration of the challenges in explaining successful learning, and a focus on the impact of feedback and course design characteristics could enhance the understanding of self-regulated learning strategies in diverse educational settings. Integrating these insights could contribute to a more nuanced and comprehensive framework for the application of self-regulated learning strategies.

In the realm of self-regulated learning (SRL), this meta-analysis sheds light on the overall impact of SRL strategies in online and blended learning environments. It reveals a moderate effect on learning outcomes without significant variations based on strategy type, course format, school level, or learning context. In contrast, Rako et al.'s (2014) empirical research focuses on the application of prompts and learning analytics to support SRL in blended learning, anticipating differences in student engagement, formative assessment outcomes, and overall satisfaction. Sutarni's study (2021) highlights the role of SRL in optimizing the digital learning environment and fostering academic achievement. Vanslambrouck's findings (2019) emphasize the predictive nature of achievement motivation on SRL profiles, offering recommendations for educational practice. Broadbent & Fuller-Tyszkiewicz investigation (2018) identifies learner profiles associated with academic success, emphasizing the importance of addressing anxiety alongside high motivation and strategy adoption. While this study provides a comprehensive overview, these other studies offer nuanced insights into specific interventions, contextual factors, and learner characteristics, collectively contributing to a more holistic understanding of optimizing SRL in diverse educational settings.

This study's findings suggest that there is a considerable variation across SRL tactics, course types, learning contexts, and syllabi when it comes to the impact of SRL interventions on learning outcomes in online and mixed settings. These results highlight the need of giving students structured guidance on how to regulate their learning processes successfully through the provision of explicit teaching on SRL methods, which has been shown to have a favorable

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effect on learning outcomes. The study also shows that the impact of SRL interventions varies depending on the course format, with blended courses possibly providing more opportunity for face-to-face engagement and collaborative learning than entirely online courses. The success of SRL interventions may also depend on factors in the learning setting, such as the accessibility of supplementary materials and technical infrastructure. Finally, it was discovered that elementary, middle, and high school pupils respond differently to SRL interventions. These findings emphasize the necessity for individualized SRL interventions to maximize learning outcomes in online and mixed settings by considering specific SRL tactics, course types, learning contexts, and school levels.

Conclusions and Suggestions

In conclusion, the meta-analysis sheds light on the moderate yet consistent impact of SRL interventions on learning outcomes in online and blended environments. The findings emphasize the pivotal role of SRL strategies, surpassing the influence of course types, learning contexts, and school levels. The combination of cognitive, metacognitive, and motivational components in SRL interventions proves crucial for enhancing students' final grades. Despite the robustness of the study, several avenues for future research can be identified. A more profound exploration into moderators influence on the efficacy of SRL strategies is called for, considering variables like individual differences and technological affordances. Investigating challenges in explaining successful learning beyond SRL, including feedback mechanisms and course design characteristics, promises to enrich our understanding. Moreover, acknowledging the differential responses of students at various educational levels calls for tailored and individualized SRL interventions. Future research endeavors should embrace longitudinal studies to gauge the sustained impact of SRL interventions over time, providing insights into their durability and factors influencing longevity. This study lays a foundation for a nuanced framework, and future research should build upon these findings to refine our understanding and guide evidence-based practices in the evolving landscape of digital education.

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Skills Needed for Success in Online Teaching: A Qualitative Study of Experienced Instructors

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Abstract

Although opportunities for online learning in higher education have increased, variations in the quality of online teaching are likely. Instructors at some institutions might be new to online teaching and/or may lack the necessary supports for creating successful virtual learning environments. Therefore, the purpose of this qualitative study was to identify the most valuable skills faculty need to teach successfully online. Instructors (N = 33) with ten or more years of online teaching experience at a highly ranked institution for online education were interviewed about their online teaching experiences. Participants' responses to the question, "*What skills do you think are most valuable for online instructors to have?*" were analyzed using a grounded-theory approach with six major themes emerging. These themes are discussed within existing frameworks that have shaped the conceptualization of online teaching skills, including the Community of Inquiry framework (COI), the faculty readiness framework, and the Technology Acceptance Model.

Keywords: Online instructors, skills for online teaching, qualitative study

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After over two decades of development, online education is now a viable pathway for many learners to access higher education. Since its inception, demand for online programs has increased (Seaman et al., 2018), due in part to changes in learner demographics, market demands, and a growing need to close equity gaps in access to degree and certificate programs (Allen et al., 2016; Phan & Dang, 2017; Schmidt, et al., 2013). The onset of the COVID-19 pandemic has only accelerated this trend (Cutri & Mena, 2021), forcibly moving the global goal posts for increased access to higher education online.

With the sharp pivot to remote instruction during the COVID-19 pandemic, opportunities for online learning continue to evolve. However, there is a variation in quality of online programs, courses, and instruction due in part to faculty preparation. The degree of faculty training for both designing and teaching online differs between institutions (Morh & Sheldon, 2017), which may impact the quality of online instruction. In addition, instructors at some institutions lack access to instructional designers, and instead can only rely on peers who may also have limited experience as to how to improve the quality of their online courses (Jaschik & Lederman, 2019). As online programs grow, there is a sustained need for skilled instructors who can deliver high quality online courses to an increasing number of online students. Therefore, it is important to assess *what skills are needed to successfully teach courses online*.

The purpose of this qualitative study was to identify the most valuable skills faculty need to teach successfully online. Instructors with ten or more years of online teaching experience at a highly ranked institution for online education were interviewed about their online teaching experiences. Participants' responses to the question, "*What skills do you think are most valuable for online instructors to have?*" were analyzed with six major themes emerging from our analysis. The following literature review focuses on the frameworks that have helped shape research in the field of online teaching and have influenced the conceptualization of the skills that are needed for success in online teaching. These include the community of inquiry framework (CoI), the faculty readiness framework, the technology acceptance framework.

Community of Inquiry

The Community of Inquiry framework (CoI) is a well-known and widely used framework for identifying the social and cognitive conditions that are needed for successful online teaching and learning (Garrison et al., 2010). Developed over two decades ago (Garrison et al., 2000), this framework consists of three overlapping elements that shape the online learning environment: social, cognitive and teaching presence (Garrison et al., 2010). Social presence refers to the ways in which social interaction creates a sense of shared community and belonging in these spaces (Garrison et al., 2010). This includes the capacity for students to experience a shared sense of identity with others, as well as opportunities to develop relationships with their peers and their instructors online (Garrison et al., 2010).

Cognitive presence is related to social presence in the sense that critical aspects of learning—such as exploration, reflection, integration, and resolution—are contingent upon “an iterative relationship between personal and shared worlds” (p. 25; Kanuka & Garrison, 2004; Garrison et al., 2010). Cognitive presence is therefore contingent upon opportunities for social and intellectual discourse in digital learning spaces (Kanuka & Garrison, 2004).

Research by Galikyan and Admiraal (2019) highlights the important connection between cognitive and social presence, revealing that engagement in online discussion boards can promote both content integration and resolution, which in turn predicts students' academic performance.

According to Anderson et al., (2001), teaching presence is a key element that facilitates both social and cognitive presence, as well as the interaction between the two. Teaching presence is conceptualized as the three major roles an instructor takes on throughout a given course: 1) a course designer who develops and organizes a virtual learning experience that enables students to engage and interact with the material and with each other; 2) a discussion facilitator who conducts and moderates social and intellectual discourse online; and 3) an instructor who engages directly in delivering content in which they are experts (Anderson et al., 2001; Caskurlu, et al., 2018).

A recent meta-analysis conducted by Caskurlu and colleagues (2018) indicates that teaching presence is associated with positive student perceptions of online learning across a range of studies. In this meta-analysis, teaching presence was positively related to students' perceptions of their learning and course satisfaction, particularly among undergraduate students enrolled in longer term online courses (e.g., one full academic term). Of the three subcomponents of teaching presence, both instructional design and facilitation of discourse online were positively associated with perceptions of learning and course satisfaction. Direct instruction was also positively associated with perceived learning and course satisfaction, but to a lesser degree than both instructional design and facilitation of discourse. Taken together, results from this meta-analysis suggest that specific skills associated with teaching presence—namely course development skills and communications skills—are strongly associated with the students' perceptions of their online learning experiences.

Faculty Readiness for Online Teaching

The body of research summarized in the Caskurlu and colleagues' 2018 meta-analysis underscores the importance of faculty preparation for online teaching. In order to implement teaching presence that acts as a conduit for students' social and cognitive presence, faculty must be both well prepared and "ready" to teach online (Phan & Dang, 2017). "Faculty readiness" for online teaching is both conceptualized and operationalized in the literature in different ways (see Phan & Dang, 2017; Cutri & Mena, 2020, for reviews), but often includes a combination of perceptual, attitudinal, and skill-based factors, as well as a number of support systems (e.g., faculty support, technology support).

Typically, faculty readiness to teach online is assessed via self-report survey measures consisting of different subscales that make up the perceptions, skills, and support systems needed for successful online teaching. For example, Palloff and Pratt (2011) developed the "Assessment of Faculty Readiness to Teach Online" scale, which measures perceptions of competencies in technical skills and time management skills, as well as both past experience and attitudes towards online learning (as cited in Chi, 2015). Based in part on the scale developed by Palloff and Pratt (2011), Chi (2015) developed a Readiness to Teach Online scale (RTTO) that further measured course design competencies and support systems, such as course development, student assessments, and technology support for faculty. In a recent study by Martin and colleagues (2019c), faculty readiness for online teaching was measured in both German and American instructors via a newly developed Faculty Readiness to Teach

Online (FRTO) scale. This skill-based measure focused specifically on instructors' technical skills (e.g., basic technical skills, experience using learning management systems), course design skills, time management skills, and communication skills.

The combination of these measures suggests that faculty readiness to teach online is multifaceted (Scherer et al. 2021), requiring a diverse skillset including (but not limited to) technical skills, course design skills, communication skills, and time management skills. However, in the review by Cutri and Mena (2020), the authors argue that beyond a “checklist of competencies” (pp. 363), variations in faculty members' professional vulnerability should guide the conceptualization and evaluation of readiness to teach online. Using Kelchterman's (2009) professional vulnerability model as a theoretical framework, Cutri and Mena (2020) analyzed 44 peer-reviewed articles by applying unique concept maps for each. These initial concept maps were integrated into a single concept map using a qualitative coding scheme based on the Kelchterman's (2009) framework. The integrated concept map yielded three main themes in faculty readiness through the lens of professional vulnerability: affective considerations (e.g., risk taking, identity disruption); pedagogical considerations (e.g., sharing power with students, communicating personality online); and organizational considerations (e.g., planning vs. spontaneity). The results of this review suggest that basic skills, such as a good communication skills and organizational skills, are formative but not summative measures of excellence in online teaching. Quality online instruction may require skills such as: 1) conversational skills that include the ability to communicate in a personable manner with students online; 2) course design skills, including the ability to innovate and take risks in course development; and 3) creativity skills and technology skills, such as the integration of course content with new technological interfaces.

The Technology Acceptance Framework

The ability to use technological interfaces creatively in digital classrooms depends in part on a range of basic technology skills, as well as a willingness to accept, use, and master new applications as they become available. This willingness has been conceptualized in the literature via the “Technology Acceptance Model” (TAM, TAM2), first developed by Davis in 1998 and later updated by Venkatesh & Davis (2000). This theoretical framework broadly articulates the conditions under which people will accept, use, and develop expertise in a particular user interface, such as “relevance to a particular job,” “perceived usefulness,” and “perceived ease of use” (Venkatesh & Davis, 2000). The TAM2 model can also be applied to faculty readiness to teach online, as findings from previous research on faculty perceptions of online teaching overlap with this theoretical framework (Wingo et al. 2017). For instance, in the RTTO scale developed by Chi (2015), faculty perceptions of their comfort with technology, their openness to using new technologies for teaching, and their willingness to learn work technologies is assessed.

To formally demonstrate the application of the TAM2 model (Venkatesh & Davis, 2000) to faculty perceptions of online teaching, Wingo et al. (2017) conducted a systematic review, searching for empirical articles testing various aspects of the TAM2 model with online instructors. Results yielded 67 articles published between 1995 and 2015, which were coded into TAM2 constructs. For instance, some articles were coded as “job relevance,” with findings supporting a desire for faculty members to connect well with students online, and to believe that their students were achieving desired learning outcomes in their online courses.

Other articles were coded as “perceived ease of use,” with findings across studies indicating that confidence in technical skills was associated with positive attitudes towards online teaching, and that skilled online instructors still valued opportunities to continue honing their technical skills.

Another example of the applicability of the TAM2 framework (Venkatesh & Davis, 2000) to faculty perceptions of online teaching comes from a recent study by Saunders et al. (2020). This study assessed faculty perceptions of transitioning a set of graduate level STEM courses into an online program. In a qualitative analysis based on in-depth interviews, “technology” emerged as a major theme. Faculty members expressed enthusiasm for the transition to an online program, as it would be opportunity to hone a new set of skills and to elevate their institution’s reputation on a global stage. They also communicated a need for IT support to ensure that they were “not alone” (pp. 692) and to allow for the maintenance of academic quality. Along with the review by Wingo and colleagues (2017), these findings align with TAM2 model and highlight instructor characteristics, support systems, and technical skills that are necessary for success in online teaching: an openness, interest in, and ability to learn new interfaces; the ability to troubleshoot technical problems as they arise; and finally, adaptively honing skills over time as the technological landscape shifts.

The Current Study

The COI, Faculty Readiness, and TAM2 frameworks provide distinct and overlapping features that have shaped research on faculty perceptions of and readiness to teach online. Research findings within these three frameworks indicate that skills required for success in online teaching are multifaceted (Scherer et al., 2021), and require continued development over time (Saunders et al., 2020; Wingo et al., 2017). These skills include but are not limited to communication skills, course design skills, time management skills, and technology skills (e.g., Martin et al., 2019b; Wingo et al., 2017). However, the skills identified by studies within each of these larger frameworks were typically conducted with faculty who vary in their familiarity and expertise with online teaching. For example, in the faculty readiness study conducted by Martin and colleagues (2019c), their US and German samples consisted primarily of faculty members who were not required to participate in online instructor training and who had been teaching online for ten or fewer years.

According to Martin and colleagues (2019a), seasoned experts are an untapped source of information offering valuable insights on best practices, standards, and competencies (Martin et al., 2019a, p. 34) for excellence in online teaching. Few studies have examined perspectives on online teaching skills from experienced online educators. Previous studies have focused on narrow skill sets such as course design skills (Martin et al., 2019a), or the challenges and opportunities of online teaching more broadly (Mansbach & Austin, 2018). Previous study instruments designed to measure faculty readiness to teach online do not focus on faculty perceptions of their own skills or the skills needed for success in online teaching (see Martin et al., 2019c).

This study adds to the literature by tapping an under-utilized source: seasoned instructors with 10 years or more of online teaching experience at a highly ranked institution for online education. These experienced instructors participated in interviews focusing on a range of online teaching experiences. This study provides a qualitative analysis of their perceptions of what skills they think are most valuable for online instructors.

Method

This study was part of a larger qualitative project that explored the experiences of online instructors in higher education. The current study focuses on 33 instructors who had taught online for 10 or more years and reports on responses to the following question: “What skills do you think are most valuable for online instructors to have?”

Data Collection

This research was conducted by a highly ranked online learning division of a public research university in the United States. The Director and the Assistant Director of the online learning research unit completed the participant interviews, as well as the project’s conceptualization. A Postdoctoral Scholar was hired shortly after data collection for this phase, and these three employees worked together on this study’s conceptualization and analysis. All three of these researchers have PhDs in content areas related to higher education, and have experience teaching college-level coursework. Therefore, all of the study participants were interviewed by interviewers with familiarity in both higher education and pedagogy. This study used a structured interview format in which we attempted to reduce interviewer bias. Thus, participant responses were more likely to vary based on their own experience rather than the experience of the interviewer.

Upon approval from the Institutional Review Board (IRB), convenience sample recruitment began with a list of approximately 130 instructors who had taught in the university’s online division for 10 years or more. Recruitment included up to three emails to these instructors that contained a link to an anonymous Qualtrics pre-survey that assessed demographic information, online teaching experiences, and interest in participating in three interviews with a member of the research team. At the end of the survey, participants were redirected from the Qualtrics survey to Acuity Scheduling (2006), an online scheduling software that allowed them to sign up for interviews.

Interview protocols were determined prior to data collection. All interviews were conducted over Zoom, and took place in the 2018-2019 academic year. Each participant completed three hour-long interview sessions with a member of our research team. Most participants completed all three of their interviews with the same research team member in order to build rapport and create a consistent participant experience. In a few cases this was not feasible due to challenges with scheduling. Once the interviews were complete, audio files were transcribed for data analysis. Participants received a \$300 gift cards for their participation. The question analyzed for the current study was included during the first interview ($M = 38.44$ minutes, $SD = 12.23$ minutes).

Participants

Participant descriptive data were collected with the online pre-survey administered in Qualtrics (2002). Since pre-survey data were collected anonymously, the results have been reported in aggregate only. Thirty-nine participants completed the pre-survey, and 33 of these respondents (85%) completed the interviews. Participants reported teaching online at the institution from 10 to 31 years, ($M = 14$ years, $SD = 4.6$). Demographics of the pre-survey respondents are shown in Table 1. Just over half of the participants identified as female and most participants reported full-time employment. The largest percentage of participants were 55 – 64-years-old and the majority reported their highest education at the doctoral level. Nine

reported they held tenure track positions, and 12 had achieved tenure at their current institution. In the academic year prior to the interview, the participants reported teaching an average of 4.6 online courses ($SD = 4.5$). Participants were recruited from a range of disciplines, and therefore represented diverse experiences teaching online in a variety of content areas (e.g., Chemistry, Computer Science, Education, Food Science and Home Economics, Fisheries and Wildlife, Philosophy, Public Health, and Sociology).

Table 1

Demographic Data Based on Pre-Survey Responses (N=39)

Demographics	f (%)
Gender	
Female	19 (59%)
Male	14 (41%)
Employment status	
Full-time	22 (67%)
Part-time or other	11 (33%)
Age range	
34-44%	7 (18%)
45-54%	5 (13%)
55-64%	17 (45%)
65+	9 (24%)
Highest Level of Education	
Doctoral	33 (85%)
Master's or other	6 (15%)
Position	
Tenure-track	9 (23%)
Non-tenure track	30 (77%)

Data Analysis

The authors used a post-positivist, grounded theory approach to qualitative data by conducting a thematic analysis involving an inductive process in which researchers identify patterns emerging from the participant responses (Strauss & Corbin, 2015; Tracy 2020). The team decided to use numeric addition as suggested by Sandelowski (2001) rather than verbal counting to avoid misrepresenting the frequency of the codes by using terms such as “several,” “most,” or “few.”

Each member of the research team completed a round of pre-coding where they read through all of the responses to the question and noted potential ideas and themes. Then, the team met to discuss ideas and potential coding strategies and decided on a combination of “In Vivo coding,” (Saldaña, 2016; p. 105), “holistic coding” (Saldaña, 2016; p. 166), and “concept coding” (Saldaña, 2016; p. 119) to identify themes in the data. These coding

methodologies were selected because In Vivo coding allowed us to identify themes using participants’ language, while both holistic coding and concept coding allowed us to interpret the data by reading larger passages, as opposed to line by line, in order to gauge meanings and the “bigger picture” behind participant responses.

One author completed the first round of coding and developed a codebook that provided a code name, description, inclusion criteria, and an example passage for each code (see Table 2). The transcribed interviews were then double-coded independently by a second research team member using the codebook developed by the other author. Coding results were compared and disagreements were resolved by discussion.

Table 2

Codebook Coding Themes

Code	Description	Inclusion Criteria
Communication	The importance of communication, modes of communication, and communication strategies in their role as an online instructor.	Includes Canvas, email, announcements, 1-to1 contact; communicating in writing including written feedback; includes clarity of written documents; includes personalized communication
Organization	The importance of and strategies for managing time interacting with and responding to students as an online instructor.	Includes managing time spent interacting with students, responding to emails, discussion boards
Time management	The importance of and strategies or techniques used to maintain organization in their daily work and in the importance of organization within the online course.	Include strategies and tools used to keep the instructor organized; the organization/structure of course content; objectives for the course
Technology skills	The importance of skills related to technology: searching for, learning, and using technologies for online teaching; and being able to instruct students on how to use technologies for the course.	Includes software, LMS; keeping up with technological changes
Flexibility	The importance of being flexible in teaching practices, changing the course design or class materials, and being flexible with the needs of online students.	Includes being patient, understanding and flexible with students; empathy for students and their situations; includes being flexible to make changes because something isn’t working for students
Creativity	The importance of creativity in the use of course materials, technology, pedagogy; experimentation; and exploring new ideas about teaching.	Includes experimentation with new ideas, technologies; being open to exploring what others are doing and incorporating it into their courses

Results

Participants’ responses to the question, “*What skills do you think are most valuable for online instructors to have?*” were coded into six broad themes: communication, organization, time management, technology skills, flexibility, and creativity. Table 3 shows the frequency with which participants mentioned each theme at least once, as well as the total number of incidents in which each theme was mentioned across participants.

Table 3

Frequency and Incidents of Codebook Themes

Codebook Theme	Frequency (%)	Total incidents*
Communication	28 (85%)	43
Written	16	
Responsiveness	8	
Tone/Voice	6	
Organization	15 (45%)	21
Time management	15 (45%)	18
Technology Skills	11 (33%)	13
Flexibility	10 (30%)	10
Creativity	3 (9%)	4

* Total number of times theme was reported across participants

Communication

Long-term instructors overwhelmingly discussed valuable skills related to communication (43 total instances; 85% of participants reporting at least once). Communication skills fell into three sub-codes: effective written communication, responsiveness, and tone or voice.

Written communication. Written communication was mentioned most frequently by participants within the broader theme of communication skills (16 instances). These instructors emphasized how important effective written communication was for online teaching, particularly when they have little in-person interaction. One of the instructors stated:

And also [written documents] have to be detailed, because since you don’t see the students face-to-face, then they should be as detailed as possible. Otherwise, every time you’ll get question: What do you mean by that? What is this? What should I do? (#9)

Specifically, instructors described this set of skills as being clear, coherent, detailed, careful, and thoughtful in their communications, as described by these instructors:

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Well, I think one skill is to be able to write succinctly and coherently. You're giving a lot of instructions. They're in writing, and if people are in different places and different times... [you] really need to have those written so that they're understandable. (#23)

...your writing skills are really, really apparent to your students and your editing and proofreading because, [if] you make a mistake or spell a word wrong they're going to find it. Because that's how you're communicating with them. (#1)

It's just, written communication, I do think that I see instructors, not just with [online] but on campus as well, use writing in ways, they're just inattentive to what kind of impression they give off by the way they communicate. I think instructors should be very alert to how their writing does communicate. (#6)

The following participant further discussed the importance of written communication in several aspects of online teaching including content, discussions, and providing feedback.

I think what's important in online instruction is being able to critically evaluate information and give it to the students, but also extract what's important in their responses. So being able to analyze and synthesize a lot of information that's going on in the classroom. Being a good communicator. I think that's also important to be able to... communicate well, and timely, and clearly. That's also important. I believe that also having this ability of... sustaining the interest of the students. So being able to interact to whatever extent it's possible with them. Whether in comments, or in discussions, or in grading their work, in whatever way. But I think communication and this sort of... analytical, synthetic skills are very important. (#20)

Responsiveness

The second most frequently mentioned communication skill by instructors was responsiveness (8 instances). For example, one participant said, "...just like traditional instructors, it's being really responsive to students and dedicated to them." Instructors emphasized the importance of responding in a timely manner and having frequent communication with students, as shown in these quotes:

Communication. It's hugely important. And timeliness, getting back to students is really important. (#32)

They need to be able to spend a lot of time communicating with students via electronic means they have... They have to be willing to sit and do a lot of that. You will be doing a lot of online interaction and they have to be willing to do that. (#16)

Yeah, communication. Make sure it's frequent. I try to do that a lot, and it's hard because sometimes I'll get students... you know, each class is unique, and within each class, you're going to have a wide variety of responses. Sometimes the students are going to respond very quickly, some of them not so much. Some of them very little, and you have to be ready for that, that varied response over time. (#19)

Tone or voice. Finally, instructors emphasized the importance of *how* they communicated. One instructor stated:

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Being thoughtful about when and how you respond. I believe that one of the ways that I connect well to my students is I have no mechanical, no “always way” of doing something, so that they know that I’m engaged with them personally when needed. That it’s not by rote, and on an online environment I think it’s easy to not see the people you’re interacting with, but if there’s a variety then students are more likely to see that you’re engaged with them, and then more likely to do their best. (#17)

Several instructors (6 instances) mentioned that the tone and/or voice of their communication with students was important, such as the importance of personal and conversational communication as demonstrated by the following:

You have to strike a tone right where you are sort of an expert and you’re providing an extra layer of content through your lectures, but they’re also there has to be some sort of a little bit less of a formality. So, it’s almost conversational is what I figured out works best.... and not sounding so much as an academic writer, but someone that’s in conversation with them about these things. (#3)

Ability to be fully present...not only intellectually, but also emotionally. Because sometimes students are seeing us on the other side of the screen as a blank slate for their fears and projections of their most scary professor figure. And I know that if we do not insert a warm and caring tone in our email consciously, it will not come through. What we would consider neutral, may not be neutral. What we consider neutral, may become that blackboard for projections. So, somebody who is able to insert that tone of firm requirements, and rigor, yet understanding and being understanding, warm, and present at the same time. That is a skill that can be very important. (#34)

Organization

Organizational skills were second most frequently discussed valuable skill by the long-term instructors (21 total instances; 45% of participants reporting at least once). Most of these responses emphasized the importance of organization within the structure of online courses. For example, one instructor stated:

Well, the organization, when you develop an online class, you develop the entire course, build it, put it out there, which takes a lot of organization of seeing a class from beginning to ending. (#21)

Many of the instructors talked about the importance of organization as a skill when designing online courses as well as teaching them. There was some overlap with communication skills, such as the need to be organized with learning objectives and modules set up in ways that communicated the course material with online students. One instructor said:

So, I’d say you have to be really organized. You have to think about your material in terms of nuggets, or modules, or packages of material. I think that’s just a general kind of skill, you need to be very organized, which I think is easier for some than others. So that’s a skill. (#27)

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Of the instructors who discussed organization as a skill, most were focused on the importance of course organization: organizing material in the online course so it was self-explanatory, clear and understandable. One instructor stated:

I always put designing and teaching together and I know they don't always go together but that you need to be able to see it from the student perspective. I'm constantly surprised by how students, I'll sort of arrange things a certain way and students won't be able to find it or use it the way I thought it would be. It just seems really self-evident from my side, so I just go ahead and take their word for it..." (#12)

A smaller group of instructors talked about organizational skills from the perspective of their own work process (instructor organization). One instructor discussed using organizational strategies such as to-do lists and reminders set to certain weeks of the course. Another instructor emphasized the importance of personal organization:

It's both about keeping yourself organized in such a way that assignments are released on time that you're doing your grading or feedback giving on time that even if you set things up to happen automatically by a Canvas or whatever delivery system you're using that you're still on top of it. (#3)

Finally, one instructor suggested that online instructors need to "...figure out an organization so that it doesn't take over their lives..." (#16). This comment referenced the need for boundaries around time spent on tasks related to online teaching, which is further discussed in the next most valuable skill, time management.

Time Management

The third most frequently discussed skills by the long-term instructors were time management skills (18 total instances; 45% of participants reporting at least once). Overall, long term instructors discussed the challenges associated with time management that are unique to online teaching and learning. For example, one instructor mentioned that "...it gets really easy to forget that you have these things to do online whether you're an instructor or a student" (#3). Another instructor stressed the importance of self-motivation and self-reliance for effectively managing time in online classes—for both instructors and students alike:

Probably the same skills that students have and that is be able to be self-motivated and do it yourself. When you have an on-campus class, there's a lecture three times a week or whatever, you show up, you do it. When you're online, you can let things slip and that's fatal for students, and it's fatal for professors. (#25)

Instructors further discussed the importance of managing their time interacting with and responding to their online students, such as managing time spent responding to student emails and online discussion boards. Similar to the responsiveness sub-theme of communication, several of the instructors indicated the importance of responding to students in a timely manner, which some alluded to being more challenging in online teaching:

Being responsive in a timely manner. And I will admit that sometimes I still struggle with that, because the students aren't in front of me, so there's less accountability. And so being able to make sure that I am responding in a timely way is, has really become more of a priority for me. It might not have been as much before, but I think it really matters. And I didn't put as much emphasis in carving out that time, to make

sure that every day I'd have a little bit of time to just, to devote to any kind of communication means for the online students. (#32)

...but being available to respond to students because students post a question or an issue, and it seems to me if the instructor isn't around for three weeks or something, that's going to be pretty frustrating, and three weeks is probably beyond, but even several days, it's too much. There needs to be a more immediate kind of response. (#23)

Again, I think being prompt is important. When you send me an email, I don't look at my email. It's not on my phone. When I sit at the computer I get it but the minute I read it, I will get back to you. I'm not gonna let your email sit for three days. It's like raising your hand in class. It's just it may take me an hour if I'm teaching a class, I can't be on the computer. So, I think that being straightforward and honest and making your expectations known. (#15)

Several of the instructors discussed time management and timely responses in relationship to boundaries around their availability to online students. For example, one long-term instructor mentioned that without boundaries, "You could easily get sucked into checking in on your course and doing stuff twenty-four hours a day. That's just not healthy." Others mentioned 24-hour cycles, and challenges to staying responsive to students within a 24-hour day, as described by these instructors:

I think, keeping up on, you know, the timeliness of this is very important. I try to get back with emails, you know, in 24, within a day if I can. And then, I try to get assignments within three or four days. That seems to keep the students at distance happier. (#13)

... you've got to be ready to be accessible nearly 24/7. That's a little - maybe not quite that much, but you know, I work a lot of nights because that's when questions come up and when you have 50 students and there's a weekly assignment - each one wants to post something, you know 2 or 3 posts - that's 150 posts to go through. That's a lot. (#22)

A few instructors discussed strategies they use to manage their time interacting with and responding to online students while maintaining presence, as described by the following instructors:

...time management is another way to show...I can be there I can be present but I don't have to spend...an hour finding some additional resource and you know creating it for the students write some of it. I've just like copied from what I've said before and I threw it into my to-do list. (#2)

I think one of the skills is being present. Different people get there in different ways, maybe they organized themselves whilst they are in the class many times, and they structure their time so they are, but just being present. So, if it's in the discussion board or creating a weekly, or biweekly announcement so it looks like you are there often. That's a skill. (#24)

Technology Skills

The fourth most frequently discussed skill by the long-term instructors were technology skills (13 total instances; 33% of participants reporting at least once). Most of these instructors emphasized that it was important for online instructors to have a certain comfort level or familiarity with online course tools such as the Learning Management System (LMS). One instructor pointed out that some faculty might not necessarily have these technology skills if they were only teaching “on ground,” while another mentioned that there might be a learning curve associated with the development of new technology skills:

If the technology skills aren't there, you will certainly spend some time learning them. We're not all familiar with a particular tool or toolbox, so that's going to be a bit of a learning curve. (#29)

A few instructors emphasized the importance of developing technological skills so that they could instruct their online students in the use of those tools, as illustrated in the following statements:

My students would need to video themselves doing different activities and edit those videos and condense those videos and send those videos. So, I would have to teach them how to do that. I'd have to develop skills in doing that. (#21)

I would say being able to guide students through technical difficulties. I mean I'm teaching technical material but that seems to be where most of the communications are. How do I use Canvas effectively? A student coming in for the first time, never using Canvas, they don't know where anything is. They're overwhelmed and there's too many menus, too many places they could communicate with me, too many places they could look at their grades or their comments. (#28)

Finally, acknowledging the changing environment of educational technology, one instructor mentioned that faculty should “...not mind searching for a new technology and changing things around, with the way new technology changes (#33).” Another mentioned the need to accept learning technologies and learn how to use them effectively, saying “...you just have to embrace that [learning technology] and use it effectively. Use it efficiently, use it effectively (#18).” These quotes further stress the importance of flexibility, the next valuable skill mentioned by long-term instructors.

Flexibility

The fifth most frequently discussed skills by the long-term instructors were skills related to flexibility (10 total instances; 30% of participants reporting at least once). Instructors discussed the importance of being flexible in teaching practices, flexible in changing the course design or class materials, and being flexible with the needs of online students. When discussing the importance of flexibility, a few of the instructors expressed the need for empathy and understanding of the needs of their online students:

So, maybe because it's distance ed, a little more; you can't hold hands, but a little more encouragement because there's so much going on in folks' lives and online, most of it's not parties, it's other stuff, bigger stuff that... you don't want to change the curriculum to make it easier for them to stay in the course; but your relationship with them should make it easier to stay in the course. (#33)

...general understanding, flexibility, being able to move. I would characterize myself as a little bit more flexible for students, particularly around the end of the school year or the end of the term because that's when they all... you know, as we all know, they tend to overschedule themselves, and they tend to procrastinate, wait 'til the end of the term to turn in their assignments and so on. So, there's a little bit of understanding and a little bit of empathy to try to understand where they're coming from and to have some flexibility. (#19)

And along with that then there's got to be a real capacity to be flexible. I think that holding online students to the same kind of rigidity of what we often expect of our on-campus students is unwise and unkind. Finding out how to do that, in a way that still has integrity, you still got to have deadlines and there still needs to be incentives for being on time and that sort of thing. But at the same time to recognize that the kinds of obstacles people are overcoming are quite real and that not every student who asks for a little special help or accommodation is trying to fool you, or take advantage of you. There might be some, but I've just concluded that I'd rather be fooled a few times and not be a jerk. I think some of those sorts of things that border on, not just skills, but really almost character qualities that I think are important for being able to interact well with this population of our student[s]. (#6)

A few of the of the instructors who discussed flexibility emphasized having patience and understanding specifically for their online students, as shown in these examples:

I mean you definitely have to have some patience and sympathy and understanding of students who, for whom this is not an easy thing to do. Both the subject matter and dealing with the technology. (#4)

Patience. I know that in my case, I teach a 400 course, it's kind of a senior assessment writing course, and that people I deal with, as I said, many of them are older than average students, or at a distance. I tell them right up front, I understand that you have a life and that life gets in the way sometimes and if you need extra time, simply ask me for it. I'm more than happy to do that, the crunch on how much time you have to hand in a second copy or for me to grade them, but we can work around those things. I think that's important. (#15)

Finally, three of these instructors discussed the importance of being flexible in terms of making changes to their online courses for the benefit of students or based on student feedback:

Well, I think this is not unique to online, but flexibility, because I would put so much work into developing this class and then a student might say, "This just doesn't work." And so, I would have to go back and change a lot of it. (#21)

The first thing we actually learned when we did this class is that where in-person, everything is almost day-by-day, certainly week-by-week, and that did not work for the traditional chemistry distance student. They needed more flexibility in deadlines. We ended up taking the course and putting it into two chunks. That worked much better for the true distance student coming back for whatever reason to take General Chemistry. (#5)

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So being open to feedback and changing once you receive it. Being flexible, things change all the time, and it goes toward communication, but tools change, and students change, and curriculum should somewhat change. (#24)

Creativity

The final valuable skill discussed by a small number of the long-term instructors was creativity (4 total instances; 9% of participants reporting at least once). These instructors discussed the importance of creativity in the use of course materials, technology, and pedagogy, and experimenting and exploring new ideas about teaching:

I think it's a lot of imagination and really, it ...wasn't so much the skills as just the willingness to explore, see what other people are doing in classes. Think about how can I incorporate that into my work. (#4)

I think also being open to new ideas of how to teach. At least, I couldn't directly take what I do in the class and translate that into the same sort of thing in a distance course. You had to look at things differently. (#5)

Just having an imagination on different ways of trying things through the use of the Internet. I do lots, experiment with lots of things, and we have Ph.D. students that also teach online. And, we meet every quarter, and they're actually very experimental. In fact, a lot of the new things that I'm doing are coming from the students. (#13)

Discussion

The purpose of this study was to garner the most valuable skills needed for success in online teaching from experienced faculty who had taught online for 10 years or more. Results from our qualitative analysis yielded six major themes that emerged from structured interviews with 33 faculty members at a highly ranked online institution. These themes included: 1) communication skills; 2) organizational skills; 3) time management skills; 4) technology skills; 5) flexibility; and 6) creativity. Overall, our findings align with the view that faculty preparedness to teach online is multi-dimensional (Scherer et al., 2021), requiring a range of skills that should continue to develop over time as the online education landscape shifts.

Support for Current Frameworks

Our findings lend further support to existing frameworks within online teaching, namely the Community of Inquiry framework (COI; Garrison et al., 2000), the faculty readiness framework (see Cutri & Mena, 2020), and the Technology Acceptance Model (Venkatesh & Davis, 2000). For instance, many of the themes and subthemes emerging from experienced online faculty highlight what the COI framework describes as "teaching presence." Within the theme of communication, experienced instructors described how the clarity, responsiveness, and tone of their communication supported not only students' learning, but the sense that their instructors were "fully present." In addition, within the time management theme, experienced instructors' emphasized ways in which these skills help foster "teaching presence"; instructors explicitly stated "being present" or "available" to students in their description of time management skills. They further described the balance between responding in a timely manner with setting necessary boundaries to foster students' sense that they were human. Using communication and time management skills as a means to

build “teaching presence” might help students feel connected to the instructor, engaged with the material, and willing to play an active role in intellectual discourse—a critical first step in “humanizing” the learning experience online (see Mehta & Aguilera, 2020 for a review).

Several themes emerging from our analysis further overlapped with measures of faculty readiness for online learning, chiefly organizational skills and technology skills. In describing organizational skills, faculty responses largely focused on organization within the context of course design, such as envisioning the whole course from “*beginning to end*,” or how course content should be nested within modules as “*packages of material*.” Current measures of faculty readiness to teach online include course design skills, with the ability to organize course content into modules as one specific focus. For instance, in a measure developed by Martin and colleagues (2019b), the subscale assessing instructors’ course design skills includes an item evaluating the ability to “organize instructional materials into modules or units” (pp. 107). Moreover, award-winning online instructors have explicitly discussed organizational approaches to course design—including organization based on learning modules—as elements of successful online courses (see Martin et al., 2019a). The results of this analysis lend further support to the ways in which course design skills are considered valuable in successful online teaching. As higher education evolves online, instructional designers will continue to play a critical role in supporting online instructors in the development of these skills.

Experienced online instructors also emphasized the importance of technology skills, which is consistently found in measures of readiness to teach online (e.g., Chi 2015; Martin et al., 2019b). In these measures, assessment of technology skills often focuses on competencies in performing specific tasks, such as using a course roster to create teams in a learning management system (see Martin et al., 2019b). However, faculty responses within this theme align more closely with the TAM2 model (Venkatesh & Davis, 2000). In the TAM2 model, technology acceptance and use are predicated in part on the extent to which a new technology is perceived as relevant to a job, as well as the degree to which people have previous experience and a willingness to engage with new technologies. Instructors in this study described ways in which knowledge of technology is “relevant to the job” of teaching online, including the ways in which these skills can help support students with technological challenges in the virtual classroom. Instructors further emphasized acceptance of digital interfaces as a pathway for success in online teaching, and the importance of learning new applications to improve the virtual learning environment. Together, results of our analysis suggest that basic technological skills are necessary but not sufficient for success in online teaching. Beyond basic competencies, faculty should be supported by their institutions in honing new skills as educational technologies evolve.

The Lens of Professional Vulnerability

In a recent review, authors Cutri and Mena (2020) use Kelchtermans’s (2009) model to argue that more than a list of skills, teaching online demands professional vulnerability that takes on a variety of different forms, including but not limited to: 1) a willingness to share personality in communicating with students online; 2) a willingness to share power with students in virtual classrooms; and 3) a tolerance for identity disruption—such as shifting from a seasoned face-to-face instructor to a beginner in another course modality (e.g., online, hybrid). Throughout the six themes identified in our analysis, experienced instructors’

responses lend support to this argument. Within the communication theme, experienced instructors discussed how the tone of their communication should emphasize their humanity, by conveying a sense of “warmth,” “concern,” and familiarity that requires a willingness to be personable. Within the technology theme, the emphasis on acceptance of current technologies and the willingness to learn new ones suggest that online faculty must be open and willing to change as the online learning environment changes. This is further evidenced in the flexibility theme, where instructors mentioned the need to adjust certain aspects of the course based on student feedback; soliciting and adjusting courses based on feedback requires a willingness to be vulnerable and open to critical feedback. Finally, within the theme of creativity, experienced faculty described a willingness to not only be the instructor but the learner, experimenting and learning from students to improve the quality of their online teaching; this example highlights one of the ways in which faculty can “share power” with their students.

The level of risk taking involved in online teaching (e.g., expressing personality, experimenting in course design and pedagogy) poses some potential challenges for faculty, particularly those seeking tenure and those who are on annual contracts at their institutions (Curti & Mena, 2020). For faculty new to online teaching, experiments in the virtual classroom could result in a loss of status that may also affect employment, such as poorer initial teaching evaluations or a loss of time spent on research due to a need to focus on online instruction (Curti & Mena, 2020). As online education continues to expand, the demands on faculty will shift in ways described by the experienced online faculty in our sample (e.g., being more available, having to structure clearer boundaries between work and personal lives, responding flexibly to the evolving needs of students). In order to ensure educational quality online, institutions will likely need to make adjustments in supporting their online teaching faculty, such as altering the ways in which faculty teaching is evaluated, providing compensation for faculty pursuing professional development opportunities in online education, and reconsidering some expectations for tenure promotions (Cutri & Mena, 2020). From a fiscal standpoint, investment in online teaching faculty and in the quality of online instruction will likely promote the vitality and longevity of these institutions in the 21st century.

Limitations and Future Directions

Although our study adds to the extant literature, there are several limitations to this study that warrant some caution. First, instructors at this institution are required to receive training to teach online and work closely with instructional designers to develop new courses and redevelop existing courses. This level of faculty support is not available at all institutions of higher education and could have influenced faculty responses to our research question. Future research could address the extent to which perceptions of the skills necessary for success in online teaching might differ based on supports available to online instructors. Second, while not the focus of this study, the level of courses faculty teach could also have impacted faculty responses. For instance, faculty who teach mostly graduate level online courses might have responded differently to our research question than faculty who teach mostly undergraduate online courses. As higher education continues to evolve online, future research should address the extent to which the skills required to teach online vary based on the course level (e.g., an introductory math course vs. an advance calculus course). Future studies could also examine how faculty with fewer years of experience would characterize

valuable skills of online teaching. Finally, our analysis was grounded in the postpositivist tradition of qualitative research, a widely accepted approach in communication studies, health sciences, and psychology, among others (Creswell & Poth, 2018; Tracy, 2020). However, we acknowledge that there are a wide range of rigorous approaches to qualitative research that might yield different interpretations of the data.

Concluding Comments

The onset of the COVID-19 pandemic has profoundly shifted the trajectory of higher education online. As course offerings, programs of study, and stackable degree pathways expand exponentially, institutions that prioritize quality instruction will likely thrive in this accelerated online learning environment. Across all six themes identified in this analysis, a key idea emerges that aligns with the theories and ideas discussed herein: Instructors consistently mentioned the capacity to use technology as a vehicle for fostering the human connections that are necessary for learning. The online teaching experts in this study provided actionable insights into the ways that online teaching skills can inform the building of these human connections, from communication and course design, to wielding technology in increasingly creative ways. Faculty responses further promote Cutri and Mena's (2020) call to view online teaching skills in a new light, and to consider how professional vulnerabilities can impact the quality of online teaching. Together, the results of this analysis have implications for the professional development of new and experienced online instructors, and can inform the supports necessary for the continued development of these most valuable skills.

Declarations

This study was approved by the Institutional Review Board (IRB) of the Oregon State University, and the protocols used in the study were approved by the Human Research Protection Program.

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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