Introduction to the Special Issue: Select Papers Presented at the 2022 OLC Accelerate Conference and the 2023 OLC Innovate Conference

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Every year, the Online Learning Consortium holds two flagship conferences: OLC Accelerate, held in the fall, and OLC Innovate, held jointly with MERLOT each spring. This past year, OLC Accelerate 2022, was held virtually November 1-2, 2022, and live, in Orlando, Florida, November 14-17, 2022. OLC Innovate 2023, was held virtually April 4-6, 2023, and live in Nashville, Tennessee, April 18-21, 2023.

The Online Learning Journal solicits research papers from those who have presented at the most recent OLC Accelerate and Innovate conferences for the annual September issue. In this special section, we feature three articles that showcase some of the research that is being conducted related to online and blended learning. Much of the work showcased at our conferences presents case studies and research from faculty and practitioners in the field. The growing focus on online learning due to the pandemic has resulted in many new models, approaches, issues, and applications being deployed to address instructional needs in the virtual classroom. These provide a valuable opportunity to examine how faculty and researchers are adapting their instruction to provide quality online learning across various institutions and disciplines.

In *Institutional Support for Academic Engagement in Online and Blended Learning Environments: Exploring Affective, Behavioral, and Cognitive Dimensions*, Charles Graham and colleagues detail the development and implementation of the Academic Communities of Engagement in higher education (ACE-HE) instrument. Based on the ACE framework, developed by Borup et al. (2020), the original instrument was updated and used to help a Columbian university measured both the affective, behavioral, and cognitive dimensions of engagement as well as how well the institution was supporting those elements in its online and blended courses. Primarily an in-person campus prior to the pandemic, this university sought to better understand engagement and barriers for blended and online students, given their increase in blended, live-remote, and fully asynchronous online learning because of the pandemic impact to instructional modalities.

The survey was completed by 1,295 university students and the authors detail the structural equation modeling that demonstrated a good fit for the ABC dimensions and for the model of institutional support for ABC engagement dimensions. Both English and Spanish versions of the ACE-HE instrument were provided and ideas were identified for institutions that want to improve their support for student affective, behavioral, and cognitive engagement dimensions in online and blended learning environments. They also discussed implications for modifications to the ACE framework.

In the second article, *Using AI to Evaluate a Competency-Based Online Writing Course in Nursing*, Rebecca Wolf and Andrew Wolf detail their research on a 14-week fully online, competency-based writing course examining students' self-efficacy, task value, and writing performance. The Writing Workshop is a Quality Matters® certified online course that provides nursing masters students with a foundation in scholarly writing, critical thinking, and synthesis to improve their ability to make research-based recommendations in the clinical setting. The course pedagogy was based on the cognitive apprenticeship model which the authors describe in detail.

Students received an initial writing prompt the first week of class and a second prompt was administered the last two weeks of the writing course. The pretest-posttest design was used to determine changes in students' writing performance, as well as changes to their perceptions of self-efficacy and task value. An artificial intelligence (AI) based writing assessment tool, IntelliMetric, was used for automated essay scoring (AES) of students' writing, which provided a baseline of students' writing proficiency before and after instruction. The authors discussed the use of this AI tool and its history, quality metrics, and value for instructors of writing. Students' self-efficacy and task value for scholarly writing were based on their survey responses, again conducted at course beginning and end for comparison.

Results indicated significant differences in students' perceptions of their writing self-efficacy and significant improvement in writing skills following the online workshop. Wolf and Wolf discussed the effectiveness of using the cognitive apprenticeship model for teaching writing and include detailed course design elements, focusing on the importance of online instructional design in writing courses. In particular, the study indicated positive results for a competency-based online approach to facilitating nursing students writing and thinking skills and providing the flexibility to engage a wide range of educational backgrounds.

The final paper presented at OLC Accelerate 2022 is from Chuck Dziuban, Patsy Moskal, Annie Reiner and Ady Cohen -- *Student Ratings and Course Modalities: A Small Study in a Large Context*. Dziuban and Moskal have a history of research on the University of Central Florida's anonymous Student Perception of Instruction (SPI) end-of-course rating form (Wang et al., 2009; Dziuban, Moskal, Kramer & Thompson, 2012). How to capture the student voice has long been a critical issue in higher education and the use of high stakes student ratings presents challenges for institutions. This article extends that research, examining student ratings from 2017 through fall 2022, including the impact of the COVID pandemic, to include 664,473 student responses.

The authors examined the impact that modality has on student ratings – a perpetual challenge as faculty often question whether a standardized rating form can adequately capture the voices of both face-to-face students and myriad online course permutations. Dziuban et al presented a careful examination of the properties of the (SPI), finding the ratings to conform to measurement quality specifications and to possess excellent psychometric characteristics. Results indicated that students tend not to assign poor ratings and extensively rate courses on the higher end of the scale where most instructors are very good or excellent with few poor outliers. Findings indicate that course modality had minimal impact, accounting for virtually none of the variation in ratings. In classification and regression tree analysis, researchers found that when students rated the effectiveness of an instructor as excellent on two items alone – helping students achieve the course objectives and creating an effective learning environment – the probability of an overall rating of excellent was .82. This was independent of course modality, term, college, department, or course level. A discussion of the relevance of these findings for teaching is included along with a charge for the education community, including OLC, to be part of a thoughtful national conversation of good ideas for how best to capture the student voice in higher education.

We would like to acknowledge OLC staff and numerous conference support members from the OLC community who gave countless hours to make 2022 OLC Accelerate and 2023 OLC Innovate successful. These past conferences have continued to straddle the post-COVID challenge of providing both virtual and face-to-face settings which effectively means twice the work for those planning, supporting, and working these venues. We are grateful for their tireless effort to provide effective and quality events where our community can gather and share our practices and research despite these challenges. We are also grateful to Mary Rice, managing editor, and Peter Shea, editor, of *Online Learning*, for their continuing guidance and help in continuing this focus on OLC Conferences and to our OLJ reviewers.

To the OLJ readers, we invite you to consider presenting your work to OLC Accelerate in fall, or to OLC Innovate in spring of each year. We especially call on those conducting quality research to consider these conferences to help support the strong need for research on the ever advancing fields of instructional technology and online learning. Quality research is critical to improving the field and these venues provide a fantastic outlet to share your work with colleagues and form communities of practice. OLJ submissions further allow others to learn from your experiences and provide a high-quality outlet for publication. Please consider submitting your original research here to *Online Learning* in the future.

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Institutional Support for Academic Engagement in Online and Blended Learning Environments: Exploring Affective, Behavioral, and Cognitive Dimensions

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Abstract
In light of the disruptions caused by the COVID-19 pandemic, leaders of higher education institutions around the world have been contemplating ways to help their universities engage in a digital transformation that must have student engagement and learning as the foremost considerations. This study reports on the work conducted at a university in Colombia that created an evaluation instrument based on the Academic Communities of Engagement (ACE) framework (Borup et al., 2020) to examine how well the institution was supporting the affective, behavioral, and cognitive (ABC) dimensions of engagement in its online and blended learning course offerings. This survey, the ACE in Higher Education (ACE-HE), measures indicators of the ABC engagement dimensions as well as indicators of institutional support for those elements. The survey was completed by 1,295 university students representing a broad demographic profile. Structural equation modeling found good fit for both the model of ABC engagement dimensions and the model of institutional support for ABC engagement dimensions. Institutional support for

affective engagement showed strong relationships to affective, behavioral, and cognitive indicators of engagement, while institutional support for behavioral and cognitive engagement did not have the same outcome. This research provides access to both English and Spanish versions of the ACE-HE instrument. It also highlights ideas for institutions that want to improve their support for student ABC engagement dimensions in online and blended environments. Finally, several implications for making updates to the ACE framework are shared.

Keywords: student engagement, affective engagement, behavioral engagement, cognitive engagement, institutional support, online learning, blended learning, academic communities of engagement

Graham, C., Borup, J., Tuiloma, S., Martínez Arias, A., Parra Caicedo, D., Larson, R. (2023). Institutional support for Academic Engagement in online and blended learning environments: Exploring affective, behavioral, and cognitive dimensions. *Online Learning, 27*(3), 4-40. DOI: https://doi.org/10.24059/olj.v27i3.4001

Student engagement is a topic that has been intensely studied by researchers and valued by institutions' practitioners because of its close association with positive outcomes like student achievement (Firat et al., 2019; Hughes et al., 2008; Kuh et al., 2007; Liu et al., 2022; Skinner et al., 1990) and satisfaction (Baloran et al., 2021; Chan et al., 2021; Filak & Sheldon, 2008; Kucuk & Richardson, 2019; Wefald & Downey, 2009). There are a diversity of frameworks and models that address student engagement and even more instruments that try to measure some aspect of the construct. In the educational psychology literature, it is common to think of engagement as having three core dimensions; affective, behavioral, and cognitive (Fredricks et al., 2004). Most of this research has focused on traditional in-person school environments and very little has explored engagement under the unique conditions of online or blended teaching environments (Martin & Borup, 2022). On the other hand, engagement in online learning research has focused heavily on environmental affordances and often uses related terms like interaction instead of engagement (Martin & Borup, 2022). The Academic Communities of Engagement (ACE) framework (Borup et al., 2020) was developed specifically with online and blended learning contexts in mind and frames engagement in terms of affective, behavioral, and cognitive (ABC) dimensions while focusing on how online and in-person communities facilitate or support students' engagement across these three dimensions. The ACE framework describes three categories of engagement facilitators/barriers that influence student engagement levels: learner background and characteristics, personal environment, and course environment.

In this research, we describe an instrument to measure ACE in higher education (ACE-HE) that can provide insight into levels of engagement as well as specific indicators of engagement support students are experiencing across the ABC dimensions in their online and blended learning experiences. We describe the development and implementation of the ACE-HE instrument that was designed to help a university measure the levels of student academic engagement in blended and online course offerings. Additionally, the ACE-HE measures a number of engagement facilitators/barriers including levels of institutional support for affective, behavioral, and cognitive engagement as well as eight external barriers that are part of students' personal environments. Specifically, we address the following research questions.

1. Is there good model fit for the ACE-HE model of affective, behavioral, and cognitive engagement?
2. Is there good model fit for the ACE-HE model of institutional support for affective, behavioral, and cognitive engagement?
3. What insights does the ACE-HE provide for understanding the relationships between institutional support for engagement and actual engagement?

Literature Review

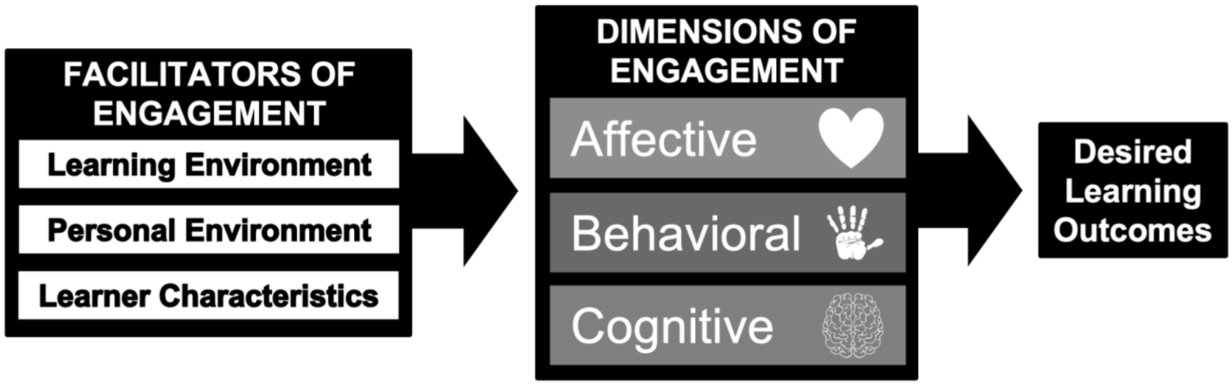
Defining and Understanding Learner Engagement

While researchers agree that learner engagement is multidimensional, there are disagreements on which dimensions should be included and defined (Christenson et al., 2012). However, recently some researchers have coalesced around the three dimensions of affective engagement, behavioral engagement, and cognitive engagement (Martin & Borup, 2022). For this research, we have adopted the following definitions provided by Borup et al. (2020; see Table 1).

> **Affective engagement:** “The emotional energy associated with involvement in course learning activities” (p. 813).
> **Behavioral engagement:** “The physical behaviors (energy) associated with the completing course learning activity requirements” (p. 813).
> **Cognitive engagement: “**The mental energy exerted towards productive involvement with course learning activities” (p. 813).

Online learners’ ability to engage affectively, behaviorally, and cognitively can vary widely and is in part dependent on the learner’s characteristics. For instance, those who are new to online learning can find it particularly challenging to engage in learning activities because they “not only need to learn a subject online but need to learn how to learn online” (Lowes & Lin, 2015, p. 18). Learning how to learn online can be problematic in environments that provide learners with flexibility in the time and pace of learning and require high levels of self-regulation (Landrum, 2020). Additionally, learning online can require that learners develop new communication skills using a variety of technology to effectively interact with peers and instructions. Technological competence has also long been cited as a requisite to learning online and those who are unable to effectively navigate and use online systems and tools will be unable to access learning materials and communicate with the instructor and others in the course (Hillman et al., 1994). Bempechat and Shernoff (2012) explained that learner engagement is malleable and highly influenced by the learning environment and support. Mahatmya et al. (2012) added that “development is situated within a set of overlapping and multifaceted environmental systems such as the home, school, neighborhood, and larger sociohistorical context that also interact to shape development” (p. 49). Similarly, Bronfenbrenner’s (1977) comprehensive and foundational theory explained that learner development occurs in a complex, layered ecology of interconnected systems which includes home, school, workplace, and community environments. Appleton et al.’s (2006) influential framework placed student engagement within three contexts—family, peers, and school. More recently, Borup et al. (2020) categorized these environments as either the learning environment that is provided, curated, and designed for the course or the personal environment that is not affiliated with the online course or program. Borup et al. (2020) added that a learner’s personal characteristics, learning environment, and personal environment are important facilitators of cognitive, affective, and behavioral engagement that lead to desired learning outcomes (see Figure 1).

Figure 1
Facilitators and Dimensions of Engagement



In summary, a learner's ability to engage affectively, behaviorally, and cognitively can be limited or facilitated by the learner's characteristics as well as the learner's course and personal environment. In the following section, we will describe the ACE framework that describes how actors within the personal and course community can help to support and increase learners' engagement.

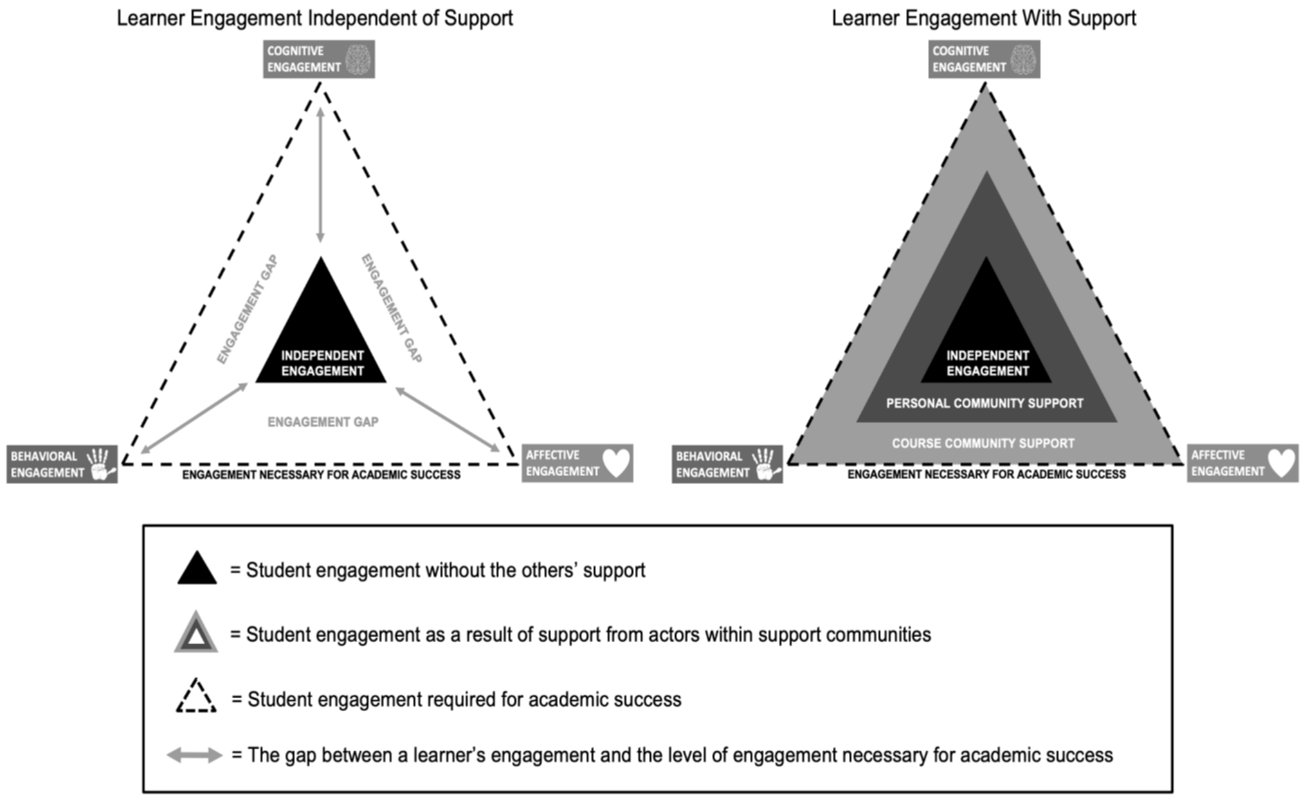
The ACE Framework

Borup et al. (2020) developed the ACE framework to explain how supports provided to online learners can help them to overcome the challenges commonly encountered when learning online and allow online learners to engage affectively, behaviorally, and cognitively more fully in learning activities. Additionally, the ACE framework acknowledges that to fully understand learner engagement, researchers need to surpass the supports that are provided to the student within a course or program. Specifically, while taking a course the learner can receive influential support from their personal community in addition to the course community. Support within learners' personal community can be especially important in an online course where much or all the learning occurs from home.

The ACE framework grouped support actors within the following two support communities: the course community of support and the personal community of support. Actors within the course community of support have a relationship with the learner because of the learner's enrollment in the course (e.g., instructors, support coaches, peers). In contrast, actors within the personal community of support have relationships with the learner independent of the learner's enrollment in the course. Often these relationships formed long before the learner enrolled in the course and can even extend the entire lifespan of the learner (e.g., family, friends, partners, community, and religious figures).

Corresponding to Vygotsky's (1978) Zone of Proximal Development, the main hypothesis of the ACE framework is that learners' ability to independently engage affectively, behaviorally, and cognitively in learning activities is limited and likely insufficient for academic success and requires support from their personal and course communities of support for academic success. While support from actors within the personal community is important, even with that support learners' level of engagement is likely insufficient and requires the critical support that is best offered by actors within the course community of support (see Figure 2).

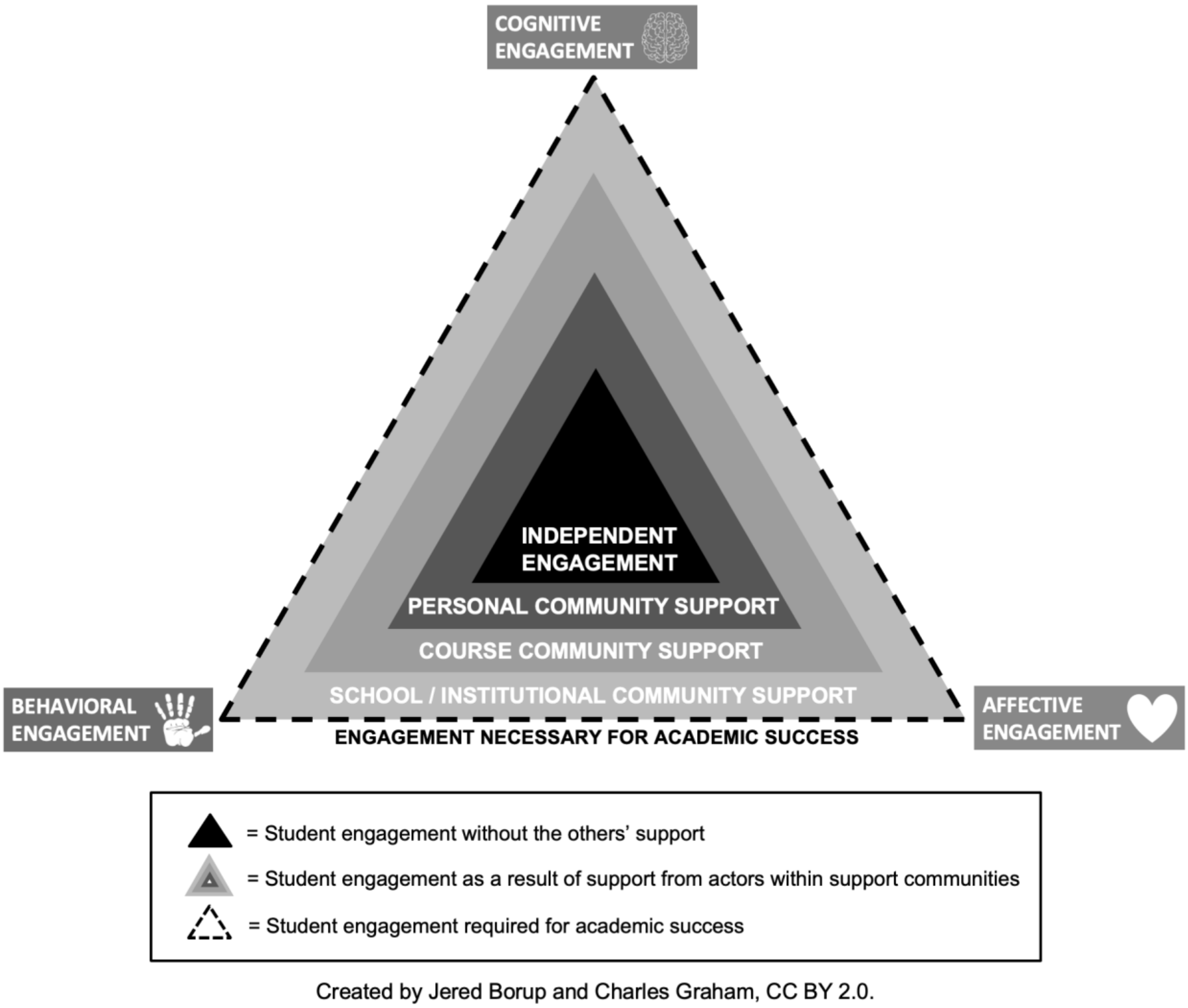
Figure 2
Visual Representation of Independent Engagement and Two Communities of Support



The ACE framework also aligned specific support elements to the dimension of engagement that they were most likely to impact. Specifically, instructing and collaborating support were aligned with cognitive engagement, troubleshooting/orienting, organizing/managing, and monitoring/encouraging progress were aligned with behavioral engagement, and facilitating communication, developing relationships, and instilling excitement for learning were aligned with affective engagement.

Whetten (1989) explained that when developing a framework there exists a tension between including all relevant factors (comprehensiveness) and the need to concentrate focus on the most important factors (parsimony). Once a framework has been developed, subsequent research can help to make it more comprehensive by adding additional factors or more parsimonious by deleting factors that have little value. Skinner and Pitzer (2012) explained that learner engagement occurs at the school level, the course level, and the activity level. The authors of the ACE framework stated, "The ACE framework considers engagement that is directly related to student involvement with academics (including engagement with course tasks and activities) rather than the institutional/school level" (Borup et al., 2020, p. 810). Because of this focus on learner engagement at the course level, the ACE framework also focused on support provided by actors within the course community. However, a more comprehensive understanding of support structures and actors can be gained by expanding the framework to include the institutional/school community of support (see Figure 3).

Figure 3
Visual Representation of ACE Framework with the School/Institutional Community of Support Dimension Added



Simply adding a construct to a framework is insufficient and efforts are needed to measure the construct in meaningful ways. When the ACE framework was first published, the authors stated:

> It is especially important for researchers to identify and create validated measures of affective, behavioral, and cognitive engagement in both online and in-person learning environments. These instruments and corresponding quantitative research could assist in identifying the types of community support that are most essential for various categories of students in specific types of learning arrangements. (Borup et al., 2020, p. 823)

In this research, we are the first to answer this call by developing and validating an instrument that measures learners' affective, behavioral, and cognitive engagement as well as the support provided by the institutional community to support learner engagement.

Methods

In this section we will outline the setting and participants for the study as well as the instrument development, data collection, and analysis procedures.

Setting and Participants

This study took place at a major private, not-for-profit university in Colombia, South America. The university has six colleges that offer 109 programs at the undergraduate and graduate levels. While the university traditionally offered primarily in-person courses, the COVID-19 global pandemic ushered in a time of retrospection and exploration of courses and programs in various modalities including blended, live-remote, and fully asynchronous online. The university leadership sought to understand how students were engaging academically in these online and blended modalities. They also wanted to better understand what personal barriers to blended and online learning students were experiencing and how the institution was supporting student online academic engagement. Stakeholders from the university helped develop, translate, pilot, and ultimately deliver the survey on institutional support for online academic engagement at the university. A total of 1,295 students (undergraduate = 1,165, graduate = 130) responded to the survey representing 14.2% of the university student population. The demographics of the survey included 714 female students, 569 male students, 2 non-binary students, and 10 people who declined to answer this question. Students reported their socio-economic status using the Colombian scale known as “estratos” (stratum), which is based on the diversity and quality of housing, using a 1 to 6 scale: 109 in stratum 1 (low-low class); 249 in stratum 2 (low class); 360 in stratum 3 (low-middle class); 357 in stratum 4 (middle class); 118 in stratum 5 (middle-high class); 70 in stratum 6 (high class), and 32 students who declined to answer.

Instrument Development

The survey items in the instrument focused on indicators for each of the three dimensions of engagement (Table 1) and three affective support elements (Table 2), three behavioral support elements (Table 3), and two cognitive support elements (Table 4) as identified in the ACE framework (Borup et al., 2020). Three or four items were developed to match descriptions of the indicators and support elements found in the original ACE framework paper. Survey developers included stakeholders from the host university as well as two of the original authors of the ACE framework. Items were translated from English into Spanish (see Appendix A) and piloted for comprehension and clarity with students from the host university. Some minor adjustments to survey items were made based on the pilot, prior to administering it university-wide.

Table 1
Online/Blended Engagement Indicators and Survey Items

<table>
<tr><th>Engagement Indicators</th><th>Survey Items*</th></tr>
<tr><td>Affective Engagement Indicators
● Boredom-enjoyment
● Anxiety/frustration-confidence
● Sadness-happiness
● Situational and personal interest</td><td>● (AE1) I highly enjoyed my online learning experiences.
● (AE2) I did not feel frustration while learning online.
● (AE3) I felt emotionally connected to others in my online learning experiences.
● (AE4) Overall, I felt highly interested in the topics covered in my online courses.</td></tr>
<tr><td>Behavioral Engagement Indicators
● Attendance/participation
● Completing/submitting work
● Following course procedures
● Time on task
● Self-regulation</td><td>● (BE1) I have been able to fully participate in my online learning experiences.
● (BE2) I have made good progress towards my learning goals by consistently completing my online work.
● (BE3) I have been able to spend the time needed to be successful in my online learning experiences.
● (BE4) I have been able to manage my own efforts when learning online.</td></tr>
<tr><td>Cognitive Engagement Indicators
● Attention
● Absorption/concentration
● Learning persistence
● Cognitive/metacognitive strategy use (questioning, exploring, note taking, checking for understanding, etc.)</td><td>● (CE1) I have been able to consistently focus my attention on the online learning tasks I am working on.
● (CE2) I have been able to exert the mental energy necessary to learn difficult concepts online.
● (CE3) I have been persistent (not given up) in my online learning experiences.
● (CE4) I have mastered effective online learning strategies (e.g., questioning, exploring, note taking, checking for understanding).</td></tr>
</table>

***** The stem and scale for these items was: “Rate your agreement with the following statements about your online learning experience this past academic year . . . (1 = strongly disagree to 6 = strongly agree)”

Table 2
Affective Support Elements for Online/Blended Engagement and Survey Items

Affective Support Elements	Survey Items*
Facilitating Communication	● (AS-FC1) feel comfortable communicating with others (e.g., instructors, advisors, classmates) online. ● (AS-FC2) have opportunities to communicate with others online. ● (AS-FC3) use a variety of online technologies to communicate with others (i.e., synchronously and asynchronously).
Developing relationships	● (AS-DR1) feel accepted by others while learning online. ● (AS-DR2) I feel like an important part of the online learning community. ● (AS-DR3) develop relationships with others (e.g., instructors, advisors, classmates) online.
Instilling excitement for learning	● (AS-IE1) enjoy online learning activities. ● (AS-IE2) get excited to learn new things in my online learning experiences. ● (AS-IE3) increase my interests in the subjects/topics I am learning online.

* The stem and scale for these items was: "I have a support community at the university (e.g., instructors, advisors, classmates) that helps me to… (1=strongly disagree to 6=strongly agree)"

Table 3
Behavioral Support Elements for Online/Blended Engagement and Survey Items

Behavioral Support Elements	Survey Items*
Troubleshooting and Orienting	• (BS-TO1) troubleshoot technological issues related to my online learning. • (BS-TO2) learn the digital platforms I need to be successful in my online learning experience. • (BS-TO3) know what it takes to be successful in online learning experiences.
Organizing and Managing	• (BS-OM1) develop time-management skills for online learning • (BS-OM2) use online technologies to track projects and due dates. • (BS-OM3) learn how to keep my online environment organized.
Monitoring and Encouraging Progress	• (BS-ME1) keep working on my online assignments even when it's difficult. • (BS-ME2) meet online assignment deadlines. • (BS-ME3) recover following academic setbacks such as missing assignments or getting a poor grade.

***Note*.** The stem and scale for these items was: "I have a support community at the university (e.g., instructors, advisors, classmates) that helps me to… (1=strongly disagree to 6=strongly agree)"

Table 4
Cognitive Support Elements for Online/Blended Engagement and Survey Items

Cognitive Support Elements	Survey Items*
Instructing	• (CS-I1) learn new concepts online in a way that I can understand. • (CS-I2) find answers to difficult concepts when I have questions related to online learning activities. • (CS-I3) get useful feedback on my online assignments.
Collaborating	• (CS-C1) work with others to understand online course material. • (CS-C2) collaborate with others to complete a course assignment online. • (CS-C3) learn from online interactions with others.

***** The stem and scale for these items was: "I have a support community at the university (e.g., instructors, advisors, classmates) that helps me to… (1 = strongly disagree to 6 = strongly agree)"

Data Collection

Data for the study came from a survey administered to all students with online courses at the university. Table 5 contains a summary of the survey constructs. English and Spanish versions of specific items can be found in the appendix. Participant responses were completely anonymous.

Table 5

Summary of constructs in the Institutional Support for Academic Engagement Survey

Data Collected	Description
Online/Blended Academic Engagement	● Affective Engagement (4 items) ● Behavioral Engagement (4 items) ● Cognitive Engagement (4 items)
Institutional Support for Online/Blended Academic Engagement	● Affective Engagement Support (9 items) ● Behavioral Engagement Support (9 items) ● Cognitive Engagement Support (6 items)
External Barriers	● Transportation difficulties (cost, access, travel time, etc.) ● Internet access/speed in student's home ● Access to a good computer ● Access to affordable housing in the metropolitan area ● Access to technical support ● Family environment (childcare, care for parents, etc.) ● Work schedule complications
Demographic Data	● Gender ● Age ● Socio Economic Level ● Academic Level (undergraduate, graduate) ● Year in school ● Academic Program ● Level of Work While in School

* We collected data related to academic success (enrollments, withdrawal rates, failures, and satisfaction). Unfortunately, due to some faulty logic in the survey, there were inconsistencies in the success data that made it unacceptable to report.

Data Analysis

RQ1: Academic Engagement & RQ2: Institutional Support for Academic Engagement

As described in the literature review, we have a strong theoretical framework to base our models for Academic Engagement and Institutional Support for Academic Engagement. Thus, we tested these theoretical models with confirmatory factor analysis (CFA) to see if the model hypothesized will reproduce the covariance matrix created by the data. If the model is defensible, it will have acceptable fit statistics (RMSEA < .08, CFA > .90, TLI > .90, SRMR < .08; Wang & Wang, 2019). If these fit statistics cutoffs are not met modification indices will be investigated to see if any small correction to the model (e.g., correlating residual variances of the items) could correct the problem. If not, exploratory confirmatory factor (EFA) analysis will be run. As mentioned in the findings section the assumptions for CFA were checked. All analyses were run in Mplus 8.7. Mplus allows the full information maximum likelihood (FIML) method for dealing with missing data that has been shown to be more effective than listwise deletion or other missing data methods (Allison, 2003).

RQ3: Relationships Between Institutional Support Elements and Engagement

Once the measurement models (Academic Engagement and Institutional Support for Academic Engagement) were made and found to be defensible, the two new models with regression elements between the latent variables were run as seen in Figures 4 and 5. Combining both the formation of the latent variables and the causal structural elements, this new model is called a structural equation model (SEM). Like in the previous step's CFAs fit indices are still calculated and reported but are less important as the focus is on the causal links between the constructs. As with the CFAs, the SEMs have assumptions that were checked. All analyses were run in Mplus 8.7 using FIML for missing data.

Findings

RQ1: Academic Engagement—Affective, Behavioral, and Cognitive

Figure 4 below represents the measurement model for the online and blended learning (OL/BL) Academic Engagement model based on the ACE Framework and described in the literature review section. We tested the OL/BL Academic Engagement data for the assumptions of normality (linearity, independence, normality, no extreme multicollinearity, and no outliers), and we found that these assumptions held true through scatter plots and other diagnostics we ran in SPSS. We then ran the CFA for the model, and it met the cutoffs for all of the fit statistics as can be seen in Table 6. This means that this model is a defensible way to reproduce the covariance matrix of the data. Given that this structure was hypothesized through the ACE framework as reflected in the literature review section, we find this to be strong evidence that the model reflects reality well.

Figure 4
Model of Academic Engagement with Affective, Behavioral, and Cognitive Dimensions (Values are Standardized Factor Loadings; all p < .001, n = 1,253)

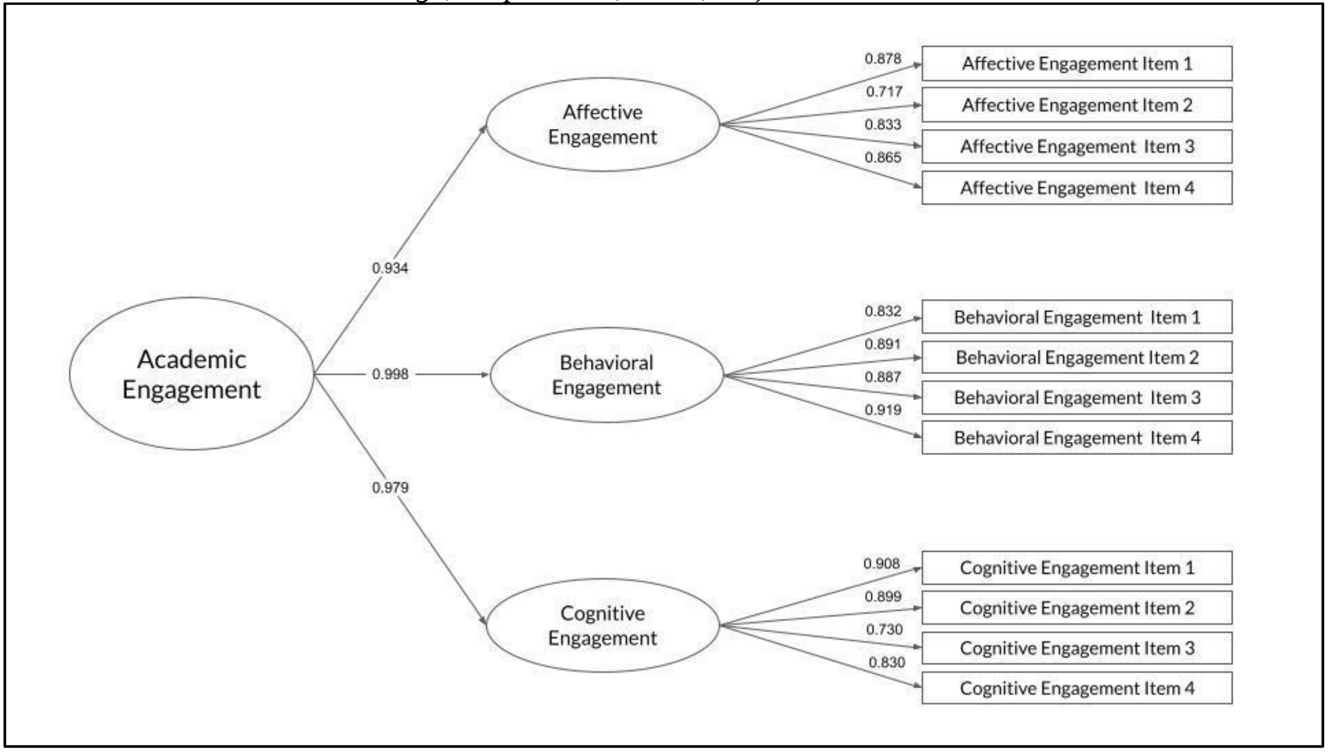


Table 6
Fit Statistics and Cutoffs for the OL/BL Academic Engagement Model

Fit Statistics	Score	Needed*
CFI	0.966	>0.9
TLI	0.956	>0.9
RMSEA	0.067	<0.08
SRMR	0.024	<0.08

*Cutoffs as described by Wang & Wang (2020)

As can be seen in Figure 4 the standardized factor loadings for all the superfactor Academic Engagement are statistically significant ($p < .001$). Additionally, the magnitude of the factor loadings for the superfactor Academic Engagement are all high and at similar magnitudes (about .9); this shows that each of the subfactors Affective Engagement, Behavioral Engagement, and Cognitive Engagement contribute relatively equally to the overall superfactor. This pattern of results is replicated with the subfactors Affective Engagement, Behavioral Engagement, and Cognitive Engagement. As in the superfactor all the factor loadings are statistically significant. The magnitude of the factor loadings for the subfactor of Affective Engagement (.7 to high .8s) have higher variability than the factor loadings for the superfactor; nevertheless, they are high and still very similar showing that there is not one of the manifest items that are overwhelming the other in the subfactor. This is true for the subfactors Behavioral Engagement and Cognitive Engagement.

The superfactor Academic Engagement has only three indicators (the subfactors Affective Engagement, Behavioral Engagement, and Cognitive Engagement). This means the model at this second level is just identified, meaning that there is no empirical way to distinguish the model that has the superfactor and a model that does not. Both of these possibilities (superfactor or just subfactors) are thus considered in the final two SEMs as discussed subsequently.

RQ2: Institutional Support for Academic Engagement—Affective, Behavioral, and Cognitive

Figure 5 below represents the measurement model for the Institutional Support for OL/BL Academic Engagement model built on the ACE Framework and described in the literature review section of this paper. We tested the Institutional Support for OL/BL Academic Engagement data for the assumptions of normality (linearity, independence, normality, no extreme multicollinearity, and no outliers), and we found that these assumptions held true. We then ran the CFA for the model, and it met the cutoffs for all of the fit statistics as can be seen in Table 7. As with RQ1, this model meets the fit statistics cutoffs, and the model was theoretically derived. This provides strong evidence that the model is defensible. This means that this model is a defensible way to reproduce the covariance matrix of the data. Given that this structure was hypothesized through the ACE framework as reflected in the literature review section of this paper, we find this to be strong evidence that the model reflects reality well. As with RQ1, all standardized factor loadings are statistically significant and of similar high magnitude (greater than .9). This shows that each higher composite is composed equally of all its indicators.

Figure 5

Model of Institutional Support for Academic Engagement With Affective, Behavioral, and Cognitive Dimensions (Values are Standardized Factor Loadings; all p < .001, n = 1253)

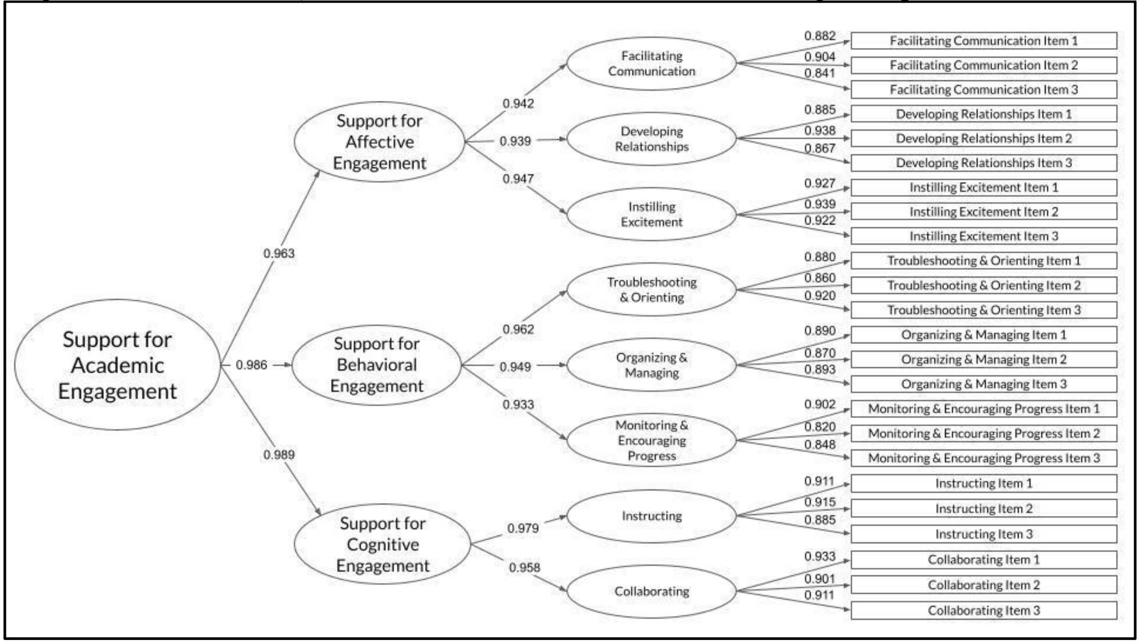


Table 7

Fit Statistics and Cutoffs for the Institutional Support for OL/BL Academic Engagement Model

Fit Statistics	Score	Needed*
CFI	0.963	>0.9
TLI	0.957	>0.9
RMSEA	0.048	<0.08
SRMR	0.027	<0.08

*Cutoffs as described by Wang & Wang (2020)

As with the RQ1, the superfactor Support for Academic Engagement has only three indicators, which as with RQ1 means the model is just identified at the third level. This gives no empirical way to judge between the model that specifies the superfactor and the model that does not. Thus, both possibilities are investigated in the two SEMS that will be discussed subsequently. This pattern continues with the superfactors at the second level (Support for Affective Engagement, Support for Behavioral Engagement, and Support for Cognitive Engagement) where the first two superfactors have three indicators each and the last (Support for Cognitive Engagement) has only two as hypothesized by the ACE framework. Support for Cognitive Engagement is technically under-identified and if run in isolation would have no unique solutions to the parameter estimates. Nevertheless, in the context of the larger CFA the extra degrees of freedom provided by having several levels estimated simultaneously allows the estimation to be completed.

RQ3: Relationships Between Institutional Support Elements and Engagement

As mentioned previously, the model formally run in RQ1 and RQ2 imposed a superfactor for Support for Academic Engagement at the second level and Academic Engagement at the third model. The ACE framework would suggest that as Support for Academic Engagement increases so would Academic Engagement. This is found to be true as seen in Figure 6 where the causal regression path from Support for Academic Engagement and Academic Engagement is statistically significant ($p < .001$) and of a high magnitude ($\beta = 0.915$). The value .915 signifies that for every one standard deviation increase of Support for Academic Engagement there is a predicted increase of Academic Engagement of .915 standard deviations. By all standards, this is an extremely strong effect, which is expected by theory.

In Table 8 the fit statistics of the overall SEM are shown to meet all the cutoff criteria for measurement models. These are very encouraging results considering the complexity of the model. Figure 6 only shows the structural elements of the model. Not shown in Figure 6 are the measurement parts of the model that are reflected in Figures 4 and 5. We are more than doubling the number of parameters in the model and yet the fit statistics support the model which shows the framework is solid.

Figure 6

Model of the Structural Relationship Between Support for Academic Engagement and Academic Engagement with Standardized Beta (p < .001; n = 1253)

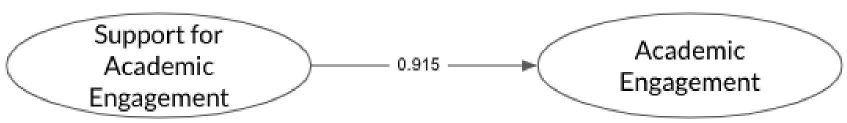


Table 8
Fit Statistics and Cutoffs for the Relationship Between Support for Academic Engagement and Academic Engagement

Fit Statistics	Score	Needed*
CFI	0.951	>0.9
TLI	0.947	>0.9
RMSEA	0.046	<0.08
SRMR	0.031	<0.08

*Cutoffs as described by Wang & Wang (2020)

As mentioned in the previous section, the models where the superfactors Support for Academic Engagement and Academic Engagement are just identified at their respective levels meaning there is no empirical way to distinguish the model with the superfactor estimated and the hypothetical model where no super factor is estimated. Since these two models (model with superfactor and model without superfactor) are mathematically equivalent we ran an alternate SEM where no superfactors are estimated and the structural elements run directly from the support subfactors (Support for Affective Engagement, Support for Behavioral Engagement, and Support Cognitive Engagement) to the engagement subfactors (Affective Engagement, Behavioral Engagement, and Cognitive Engagement) as shown in Figure 7. Table 9 also shows that the fit statistics for the SEM meet all the cutoff criteria. As above, Figure 7 is showing only the structural elements of the model, the measurement parts as shown in Figure 4 and Figure 5 (but no super factor is estimated in either) are not shown. This analysis will allow us to discover if there is nuance between the support latent variables and engagement latent variables. The results are surprising. The ACE framework would suggest that each support latent variable would strongly predict its respective engagement latent variable. This is only true of the direct regression path from Support for Affective Engagement to Affective Engagement ($\beta = 1.163$, $p < .001$). This relationship is extremely strong. Unexpectedly, Support for Behavioral Engagement does not predict Behavioral Engagement ($p > .1$) and Support for Cognitive Engagement does not predict Cognitive Engagement ($p > .1$). Instead, Support for Affective Engagement also predicts Behavioral Engagement ($\beta = 0.802$, $p < .001$) and Cognitive Engagement ($\beta = 0.589$, $p < .001$) albeit less strongly than it predicts Affective Engagement. Support for Behavioral Engagement predicts Cognitive Engagement ($\beta = 0.537$, $p < .05$) with moderate strength. Support for Cognitive Engagement does not predict any of the Engagement latent variables ($p > .1$). The implications of these surprising results, both from a measurement and substantive point of view will be unpacked in the discussion section.

Figure 7
*Model of Relationship Between Institutional Support Dimensions and Engagement Dimensions (**p < .001, *p < .05, dotted lines p > .1; n=1253)*

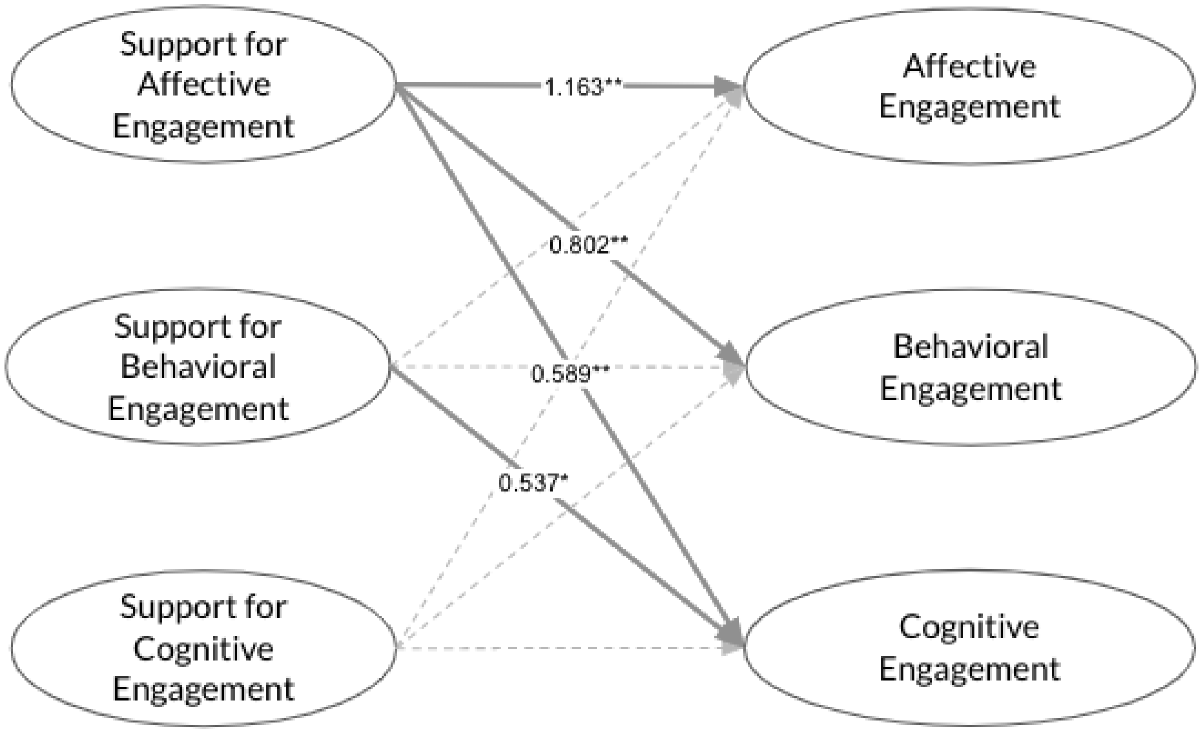


Table 9
Fit Statistics and Cutoffs for the Relationship Between Affective, Behavioral, and Cognitive Support for Academic Engagement and Affective, Behavioral, and Cognitive Engagement

Fit Statistics	Score	Needed*
CFI	0.966	>0.9
TLI	0.956	>0.9
RMSEA	0.067	<0.08
SRMR	0.024	<0.08

*Cutoffs as described by Wang & Wang (2020)

Discussion and Implications

In this discussion we first address how this research has helped prompt an update to the ACE framework in important ways. Then we discuss the implications of our findings for the SEM model of Learner Engagement and Institutional Support Engagement Facilitators. Finally, we explore implications for the more complex findings connecting engagement facilitators and indicators in the SEM models.

Implications for Updating ACE Framework

When the ACE framework was originally proposed, it was based on a review of existing literature and frameworks as well as case studies conducted by the framework authors and their colleagues in various types of online and blended learning environments at the secondary and higher education levels (Borup et al., 2020). This research primarily focused on the course level as opposed to the school or institutional levels identified by Skinner and Pitzer (2012). This focus on course-level engagement was also reflected in the ACE framework that focused on academic engagement "with academics (including engagement with course tasks and activities) rather than the institutional/school level" (Borup et al., 2020, p. 810). Similarly, the ACE framework included the Course Community of Support but not support provided by the school or institution. Since a course is situated within a school or institution, there is expected to be a significant level of overlap between the course community and the school community actors and the support that they offer. This would be especially true in small schools or institutions where actors are likely to fulfill roles in both communities. However, both conceptually and in practice the distinction can prove helpful. For instance, when developing and validating measures of a sense of community, Rovai and colleagues (Rovai, 2002; Rovai et al., 2004) made distinctions between course community and school community. Similarly, Thorpe (2002) categorized support systems for online learners within the "institutional context and the course or teaching context" (p. 110). Trespalacios et al. (2023) added: "Regarding institutional context, students need to have support regarding admission, registration, scholarship, research, and student life issues. However, students also need support when it comes to their courses such as completing assignments, understanding the instructional or assessment materials" (p. 39).

We argue that a similar distinction within the ACE framework provides a broader and more nuanced understanding of both the communities of support including the types of support and the actors providing that support. A strong school or institutional support community might involve a pattern of multiple strong interconnected course communities that you might see in well-designed online programs. A school or institutional support community might also entail support structures that typically reside outside of individual courses and provide access to technical support, library resources, mental health and wellness resources, academic advising, study skills, etc. As a result, we have revised Figures 1 and 3 (see Figures 8 and 9) to include the school/institutional environment and community and the support that is provided within them. Environmental facilitators are represented by the circle that encompasses the model, community facilitators are represented by the support triangles in the model, and learner characteristics are represented within the central black triangle of the model.

In Figure 9, we used a circle to emphasize that academic engagement as well as the support communities should be understood within the context of the environments in which the learner and the communities are situated. There are unique environmental facilitators and barriers at different levels. For example, Spricigo et al. (2023) identified facilitators/barriers in the personal study environment (e.g., computer access, internet access, study space, time availability) as well as course design elements in the course environment (e.g., clear organization, helpful materials, accurate assessments, relevant activities, interesting activities).

Figure 8
Expanded Facilitators and Dimensions of Engagement

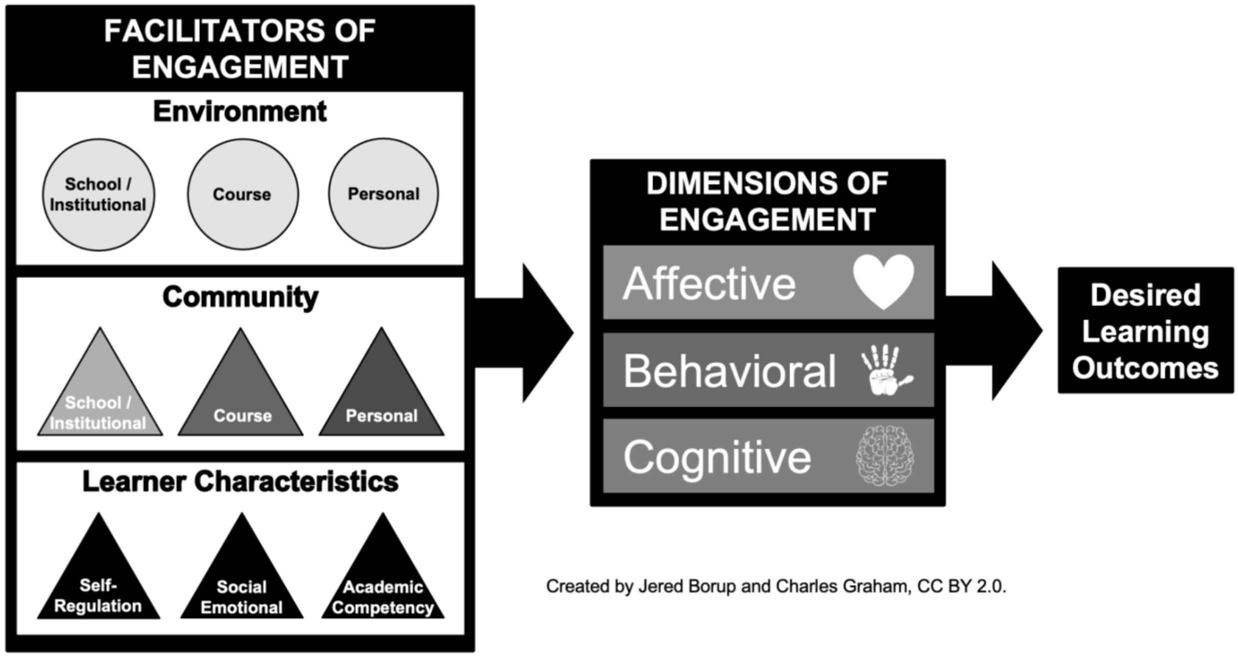
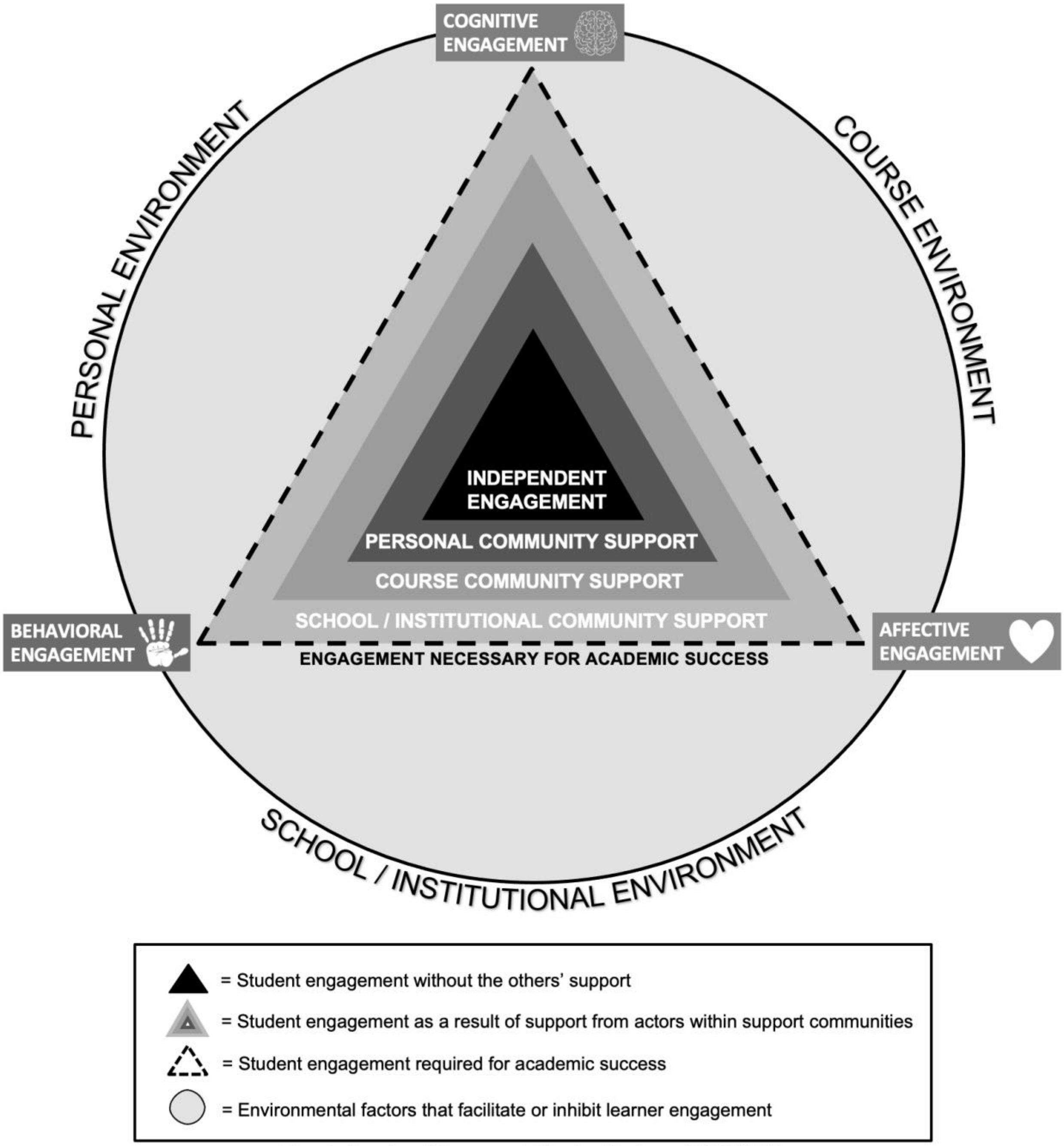


Figure 9
Academic Communities of Engagement (ACE) Framework with Expanded Environmental Facilitators and Support Communities



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Models for Engagement Indicators and Institutional Support Facilitators

Previous research as well as the ACE framework have made a distinction between the *indicators* and *facilitators* of ABC engagement dimensions. Facilitators and barriers are opposite sides of a coin. When a support element (e.g., technical support, internet access, etc.) is present it *facilitates* engagement and when it is absent it becomes a *barrier* to engagement (Spricigio et al., 2023). This research has presented solid evidence for a model that measures *indicators* of ABC engagement (see Table 1 and Figure 4). It also presents evidence of a model for measuring *facilitators* based on the support structures identified in the original ACE framework (see Tables 2 through 4 and Figure 5). The support structures in the model mostly focus on supporting community at the course level. Institutions have an important role to play in setting expectations and supporting the communities that directly impact the course level learning. However, the expanded model (see Figure 9) highlights additional areas that institutions might consider in trying to support student engagement. For example, future research might also explore the institutional role in providing support in some of the following areas:

- **Environmental Facilitators/Barriers**—it is common for the institution to consider facilitators/barriers in classrooms and study spaces on campus. Because online learning can take place anywhere, barriers in the personal environment can be a hindrance to learner engagement. The institution can also play a role in understanding and helping to mitigate these personal environmental barriers. Tuiloma et al. (2022) and Spricigio et al. (2023) have identified various personal barriers to student engagement related to transportation, computer and internet access, technical support, study environment, etc.
- **Institutional Community Facilitators**—many institutions have on-campus access to communities that support academic learning, for example, general writing support labs, counseling offices, learning skills opportunities, academic clubs, etc. These are community supports that are not attached to any specific course and may not be easily accessible to online students.
- **Learner Characteristics Facilitators/Barriers—**learners come to higher education with a wide range of characteristics that influence their ability to engage in learning activities. In Figure 8 we hypothesize that the following three learner characteristics are particularly influential in determining a learner's ability to engage in learning activities without the support from others: self-regulation abilities, social-emotional skills, and academic competency. The university's ability to support students in these personal areas can have a positive impact on students' ability to engage in their learning. This is a type of facilitator/barrier that is the least well-explored in our new model (see Figure 8) and is an area where additional research and development is needed.

Relationship Between the ABC Dimensions of Engagement and Support Indicators

In this research we adopted a model of learner engagement that contained the three dimensions of affective, behavioral, and cognitive. Like others before us, we acknowledge that these dimensions overlap substantially (Ainley, 2012; Pekrun & Linnenbrink-Garcia, 2012). Ainley (2012) explained that these overlaps "highlight the need for close scrutiny of these constructs and the relations between them" (p. 285). Betts (2012) explained that the multidimensionality of learner engagement and "the great deal of overlap between the different types of engagement" makes developing an instrument to measure engagement "quite difficult" (p. 786).

Despite these challenges, when measuring the ABC dimensions of engagement, we found strong evidence that our measurements reflected reality well. We also found that each of the dimensions of engagement contributed relatively equally to the overall superfactor of Academic Engagement. We view this as an important contribution to the field.

The ACE framework (Borup et al., 2020) identified support indicators and aligned them to one of the ABC dimensions of engagement. As a result, our instrument also attempted to measure the support indicators as identified by the ACE framework. Specifically, support for affective and behavioral engagement both had three indicators, and support for cognitive engagement had two indicators. Similar to our attempt at measuring the ABC dimensions of engagement, our analysis of the support indicators provided strong evidence that the model was defensible.

While our efforts to measure the dimensions of engagement and the supports for engagement were largely successful, we did experience difficulties as predicted by Betts (2012) when addressing the hypothesis that those support indicators are positively correlated with a particular dimension of engagement. We were surprised to see that only Support for Affective Engagement was strongly associated with the measure for Affective Engagement and similar associations were not found between Support for Behavioral Engagement and Behavioral Engagement or between Support for Cognitive Engagement and Cognitive Engagement. In fact, Support for Affective Engagement was associated with all three of the ABC dimensions of engagement. This finding underlines the importance of support for affective engagement. Other frameworks such as the Community of Inquiry (Garrison et al., 2000) also highlighted the importance of affective elements, such as social presence, to online learners' ability to participate in and learn from course activities such as online discussions. In fact, in an earlier version of the ACE framework, Borup et al. (2014) recognized a sense of closeness and social presence as *enabling variables* because they allowed for support efforts to be more successful.

While we did not find all the expected relationships, we did find that the overall support for academic engagement had an extremely strong effect on overall academic engagement. As a result, we recommend that the current instrument be used for measuring overall supports for academic engagement. We also call on additional research to better understand which support indicators are particularly impactful for each of the ABC dimensions of engagement.

Conceptually we and other researchers have made distinctions between the dimensions of engagement and aligned supports to specific dimensions but in practice, there are considerable overlaps. As a result, when support is offered to increase one dimension of engagement it will likely have an impact on the other dimensions. As Betts (2012) explained, any effort to measure the dimensions of learner engagement and the supports that impact them will encounter obstacles. Success in this area will prove elusive and will likely require collaborative and iterative approaches to research. We see this research study and instrument as an important step in the process but also recognize that a large amount of work remains.

We also call on researchers to replicate this research using the Spanish version of the ACE-HE instrument in other Spanish-speaking countries as well as the English version of the ACE-HE instrument using data collected in the United States and other countries where English is the primary language spoken. Learner engagement and the support provided by community actors is fundamentally a social experience that is highly influenced by culture. Additional research conducted culturally different contexts may result in different findings. Similarly, validating the English version of ACE-HE instrument is important prior to widely using that version of the instrument. While the structural equation modeling found good fit for both the model of ABC engagement dimensions and the model of institutional support for ABC engagement dimensions using the data collected with the Spanish version of the ACE-HE instrument, this validation should not be applied to the English version of the instrument considering the imperfect nature of translation from one language to another.

Conclusion

The ABC dimensions of learner engagement are important for positive outcomes in online courses and their absence has been highlighted as contributing factors for online learning's attrition rates that tend to be higher than those in in-person courses. When learner engagement is low, support from others can help. However, online programs need better measures of learner engagement so that they can identify and respond to low learner engagement. Repeated measures of learner engagement can also help online programs see the impact of their support efforts. Building on the ACE framework, the data collected using our new instrument was found to be a good fit for both the model of the ABC dimensions of engagement and the model of institutional support for ABC dimensions of engagement. However, the correlations between the support elements and their intended dimension of engagement did not entirely follow the model hypothesized by the ACE framework. These results are insightful but should be understood with the context and limitations of this research. Mainly, this research was conducted at a single university in Colombia and additional research within other universities, countries, and cultures may have different findings. Additionally, more research is needed examining the correlations between specific support indicators and the dimensions of engagement.

Declarations

The authors declare no conflicts of interest associated with this study.

Collection of data from human subjects was conducted under institutional guidelines of data protection and confidentiality reviewed by the General Secretary Office at UNAB.

The authors declare no funding associated with this study.

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Appendix A

Institutional Academic Community of Engagement (ACE) Survey 1.0
University Support for Academic Engagement—Higher Education
English-Spanish Translation

English	Spanish
In 2020, UNAB University implemented a hybrid/blended education model, which promotes flexibility by combining face to face interactions with video conferences via Microsoft Teams, classrooms set up for broadcasting, and virtual platforms such as Moodle and Canvas for asynchronous moments. The purpose of this survey is to understand students' needs and visualize institutional support actions to improve hybrid education at UNAB.	La Universidad Autónoma de Bucaramanga ha implementado a partir del 2020 un modelo de educación híbrida, conocido también como Ambientes Híbridos de Aprendizaje -AHA-, el cual privilegia la flexibilidad combinando la presencialidad con espacios tales como las aulas virtuales de Microsoft Teams, los salones de clase acondicionados como Teleclases para las interacciones sincrónicas (con horario definido); y las plataformas virtuales TEMA y CANVAS para las interacciones asincrónicas (no sujetas a horario). Esta encuesta tiene como objetivo, conocer las necesidades de los estudiantes y las oportunidades de mejora en el apoyo institucional para seguir consolidando el modelo de educación híbrida en la UNAB. La encuesta está compuesta por 5 secciones, tiene un tiempo estimado de diligenciamiento de 15 minutos y evaluará la experiencia durante el primer semestre de 2021.

English	Spanish
1. Academic Success ● How many courses did you take the first semester of 2021 in the online/blended modality? ○ 0 courses ○ 1 course ○ 2 courses ○ 3 courses ○ 4 courses ○ 5 courses ○ 6 courses ○ 7 courses ○ 8 courses ○ More than 8 courses	**1. Desempeño académico** ● ¿Cuántos cursos matriculó el primer semestre de 2021 en ambientes híbridos/virtuales en la UNAB? ○ 0 cursos ○ 1 curso ○ 2 cursos ○ 3 cursos ○ 4 cursos ○ 5 cursos ○ 6 cursos ○ 7 cursos ○ 8 cursos ○ Más de 8 cursos

• How many online/blended courses did you withdraw from before the end of the first semester of 2021? ○ 0 courses ○ 1 course ○ 2 courses ○ 3 courses ○ 4 courses ○ 5 courses ○ 6 courses ○ 7 courses ○ 8 courses ○ More than 8 courses	• ¿Cuántos cursos dio de baja en el primer semestre de 2021 en ambientes híbridos/virtuales? ○ 0 cursos ○ 1 curso ○ 2 cursos ○ 3 cursos ○ 4 cursos ○ 5 cursos ○ 6 cursos ○ 7 cursos ○ 8 cursos ○ Más de 8 cursos
• How many online/blended courses in the first semester of 2021 did you score less than a 3 grade (3.5 grade for graduate courses)? ○ 0 courses ○ 1 course ○ 2 courses ○ 3 courses ○ 4 courses ○ 5 courses ○ 6 courses ○ 7 courses ○ 8 courses ○ More than 8 courses	• ¿Cuántos cursos culminó en el primer semestre de 2021 en ambientes híbridos/virtuales con nota menor a 3.0? (3.5 para posgrados)? ○ 0 cursos ○ 1 curso ○ 2 cursos ○ 3 cursos ○ 4 cursos ○ 5 cursos ○ 6 cursos ○ 7 cursos ○ 8 cursos ○ Más de 8 cursos
• How satisfied were you with your overall experience in your online/blended courses during the first semester of 2021? ○ 0=very unsatisfied ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6=very satisfied	• ¿Qué tan satisfecho estuvo con la experiencia en general de los cursos en el primer semestre de 2021 en ambientes híbridos/virtuales? ○ 0=muy insatisfecho ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6=muy satisfecho

English	**Spanish**

2. Academic Engagement **STEM:** Rate your agreement with the following statements about your online learning experience this past academic year . . . (1=strongly disagree to 6=strongly agree)	**2. Compromiso académico** **Instrucción:** Evalúe los siguientes enunciados con relación a su experiencia en ambientes híbridos/virtuales durante el semestre pasado. (1=totalmente en desacuerdo hasta 6=totalmente de acuerdo)

● I highly enjoyed my online learning experiences. ● I did not feel frustration while learning online. ● I felt emotionally connected to others in my online learning experiences. Overall, I felt highly interested in the topics covered in my online courses.	● Disfruté en gran escala mi experiencia de aprendizaje en ambientes híbridos/virtuales ● No sentí frustración en mi experiencia de aprendizaje en ambientes híbridos/virtuales ● Me sentí emocionalmente conectado con otros en mi experiencia en ambientes híbridos/virtuales En general, sentí gran interés por los temas abordados en los cursos en ambientes híbridos/virtuales
● I have been able to fully participate in my online learning experiences. ● I have made good progress towards my learning goals by consistently completing my online work. ● I have been able to spend the time needed to be successful in my online learning experiences. ● I have been able to manage my own efforts when learning online.	● He logrado participar activamente en mis experiencias de aprendizaje en ambientes híbridos/virtuales ● He obtenido un progreso notable en el logro de mis aprendizajes, al terminar constantemente las tareas en ambientes híbridos/virtuales ● He sido capaz de dedicar el tiempo necesario para tener éxito en mis experiencias de aprendizaje en ambientes híbridos/virtuales ● He sido capaz de enfocar mis esfuerzos personales para aprender en ambientes híbridos/virtuales
● I have been able to consistently focus my attention on the online learning tasks I am working on. ● I have been able to exert the mental energy necessary to learn difficult concepts online.	● He sido capaz de enfocar constantemente mi atención en las tareas en ambientes híbridos /virtuales ● He sido capaz de destinar la energía mental necesaria para aprender conceptos difíciles en ambientes híbridos/virtuales

• I have been persistent (not given up) in my online learning experiences. • I have mastered effective online learning strategies (e.g., questioning, exploring, note taking, checking for understanding).	• He sido persistente (no me he rendido) en mis experiencias en ambientes híbridos/virtuales • Domino eficazmente estrategias de aprendizaje en ambientes híbridos/virtuales (por ejemplo, indagar, explorar, tomar notas, verificar comprensión, etc)

English	**Spanish**
3. Academic Support for Engagement **STEM:** I have a support community at the university (e.g., instructors, advisors, classmates) that helps me to… (1=strongly disagree to 6=strongly agree)	**3. Apoyo institucional para el compromiso académico** **Instrucción:** Relacione esta frase "Cuento con una comunidad de apoyo en la universidad (por ejemplo, profesores, consejeros, compañeros de clase), que me ayudan a…", con las siguientes opciones. (1=totalmente en desacuerdo hasta 6=totalmente de acuerdo)
● feel comfortable communicating with others (e.g., instructors, advisors, classmates) online. ● have opportunities to communicate with others online. ● use a variety of online technologies to communicate with others (i.e., synchronously and asynchronously).	● Sentirme cómodo en la comunicación con otros (por ejemplo, profesores, consejeros, compañeros de clase) en ambientes híbridos/virtuales ● Tener oportunidades de comunicación con otros en ambientes híbridos/virtuales ● Usar una variedad de tecnologías digitales para la comunicación con otros (por ejemplo, sincrónica y asincrónicamente).
● feel accepted by others while learning online. ● feel like an important part of the online learning community. ● develop relationships with others (e.g., instructors, advisors, classmates) online.	● Sentirme aceptado por otros mientras aprendo en ambientes híbridos/virtuales ● Sentirme parte importante de una comunidad de aprendizaje en ambientes híbridos/virtuales ● Mejorar relaciones interpersonales en ambientes híbridos/virtuales (por ejemplo, con profesores, consejeros, compañeros de clase)
● enjoy online learning activities. ● get excited to learn new things in my online learning experiences. ● increase my interests in the subjects/topics I am learning online.	● Disfrutar las actividades de aprendizaje en ambientes híbridos/virtuales ● Sentir entusiasmo por aprender nuevas cosas en ambientes híbridos/virtuales. ● Incrementar mi interés por los temas aprendidos en ambientes híbridos/virtuales
● feel comfortable communicating with others (e.g., instructors, advisors, classmates) online. ● have opportunities to communicate with others online.	● Sentirme cómodo en la comunicación con otros (por ejemplo, profesores, consejeros, compañeros de clase) en ambientes híbridos/virtuales ● Tener oportunidades de comunicación

• use a variety of online technologies to communicate with others (i.e., synchronously and asynchronously).	con otros en ambientes híbridos/virtuales • Usar una variedad de tecnologías digitales para la comunicación con otros (por ejemplo, sincrónica y asincrónicamente).
• feel accepted by others while learning online. • feel like an important part of the online learning community. • develop relationships with others (e.g., instructors, advisors, classmates) online.	• Sentirme aceptado por otros mientras aprendo en ambientes híbridos/virtuales • Sentirme parte importante de una comunidad de aprendizaje en ambientes híbridos/virtuales • Mejorar relaciones interpersonales en ambientes híbridos/virtuales (por ejemplo, con profesores, consejeros, compañeros de clase)
• enjoy online learning activities. • get excited to learn new things in my online learning experiences. • increase my interests in the subjects/topics I am learning online.	• Disfrutar las actividades de aprendizaje en ambientes híbridos/virtuales • Sentir entusiasmo por aprender nuevas cosas en ambientes híbridos/virtuales. • Incrementar mi interés por los temas aprendidos en ambientes híbridos/virtuales
• troubleshoot technological issues related to my online learning. • learn the digital platforms I need to be successful in my online learning experience. • know what it takes to be successful in online learning experiences.	• Resolver problemas tecnológicos relacionados con el aprendizaje en ambientes híbridos/virtuales • Conocer adecuadamente las plataformas digitales para tener éxito en la experiencia de aprendizaje en ambientes híbridos/virtuales • Saber lo que se requiere para tener éxito en ambientes de aprendizaje híbridos/virtuales
• develop time-management skills for online learning • use online technologies to track projects and due dates. • learn how to keep my online environment organized.	• Desarrollar habilidades de manejo del tiempo para el aprendizaje en ambientes híbridos/virtuales • Usar herramientas digitales para hacer seguimiento a proyectos y cumplimiento de plazos • Aprender a mantener organizado el entorno para el aprendizaje en

	ambientes híbridos/virtuales
• keep working on my online assignments even when it's difficult. • meet online assignment deadlines. • recover following academic setbacks such as missing assignments or getting a poor grade.	• Seguir trabajando en las tareas en ambientes híbridos/virtuales, incluso cuando éstas sean difíciles • Cumplir con los plazos de entrega de tareas en ambientes híbridos/virtuales • Recuperarse de retrocesos académicos, tales como incumplir con una tarea u obtener una mala nota
• learn new concepts online in a way that I can understand. • find answers to difficult concepts when I have questions related to online learning activities. • get useful feedback on my online assignments.	• Aprender y comprender bien nuevos conceptos en ambientes híbridos/virtuales • Encontrar respuestas a conceptos difíciles cuando se tengan preguntas sobre actividades en ambientes híbridos/virtuales • Obtener retroalimentación efectiva en las tareas realizadas en ambientes híbridos/virtuales
• work with others to understand online course material. • collaborate with others to complete a course assignment online. • learn from online interactions with others.	• Trabajar con otros en comprender los materiales y recursos dispuestos en los ambientes híbridos/virtuales • Colaborar con otros en culminar las tareas en ambientes híbridos/virtuales • Aprender del relacionamiento con otros en ambientes híbridos/virtuales

English	**Spanish**
4. Demographic Data	**4. Información Demográfica**
• Please identify your gender. ○ Female ○ Male ○ Non-binary ○ Prefer not to say	• Favor identificar su género ○ Femenino ○ Masculino ○ No-binario ○ Prefiero no responder
• Please identify your age (in years). ○ Select numbers from pulldown list	• Favor identificar su edad (en años). ○ Menos de 17 años ○ 17 años

○ Less than 17 years ○ 17 years ○ 18 years ○ … ○ 99 years	○ 18 años ○ 19 años ○ … ○ 99 años ○ Más de 99 años
● Please identify your socio-economic level. ○ Level 1 ○ Level 2 ○ Level 3 ○ Level 4 ○ Level 5 ○ Level 6	● Favor seleccionar su estrato socio-económico. ○ Estrato 1 ○ Estrato 2 ○ Estrato 3 ○ Estrato 4 ○ Estrato 5 ○ Estrato 6
● Please identify your academic level. ○ Undergraduate ○ Graduate	● Favor identifique el nivel que está estudiando. ○ Pregrado ○ Posgrado
● Please identify the semester you are enrolled in. (options) ○ Semester 1 ○ Semester 2 ○ Semester 3 ○ Semester 4 ○ Semester 5 ○ Semester 6 ○ Semester 7 ○ Semester 8 ○ Semester 9 ○ Semester 10	● Favor identifique el semestre que está cursando actualmente. ○ Semestre 1 ○ Semestre 2 ○ Semestre 3 ○ Semestre 4 ○ Semestre 5 ○ Semestre 6 ○ Semestre 7 ○ Semestre 8 ○ Semestre 9 ○ Semestre 10
● Please identify the academic program you are enrolled in. ○ UNAB provided graduate or undergraduate options based on student answer to the previous question "academic level" (programs listed underneath alphabetically) ○ Other	● Favor identifique el programa académico en el que se encuentra matriculado. ○ UNAB proporcionó opciones de posgrado o pregrado según la respuesta del estudiante a la pregunta anterior "nivel académico" (los programas se enumeran debajo en orden alfabético) ○ Otro
● How would you describe your employment status? ○ Not employed	● ¿Cuál es su situación laboral actual? ○ No me encuentro trabajando actualmente

○ Part-time work ○ Full-time work	○ Trabajo parcialmente ○ Trabajo tiempo completo
Identify how much of a barrier each of the following are to your participation in your online learning . . . (Scale: 0=no barrier to 6=very large barrier) ● Transportation difficulties (cost, access, travel time, etc.) ● Internet access/speed in my home ● Access to a good computer ● Access to affordable housing in the metropolitan area ● Access to technical support ● Family environment (childcare, care for parents, etc.) ● Work schedule complications	Valore las siguientes situaciones como posibles obstáculos para su efectiva participación en ambientes híbridos/virtuales. (Escala: 0=no es un obstáculo a 6=es un gran obstáculo) ● Dificultades de transporte (costo, acceso, tiempo de desplazamiento, etc.) ● Acceso y velocidad de Internet en casa ● Acceso a un buen computador ● Acceso a residencia económica en el área metropolitana de Bucaramanga ● Acceso a apoyo técnico ● Ambiente familiar (cuidado de niños, cuidado de adultos mayores,etc.) ● Conflicto de horarios por obligaciones laborales

English	**Spanish**
5. Open-ended Question Please share any comments or ideas you have about how the university can better support your academic engagement in online/blended environments?	**5. Pregunta abierta** A continuación, te agradecemos compartir comentarios o sugerencias sobre ¿cómo puede la universidad apoyar mejor tu compromiso académico en ambientes híbridos/virtuales?

Using AI to Evaluate a Competency-Based Online Writing Course in Nursing

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Abstract
Nursing education is transitioning from traditional teaching to competency-based education. Additionally, more nursing courses and programs are now offered online. Scholarly writing is a powerful strategy to teach effective communication and critical thinking, both core competencies for safe and effective nursing practice. However, teaching writing online to nursing students is challenging due to a lack of research evaluating best practices, faculty time constraints, and inconsistent writing assessment. Automated essay scoring systems using artificial intelligence (AI) provide new opportunities for efficient, reliable, and valid assessment of writing skills. We used a quasi-experimental design to investigate the impact of a 14-week fully online competency-based writing course on students' self-efficacy, task value, and writing performance. The participants were master's nursing students enrolled in an existing one-semester online competency-based writing course for healthcare professionals. An AI-powered writing assessment, IntelliMetric®, and the SAWSES self-efficacy survey were administered pre- and post-intervention. The results showed statistically significant gains in self-efficacy and writing performance with large effect sizes. This study addresses the gap in nursing education regarding the assessment of online, research-based writing interventions on students' scholarly writing capacity. Recommendations include implementing a required scholarly writing course in all graduate-level nursing programs, scaffolding students' competency development with the cognitive apprenticeship model, using best practices from composition research to inform online instruction, and employing AI-powered automated essay scoring to evaluate students' writing progress and instructional efficacy.

Keywords: online writing instruction, competency-based education, cognitive apprenticeship, automated essay scoring, writing in the disciplines

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The demand for online nursing courses has been growing. For example, from 2015 to 2019, the enrollment of master of science nursing students in distance learning programs increased by 13.7% (American Association of Colleges of Nursing [AACN], 2021b). In 2016, the number of online students in the U.S. increased for the fourteenth consecutive year, and 31.6% of all higher education students reported taking at least one distance education course (Seaman et al., 2018). In 2020, the COVID-19 pandemic prompted even more faculty and students to adopt virtual learning (2021b). Currently, there are 614 schools in the U.S. offering online nursing programs (Peterson's, n.d.), and 93% of nursing educators reported using online and/or distance learning (Wolters Kluwer, 2020). Online instruction offers flexibility and choice for students, particularly nurses already in practice. Based on a survey of the Graduate Nursing Student Academy, graduate students reported a preference for online/distance learning as opposed to mandatory in-person classes, eliminating PowerPoint-based lectures, and more training to improve faculty's use of educational technologies (Leaver et al., 2022). The growing technological landscape of higher education challenges nursing schools and educators to adopt best practices in online learning to remain competitive.

Nursing education is also in the midst of a paradigm shift from traditional, lecture-based teaching to competency-based education (Wolf, 2022). Competency-based education enables students to develop and demonstrate the essential knowledge, skills, and attitudes required to provide safe and effective care in our increasingly complex and dynamic healthcare system. The American Association of Colleges of Nursing (2021a) is leading this transformation through new competency standards reflecting the current and future needs of the profession. In response to the same shifts in the healthcare environment, the National Council of State Boards of Nursing (2023) has just launched a radically different nursing board exam focusing on cognitive competencies such as clinical judgment and decision-making.

Writing remains an essential educational strategy in nursing education. Scholarly writing enables the assessment of critical cognitive competencies required for nursing practice. Writing assists nurses in practicing, developing, and demonstrating critical thinking, clinical judgment, and decision-making. Nursing faculty recognize the importance of providing students opportunities to improve and demonstrate their critical thinking because it directly impacts patient care. Brennan et al. (2004) found that 65% of nursing errors resulted from poor clinical decision-making skills. Recognizing the importance of these cognitive skills for nursing care, the National Council of State Boards of Nursing (NCSBN, 2023) has transformed its 2023 certification exam to focus on assessing the clinical judgment of newly graduated nursing students. Clinical judgment is "an observed outcome of critical thinking and decision-making" (NCSBN, 2019, para. 1). Critical thinking and decision-making skills are integral to nurses providing quality patient care.

Writing also encompasses vital communication competencies for nurses. Clear writing is an integral part of documentation, patient education, and communication with colleagues, particularly for advanced practice nurses like nurse practitioners (McQuerrey, 2017). The World Health Organization (2016) and the American Nursing Association (2015) have cited communication skills as a core competency for nurses. Clear, effective communication between nurses and patients is critical to positive patient outcomes (Sibiya, 2018). Furthermore, Oermann et al. (2015) asserted that master's and doctoral-level nurses need to learn how to share and publish their results from evidence-based practice research to lead the profession forward. Scholarly writing instruction is integral to nursing education because it has been shown to promote critical thinking and improve communication skills, thereby improving nursing practice (Gazza & Hunker, 2012; Jefferies et al., 2018; Zygmont & Schaefer, 2006).

Although faculty recognize the importance of teaching writing, they face enduring and formidable challenges to effective instruction. Recurring issues with the lack of quality and development in student writing have been noted by college professors since the early 1900s (Bean, 2011) and among nursing faculty (Bickes & Schim, 2010; Gazza & Hunker, 2012; Oermann, 2013; Roberts & Goss, 2009). Common themes include frustration with students' lack of correct grammar and citation style, poor organization of ideas, inadequate synthesis representing a deep understanding of the research literature, and problems with writing coherence and clarity (Lea & Street, 2006; Bean, 2011). Other researchers have found that nursing students report low task value for scholarly writing (Borglin & Fagerstrom, 2012; Johansen & Harding, 2013; Smith & Caplin, 2012; Whitehead, 2002). Too often, graduate students progress through their coursework to graduation without demonstrating sufficient mastery of written communication and underlying critical thinking competencies (Bickes & Schim, 2010).

Nursing faculty struggle to teach writing effectively to nursing students for several reasons. For example, there is a lack of a standardized requirement and approach to teaching nursing students discipline-specific writing skills from within the profession (Andre & Graves, 2013; Oermann et al., 2015). Outside the nursing profession, there are established best practices in writing pedagogy, but most nursing faculty are not formally educated in writing pedagogy. Not surprisingly, nursing faculty tend to rely on the positivist-influenced instructional methods by which they were taught (Gimenez, 2012). Thus, nursing faculty tend to fixate on grammar and formatting errors and take a deficit approach to students' writing rather than an approach aimed at developing the cognitive skills required for effective argumentation and clear communication (Borglin & Fagerstrom, 2012; Brannon et al., 2008). Finally, amidst a global nursing shortage, many faculty members are expected to work clinically as well as teach (Worrall-Carter & Snell, 2003; Zhang et al., 2018), leaving little time for the work of commenting on student drafts or learning new online pedagogical techniques.

One major challenge to developing a standardized, evidence-based approach to the online teaching of writing in nursing and other fields is the collection of valid data on writing performance. Traditionally, assessing writing takes significant time for faculty to read and grade lengthy assignments. Evaluations of writing instruction include subjective information regarding faculty and/or student satisfaction, but quantitative data are also needed to test the effectiveness of instruction on improving students' writing performance (Hawks et al., 2016; Oermann et al., 2015; Troxler et al., 2011). However, automated essay scoring (AES) systems empowered by artificial intelligence provide new opportunities to assess student writing in a way that is valid, reliable, and efficient.

In this paper, we report on a study that evaluated the impact of an online writing course for master's level nursing students on their writing competencies, combining best practices in writing pedagogy with established principles of online instruction and AES assessment. We argue that online learning can offer effective and flexible opportunities for nursing students to develop their writing skills using a cognitive apprenticeship framework. We employed a combination of survey instruments to measure writing self-efficacy and task value and automated essay scoring to measure writing performance using a quasi-experimental design. Our research question was, how does a discipline-specific online writing course affect students' self-efficacy, task value, and scholarly writing performance?

Literature on Online Writing Instruction and Assessment

Warnock (2009) asserted that effective online writing instruction depends on migrating well-established writing pedagogy into online contexts. Central to this pedagogy is the understanding that writing is a social practice. A review of the literature on online writing instruction supports this assertion. Stewart (2021) elaborated on the importance of social presence in online writing instruction, a crucial aspect of writing as a social practice. Stewart suggested that creating a sense of "realness" and fostering social interactions are vital for effective online writing instruction. Grigoryan (2017) underscored the importance of interaction between instructor and student through effective feedback, highlighting the need for developing teaching practices and approaches to feedback designed specifically for online learning environments. Hawisher & Pemberton (2019) conducted a text analysis of discussion boards and assignments in an asynchronous online composition course, with results highlighting the importance of fostering discourse, providing constructive feedback, and promoting self-reflection among students.

However, these research-based recommendations are not always adhered to in online settings. Kwak (2017) conducted an analysis of Massive Open Online Courses (MOOCs), and the findings suggested the online designers ignored best-practices in writing pedagogy, and focused on describing discrete skills like grammar, rather than the social practice of writing. Kwak's research reinforces the importance of using rubrics to ensure that online instructors and designers are using best practices. Zimmerman et al. (2020) asserted that Quality Matters (n.d.) provides a robust, research-based, and regularly updated framework for online course quality assurance. A review of relevant literature revealed multiple studies about online writing instruction, including case studies, surveys, and qualitative studies. However, we did not find any empirical studies evaluating the impact of specific online writing interventions on learning. One reason for the lack of empirical data on outcomes may relate to a lack of valid instruments for measuring writing proficiency. Artificial intelligence may offer a solution.

There is an extensive and growing body of research on the use of artificial intelligence (AI) supported by automated essay scoring (AES). The use of AES can improve efficiency, provide instant feedback to students, enhance validity, and provide 100% test-retest reliability (Hussein et al., 2019). AI systems have strong construct validity measuring subsets that are integral to the scholarly writing process in alignment with pedagogical practices. For example, the IntelliMetric® AES has subsets based on the hierarchy of writing concerns, a concept that has been widely recognized and used in the field of academic writing (Wolf & Wolf, 2022; Bean, 2011; Harvard Writing Project, 2007). The hierarchy is divided into two categories: higher-order concerns (meaning-based skills such as focus, development, and organization) and lower-order concerns (grammar, language usage, and sentence mechanics). The IntelliMetric® assessment, for instance, measures similar constructs, thereby validating the writing assessment's construct validity (Haisfield et al., 2012).

Despite the demonstrated validity, the use of Automated Essay Scoring (AES) systems has been met with criticism, primarily due to their inability to directly measure the author's critical thinking, logic, quality of evidence, creativity, or other subtleties employed by expert writers (Deane, 2013). However, even though the measurement of these constructs is not direct, writing assessment by AES maintains a high correlation with human scorers in these categories (Bennett, 2011). Furthermore, the limitations of AES systems may not apply to more sophisticated systems like IntelliMetric®. IntelliMetric® has shown reliability and validity across multiple studies, aligning with the manual scoring of experts, accurately scoring across multiple content areas and grade levels, and providing stable results across various samples (Elliot, 2003; Rudner et al., 2006). Thus, AES can serve as a valid measure of writing proficiency with constructs aligned with a hierarchy of concerns, with high reliability and improved efficiency, making it an ideal measure for this study.

An Overview of Best Practices in Discipline-Specific Writing Instruction

Writing instruction serves several purposes within a competency-based approach to nursing education. First, scholarly writing helps nurses develop critical thinking (Goodman, 2011; Lavelle et al., 2013) and communication skills (Gazza & Hunker, 2012; Luthy et al., 2009; Whitehead, 2002). Second, nurses need to understand research and apply it in evidence-based practice. This requires developing the ability to synthesize evidence echoing the process of writing a formal thesis-driven research paper (Jefferies et al., 2018). Third, students write to an intended audience of nursing colleagues and researchers, allowing them to develop their professional identity as nursing scholars and start contributing to a professional discourse community that advances knowledge to improve practice (Borglin, 2012; Tyndall & Scott, 2017). Finally, writing offers opportunities to develop a reflective practice where nurses can direct their learning, set goals, self-monitor, and regularly evaluate their performance as healthcare professionals (Billings & Kowalski, 2006; Binding, 2010; Carter, 2008; Jefferies et al., 2018; Naber & Wyatt, 2014).

Researchers have found that there are ways to support students' writing and clarify their expectations for student work that are directly relevant to supporting the development of writing-related competencies. Because writing is a form of communication, social context and mediation is an effective method to improve students' writing. Faculty can address higher- and lower-order writing concerns and provide a balance of praise and recommendations. Reflective writing within a discipline can be a way to help nurses develop not only as writers but also as reflective practitioners. These findings echoed the literature on online writing instruction.

Sequenced Instructional Design

Writing research reveals several ways to promote writing development through sequenced instructional design. Brown et al. (2018) found that students were most satisfied with online lessons that are well-structured and clear, with logical sequencing that is easy to follow, and that this is an often taken-for-granted part of instructional design overlooked in quality standards. Ideally, writing assignments and writing-intensive courses should be intentionally weaved throughout a program to create multiple opportunities for writing across the curriculum (Hawks et al., 2016; Luthy et al., 2009; Oermann et al., 2015). The writing across the curriculum approach is based on the following principles: writing is linked to thinking and transformative learning, writing is contextual and requires learning discipline-specific modes of discourse, and writing is the responsibility of all faculty and belongs in every class (McLeod & Soven, 2000).

Troxler et al. (2011) performed an integrative review of writing strategies used to teach undergraduate nurses writing. They identified five common elements across the literature: low stakes writing assignments, the importance of faculty training, sequencing assignments, providing students with exemplars, using rubrics, and requiring revision after feedback. The researchers found that program-wide writing initiatives likely included more of these elements than stand-alone workshops or courses. Likewise, Oermann et al. (2015) performed a systematic review of programs for developing nurses' writing skills. They found many examples of writing assignments being added to individual nursing courses to improve writing, some instances of a specific course designed to address writing development, and strategies for writing across the curriculum (WAC). The authors recommended a more planful approach to how writing assignments were designed across a nursing program because students need practice, as well as feedback and the opportunity to revise papers. In agreement with Hawks et al. (2016), Troxler et al. and Oermann et al. also saw a need to evaluate the effectiveness of writing interventions since they were lacking in their reviews.

Luthy et al. (2009) described their implementation of WAC in a baccalaureate nursing program. They found that breaking a paper into parts was helpful for both faculty and students and that ongoing faculty feedback on students' written work strengthened their writing ability. They also reported that the use of peer feedback on first drafts and rubrics saved time for faculty. Gazza and Hunker (2012) created a writing scaffold to facilitate scholarly writing development. Similar to Luthy et al., they recommended sequencing assignments, using rubrics, and providing feedback from faculty, peers, and writing tutors as essential strategies for nursing faculty. Although the writing scaffold was not evaluated for effectiveness, the authors did note that their strategies were evidence-based.

Providing Clear Writing Expectations

Providing clear expectations on assignments is critical not only for students to perform well on writing assessments within a specific class but also for developing writing competencies. Researchers suggest that clear expectations can be communicated effectively through standardized assignment guidance sheets, standardized rubrics, and exemplars or model papers. Bean (2011) asserted that providing students with assignment guidance sheets that specifically explain the purpose, intended audience, required elements, and approach to the writing process can help students learn writing and produce better assignments. Wengel & Fager (2008) found that students who were given these assignment guidance sheets wrote more developed and coherent essays than those who were not. A literature review by Warren & Glass (2010) found that this kind of explicit assignment guidance is an effective way to improve student writing across various disciplines. Ray (2009) found that this approach was also practical for teaching writing to nursing students.

Two studies examined standardizing writing rubrics to be used in a WAC program. Minnich et al. (2018) reported high interrater reliability among faculty using the scholarly writing rubric. Abbott and Shaw (2019) shared their success in creating a hybrid standardized rubric for writing that had common areas of assessment and individualized areas depending on the course's focus.

The use of exemplars, or model papers, was also recommended in the literature. Carter et al. (2018) performed an integrative review of using student exemplars. They found that students valued the faculty's use of exemplars because it gave them confidence and helped clarify faculty expectations. Other researchers mentioned the use of exemplars but did not include an evaluation of that practice (Behrens et al., 2016; Naber et al., 2014).

Socially Mediated Writing Development

As a medium of communication, writing is a social practice that requires rich interaction between students and instructors to learn. The social context of writing includes communicating a message to an audience, understanding what discourse format is required for the situation, and drawing upon prior knowledge (Bean, 2011). Students learn how to manage these elements of writing with the help of accomplished experts who are more knowledgeable about writing in their discipline. McCutchen's (1996) research results suggested that learning from a more skilled writer is necessary for many students to go beyond simple writing processes such as "retrieve and encode" to a more interactive and recursive process. She explained that advanced writers constantly shift between planning for the writing task, transcribing the actual words, and revising what has been written based on their purpose and audience. Novice writers, in contrast, equate writing to only transcribing words onto the page without planning or revision work. Based on previous research studies, McCutchen argued that many early writers will continue using rudimentary writing processes unless they learn strategic, recursive processes from more expert writers. Similarly, Baleghizadeh and Gordani (2012) found that conferences with faculty produced superior writing results compared to direct written feedback in their research study of graduate university students. Overall, the development of inexperienced writers is significantly enhanced with social mediation of the writing task by more experienced others.

In addition to the importance of social mediation in improving students' writing processes, discipline experts are essential to inducting novices into the professional dialogue. Mitchell (2018) argued that because writing is a social construct, writing can be used to teach students the discipline-specific knowledge needed to enter the profession successfully. Ivanic (1998) also recognized the influence of literacy practices from multiple ecological contexts on a writer and their identity development. Planning meaningful social interactions is recommended in online writing settings as well (Grigoryan, 2017; Hawisher & Pemberton, 2019; Stewart, 2021).

Providing Balanced Feedback

Enhancing writing development requires faculty giving and students receiving feedback on drafts (Jefferies et al., 2018). Ball et al. (2009) surveyed students regarding faculty's written feedback on their papers. Students regarded faculty comments that balanced strengths and areas to improve as valuable to their learning. In addition, the students noted the importance of faculty providing sensitive comments, focusing on positives, and reading their papers as supportive believers in their abilities.

Feedback from faculty should be honest, but care must be taken regarding the classroom environment. Edmonson coined the term *psychological safety* when she was researching effective healthcare teams. Psychological safety is characterized by an environment where everyone feels safe enough to share their ideas, questions, or challenges, and take risks without negative repercussions (Edmonson, 1999). She discovered that when people feel safe, they have a higher chance for growth and collaboration. Likewise, researchers have found that students responded better when feedback included *mitigating* comments, where positives were included as well as negatives and framed in an encouraging way (Ball et al., 2009; Chandler et al., 2005; Smith, 2008). As Bean (2011) epitomized, the goal of faculty "is to provide useful instruction, good advice, and warm encouragement" (p. 321).

In addition to praise and psychological safety, effective feedback should be prioritized using a hierarchy of writing concerns. Bean (2011) advised college professors to be strategic when giving students written feedback and to keep in mind that the goal is to help students improve their writing, not point out every error. To that end, he recommended using "a hierarchy of concerns, descending from higher-order issues (ideas, organization, development, and overall clarity) to lower-order issues (sentence correctness, style, mechanics, spelling, and so forth)" (p.

322) and to limit comments to two or three issues per draft. Once students have addressed higher-order concerns, professors can continue to lower-order concerns. The Harvard College Writing Program (2007) advocated for a similar approach, adding that faculty should point out helpful and unhelpful patterns in student writing. An organized approach to feedback guides faculty in attending to the most salient issues first and guides students in efficiently prioritizing their revisions (Wolf & Wolf, 2022).

Promoting Reflection and Growth

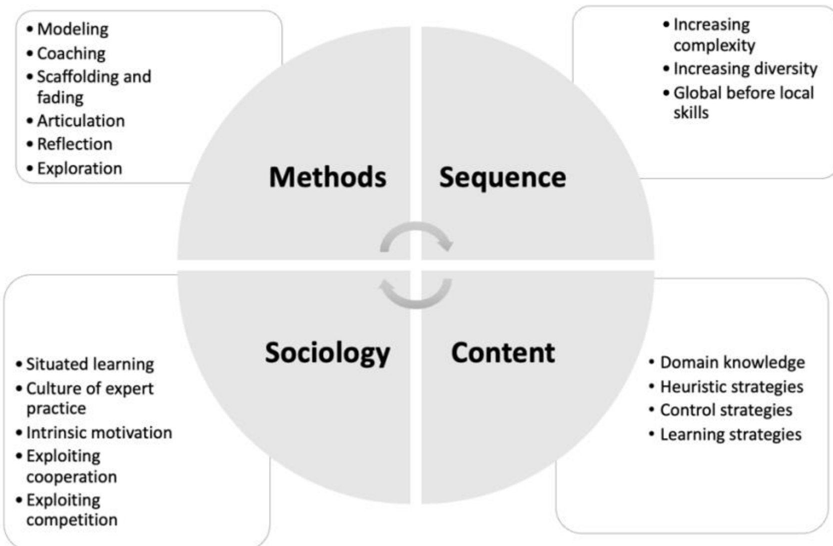
Even though writing is a context-specific, socially mediated task, encouraging students to take ownership of their writing process is vital to their development as autonomous thinkers. There are several ways to help writers examine their written work and ideas. Researchers have found that reflection journals on clinical experiences can help students develop a reflective nursing practice (Billings & Kowalski, 2006; Binding et al., 2010). Based on self-report data, reflective writing has increased students' belief in themselves as competent writers (Carter, 2008). Lavelle et al. (2013) found that students who reflected on their writing earned higher grades and were more likely to engage in the revision process than students who did not. Reflection encourages students to connect new learning and experiences with previous knowledge, analyze problems, and critically evaluate currently held beliefs and ideas. This metacognition about one's thinking enables nurses to assimilate and accommodate new information and processes to become better practitioners (Wolf et al., 2022). Ongoing critical reflection is a necessary skill for nurses to innovate, drive the profession forward, and move dialogue outward to other disciplines.

Theoretical Framework: The Cognitive Apprenticeship Model

Cognitive apprenticeship was the conceptual framework used to combine these best practices in online education with writing pedagogy. The cognitive apprenticeship theory challenges the traditional approach to education in the industrial era focused on rote learning of factual and conceptual knowledge (Collins et al., 1987). Traditional lectures fail to teach professional students the processes and strategies experts use to solve complex problems in real-world contexts. For example, in learning writing, a novice may know the rules of grammar and composition but fail to understand the methods expert writers use to plan, organize, draft, and revise manuscripts in a specific discipline.

Collins et al. (1987) proposed a new framework for designing learning environments based on classic apprenticeships, where students learn complex cognitive skills through structured interactions with teachers. The model comprises four domains: sociology, sequencing, method, and content (Figure 1). Sociology refers to the social environment that situates learning within authentic problems and communities of practice. Sequencing involves the gradual progression of learning from simple to complex tasks and teaching global skills before local ones. The method encompasses the pedagogical methods teachers use to guide students from novice to independent mastery. These specific teaching activities that help students acquire cognitive skills include modeling, coaching, scaffolding, articulation, exploration, and reflection. Finally, content focuses on the types of knowledge needed to become an expert in a domain, such as facts, concepts, and methods of self-regulation that include monitoring and remediating behavior, problem-solving, and learning strategies that facilitate the students' ongoing growth within the community of practice.

Figure 1
A Framework for Designing Learning Environments



Note. This is a graphic representation of the framework presented in Collins, A., Brown, J. S. & Newman, S. E. (1987). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. B. Resnick (Ed.), *Cognition and instruction: Issues and agendas.* Lawrence Erlbaum Associates.

The cognitive apprenticeship model has been used to guide writing pedagogy (Bean, 2011) and research on writing instruction (Bernstein & Greenhoot, 2014; Klucezvsek et al., 2016; Ding, 2008). Cognitive apprenticeship was used as a model to design this online writing course because scholarly writing in nursing requires mastery of complex cognitive skills.

Methodology

Our purpose in this study was to explore the experience of master's nursing students in a discipline-specific online writing course and measure how the course affects students' writing capacity, self-efficacy, and task value. We used a quasi-experimental design. The research question was: How does a discipline-specific online writing course affect students' scholarly writing performance, self-efficacy, and task value?

Study Population

Participants were students enrolled in a course called The Writing Workshop at a school of nursing at a non-profit research-intensive university during the 2021 fall semester. The course enrollment began at 68. Four students who dropped out of the course were excluded from the study, so there were 64 participants with demographic characteristics and master's program membership detailed in Table 1.

Table 1
Demographic Data of Study Participants

Attribute	Frequency	Percent
Gender		
Female	58	90.6
Male	6	9.4
Race/Ethnicity		
Hispanic	2	3.1
American Indian or Alaska Native	2	3.1
Asian	3	4.7
Black or African American	0	0.0
Native Hawaiian or Other Pacific Islander	0	0.0
White	54	84.4
2+ Races [a]	2	3.1
Nonresident Alien	1	1.6
Academic Program		
Nurse Practitioner	19	29.7
Certified Nurse Leader	7	10.9
Healthcare Leadership	15	23.4
Nursing Education	10	15.6
Non-matriculated	13	20.3

[a] Two students identified here as 2+ races, one self-identified as Black and Native American, the other as White and Asian.

Procedure

The research protocol was approved by the Institutional Review Boards of the University of Southern California and the University of Rochester. Pre- and post-test survey data on student self-efficacy and task value, and automated essay scoring (AES) of writing proficiency were measured routinely in this course for program evaluation. Using a quasi-experimental design, these data were analyzed to answer the research question.

Intervention

The Writing Workshop is an online course designed to provide master's nursing students with a foundation in scholarly writing, critical thinking, and synthesis to make research-based recommendations to improve clinical practice. Using those objectives, backward design was used as the instructional design method (Wiggins & McTighe, 1998). The course also went through the Quality Matters peer review process and gained certification in 2017. The Quality Matters rubric is based on the eight general standards of course overview and introduction, learning objectives, assessment and measurement, instructional materials, learning activities and learner interaction, course technology, learner support, and accessibility and usability (Quality Matters, n.d). An online course needs to achieve 85% on the rubric and meet all essential standards to achieve certification.

The AES was used in a few ways. First, it provided a quick, objective measure of students' academic writing ability. These scores helped ensure an equitable distribution of students among the course faculty. Second, it gave the faculty and students a baseline for each student's writing strengths and weaknesses. Students were encouraged to use this information in setting their own personal goals for the semester. Finally, students were asked to reflect on the changes in their AES scores at the end of the course, providing them with comparable data points to evaluate their progress and set new writing goals for the future.

The course pedagogy was based on the four components of the cognitive apprenticeship model (Collins et al., 1987). Our adaptation to online writing is represented in Figure 2.

1. Sociology considers the learning environment: Students in the course explore a real-world problem faced by nurses in their area of clinical practice. Social mediation of learning is promoted through weekly interactions with a team of experts in writing and/or nursing (Baleghizadeh & Gordani, 2012). The faculty intentionally foster psychological safety (Edmonson, 1999) to create a class culture conducive to taking risks and experimenting without fear of judgment. Elements of building online relationships were also incorporated by providing instructor-created video content, defining course expectations, asking questions, using videoconference webinars and individual student meetings, and providing weekly individualized feedback (Martin, 2019).
2. Sequencing: The course is divided into 14 weekly modules designed to scaffold students' progress through stages of an iterative writing process: (a) define a problem; (b) search the literature for applicable studies; (c) critically read, summarize, and synthesize the results; (d) create an outline and thesis; (e) participate in peer review; (f) develop a classical argument supported by evidence; and (g) use revision strategies to improve presentation of scholarly thinking and argumentation. Discipline-specific writing expectations are clarified using detailed assignment guidance and a standardized rubric for scholarly writing (Troxler et al., 2011). Faculty use a hierarchy of writing concerns to guide students through the revision process in an organized way, focusing on higher-order thinking skills before lower-order (Bean, 2011; Wolf & Wolf, 2022).
3. Method: This course employs a flexible "scale of help" to support students' autonomy and writing competency. Each student is assigned to work with the same faculty mentor throughout the course. Formative feedback from faculty is provided on each weekly assignment and students learn how to engage in peer review (Oermann et al., 2015) and ongoing reflection. Faculty differentiate feedback based on student needs. In the final stages of the writing process, students keep revising and receiving feedback until their writing meets expectations for early graduate-level work.
4. Content: Students learn higher-order writing strategies to improve their focus, use of evidence, and organization of ideas. Students also learn to control lower-order writing concerns such as paragraph organization, sentence structure, transitional devices, diction, and using APA style citations and formatting. Students are guided from reading research to constructing knowledge, synthesizing ideas, and discerning how to best present their research-based recommendations to a professional audience.

Figure 2
The Cognitive Apprenticeship Model in Online Writing Instruction

Note. This model is based on Collins et al.'s (1987) Framework for Designing Learning Environments.

Data Collection

Writing assessment data were collected within the first week of the Writing Workshop. All students were given the same prompt for the pre-test. The one-hour assessment is web-based so it is hosted, scored, and stored on Vantage Labs' server and reports can be downloaded by school administrators. The post-intervention assessment was given in the last two weeks of the writing course. Students were given a different writing prompt on the post-test.

Survey on Situated Academic Writing Self-Efficacy Scale

The *Situated Academic Writing Self-Efficacy Scale,* developed by Mitchell et al. (2021), was used in the creation of the school's self-efficacy survey. This survey is based on Bandura's (1997) concept of self-efficacy, as part of his social cognitive theory (Bandura, 1986), and was used to provide deeper insight into students' writing development. Self-efficacy is the idea that one's beliefs about their ability affect their motivation and achievement. Specifically, self-efficacy mediates a person's ability to maintain effort, progress towards a learning goal, and persist despite challenges. Participants in the study were given a pre- and post-intervention self-efficacy survey on scholarly writing to measure any differences in self-efficacy after the writing intervention and facilitate students' reflection on their confidence about writing (see Appendix A for a list of the survey questions).

The scale was originally developed with nursing students and was later validated with interdisciplinary undergraduate and graduate students. The survey is divided into three subscales that address more complex features of scholarly writing as students make progress through the survey, including: (a) writing essentials focusing on confidence with word choice, and synthesizing evidence; (b) relational reflective writing focusing on using feedback for revision, monitoring, and reflecting on their writing process; and (c) creative identity focused on perceptions of creativity, writing voice, and general confidence about scholarly writing.

Survey on Task Value

Students' task value for scholarly writing was also measured on the survey. Task value is a component of expectancy-value theory and represents the value a person places on a specific task, helping them attain a desired goal. Like self-efficacy, task value affects a student's motivation to engage in, persist with, and perform well on a task that they value (Eccles & Wigfield, 2002). Questions from *A Manual for the Use of the Motivated Strategies for Learning Questionnaire* (MSLQ; Pintrich et al., 1991) were adapted regarding the task value component of motivation. These questions were framed within the context of learning scholarly writing. The six questions include two questions about utility value, two questions on intrinsic value, and two on the attainment value of scholarly writing (see Appendix A for a list of the survey questions).

Automated Essay Scoring of Writing Proficiency

The automated writing assessment was developed by Vantage Labs using the artificial intelligence (AI) called IntelliMetric®. This test was based on a five-level rubric aligned to a similar hierarchy of writing concerns taught in the Writing Workshop. IntelliMetric® has demonstrated reliability and validity (Elliot, 2003; Rudner et al., 2006).

Instrumentation

IntelliMetric® has been used to administer testing for multiple educational institutions at the district, state, and higher education levels. For instance, IntelliMetric® has been used by The College Board, Harcourt Companies, and the Secondary School Assessment Testing Board (Elliot, 2003). Currently, ACT, GMAC, ACER, and ACARA use IntelliMetric® and work with Vantage Labs for automated scoring.

The scoring system for each prompt within the IntelliMetric® system was created by collecting hundreds of written responses from community college students that were scored by faculty. The AI system was trained to recognize patterns in an effective persuasive essay and calculate scores based on the faculty's scoring of hundreds of essays responding to the same prompt. The Intellimetric® AES was based on a five-item rubric created by writing specialists who selected anchor papers from national exemplars for each score point appropriate for college student expectations. The IntelliMetric® test has a rating scale of 1 to 6 for each item and the holistic score, representing a mean of all items. The rubric generally defines a holistic score of three as the equivalent of the writing skills expected of the average first-year undergraduate student, a four would correspond with a college senior, a five would be considered a master's level, and a top score of six would indicate doctoral-level writing (Edelblut, personal communication, April 18, 2022).

Validity and Reliability

This AI-scored writing assessment demonstrates construct validity because the subsets measured are subskills of the scholarly writing process. The subscale scores are based on the hierarchy of writing concerns (Bean, 2011; Harvard Writing Project, 2007; Wolf & Wolf, 2022). These areas are divided into two categories. The higher-order, or global concerns, are the meaning-based skills of focus, development, and organization. The lower-order, or local concerns, include grammar, language usage, and sentence mechanics. The Vantage Labs assessment measures similar constructs: focus and meaning, content and development, organization, language usage, and mechanics (Haisfield et al., 2012). The writing assessment has construct validity because it uses the same constructs as the hierarchy of writing concerns and the writing rubric used for the final paper in the course.

IntelliMetric® has further demonstrated reliability and validity. Elliot (2003) summarized a review of over 100 studies involving the use of IntelliMetric®, showing that this technology aligns with the manual scoring of experts, can accurately score across multiple content areas and grade levels, and provides stable results across various samples. Rudner et al. (2006) examined IntelliMetric® prior to adopting it as a secondary measurement to human raters for GMAT essays and concluded that IntelliMetric® scores matched human raters, the AI was able to identify essays containing plagiarism, and the technology was "superior to simple word counts or simple probability modeling" (p. 12).

Data Analysis

Scores from the AES measures of writing proficiency, self-efficacy survey, and task-value survey were first summarized with descriptive measures of central tendency. To test the effectiveness of the writing intervention, pre- and post-test scores were then analyzed using a paired *t*-test for dependent measures.

Results

Improvement in Self-Efficacy: Self-Efficacy Survey Results

Statistically significant differences between pre- and post-intervention scores were found across all three subscales for writing self-efficacy, including writing essentials (t (49) = 6.8, $p <$ 0.001; d = .96), relational reflective writing (t (48) = 7.7, p < 0.001; d = 1.1), and creative identity (t (47) = 7.8 p < 0.001; d = 1.12). The average scores were all higher on post-test scores compared to pre-test scores, indicating a significant improvement in students' reported self-efficacy after completing the Writing Workshop (see Table 3). Effect sizes for these differences were large (Cohen's d > 0.8), demonstrating clinical as well as statistical significance (Cohen, 1988). These results are summarized in Table 2.

Table 2

Pre- and Post-Test Scores on Self-Efficacy and Task Value

Subscales	Test	*M*	*N*	*SD*	*t*	*df*	*p*	*d*
Writing essentials	Pre	6.08	50	1.69	6.8	49	0.001	0.96
	Post	7.89	50	1.47				
Relational reflective writing	Pre	6.68	49	1.40	7.7	48	0.001	1.10
	Post	8.25	49	1.10				
Creative identity	Pre	5.70	48	1.48	7.8	47	0.001	1.12
	Post	7.72	48	1.48				
Task value	Pre	7.93	50	1.50	0.8	49	>0.05	0.11
	Post	8.08	50	1.49				

No Change in Task Value for Scholarly Writing: Task Value Survey Results

The difference between task value pre- and post-course scores was not significant (t (49) = 0.8, $p > 0.05$; $d = 0.11$). In other words, respondents reported approximately the same task value score on the pre-test as they did on the post-test (see Table 2). It is notable that survey respondents exhibited high task value for scholarly writing (7.93 out of 10) before the course and that high task value remained consistent after the course (8.08 out of 10).

Table 3

Parametric Statistics: Pre- and Post-Course Writing Assessment Scores

Dimension	Test	*M*	*N*	*SD*	*t*	*df*	*p*	*d*
Focus and meaning	Pre	3.18	57	0.83	14.3	56	0.000	1.9
	Post	4.70	57	0.91				
Content and development	Pre	2.74	57	0.72	12.3	56	0.000	1.63
	Post	4.14	57	0.83				
Organization	Pre	2.82	57	0.66	12.2	56	0.000	1.62
	Post	4.12	57	0.73				
Language usage and style	Pre	2.95	57	0.67	16.2	56	0.000	2.15
	Post	4.77	57	0.93				
Mechanics and conventions	Pre	2.82	57	0.66	15.3	56	0.000	2.03
	Post	4.47	57	0.85				
Holistic Score	Pre	3.19	57	0.81	15.1	56	0.000	2.00
	Post	4.79	57	0.92				

Improvement in Writing Performance: Writing Assessment Results

Statistically significant differences between pre- and post-scores were found across all six subscales of the writing proficiency test, including: focus and meaning (t (56) = 14.3, $p < 0.000$; $d = 1.9$), content and development (t (56) = 12.3, $p < 0.000$; $d = 1.63$), organization (t (56) = 12.2, $p < 0.000$; $d = 1.2$), language usage and style (t (56) = 16.2, $p < 0.000$; $d = 2.15$), mechanics and convention (t (56) = 15.3, $p < 0.000$; $d = 2.03$). The holistic score, representing a mean of means of the subscales also showed a significant difference between pre- and post-tests (t (56) = 15.1, $p < 0.000$; $d = 2.00$). The average scores were all higher on post-test scores, compared to pre-test scores, indicating a significant improvement in writing skills following completion of the Writing Workshop (see Table 3). Effect sizes for these differences were large (Cohen's $d > 0.8$), demonstrating clinical as well as statistical significance (Cohen, 1988).

Discussion

This study has evaluated an existing competency-based writing intervention that used a cognitive apprenticeship approach to deliver writing instruction to students in graduate nursing education in an online course. The literature on best practices in online writing pedagogy, including research specific to nursing education, was reviewed, analyzed, and used as the foundation for this study. The literature review revealed a need for more studies measuring the impact of online writing pedagogy on student performance in both the nursing literature and online learning literature. However, there is ample literature on writing pedagogy in other contexts. This study tested the effect of combining many of these evidence-based practices of writing pedagogy together in one online course organized around a cognitive apprenticeship framework aimed at improving writing competencies for graduate nursing students.

Findings from the study suggest that an online writing course designed and taught according to a cognitive apprenticeship model significantly impacted students' writing self-efficacy and performance. Specifically, survey data showed that the Writing Workshop improved students' self-efficacy across all three subscales, including writing essentials, relational reflective writing, and creative identity, with large effect sizes. Similarly, student writing performance increased significantly from pre- to post-test in all six subscales and the holistic scores, demonstrating large effect sizes. The results highlight the effectiveness of a cognitive apprenticeship model in improving both self-efficacy and performance in scholarly writing.

The Cognitive Apprenticeship Model

The cognitive apprenticeship model is useful for interpreting this study's results. Cognitive apprenticeship includes four pedagogical components that must be addressed for effective teaching and learning (Collins et al., 1987). We will use these four components to analyze why the intervention was successful.

The Sociology of the Learning Environment

Because writing is a form of communication, it is also an inherently social activity that presupposes a specific audience, format, and message to deliver (Bean, 2011). In The Writing Workshop, the writing task was situated in a meaningful, relevant task of researching a nursing-related problem and writing recommendations based on the literature. Intrinsic motivation was supported because students chose their topic and created their writing goals from the beginning. In addition, students engaged in peer review and small group work during synchronous webinars.

Faculty enhanced instructor presence via pre-recorded lecture videos in the Blackboard LMS. Faculty were available to talk or meet with them as needed. Students reached out to meet with faculty when they needed clarification or additional support. Some students had several conferences with their assigned faculty throughout the semester; others did not require any. Faculty offered students generous flexibility regarding late submissions, without penalty, because they wanted to allow students sufficient time to research, think, write, and revise. This warm, benevolent, psychologically safe environment was intentional to help students take risks and grow from their mistakes without fear of harsh judgment.

Although students received a maximum of ten points on each weekly assignment, and their final paper had to achieve a minimum of 80% on the rubric, the course itself was "pass or fail" to help students focus on faculty feedback instead of grades. Rather than taking a deficit approach, where students who are not successful are deemed deficient, the prior knowledge and strengths of students were used as a foundation for new knowledge. Faculty invited students' drafts, providing them with encouraging praise and constructive feedback on their writing in progress. This approach aligns with research about the importance of encouraging students' efforts and establishing psychological safety in promoting the learner's growth and development (Ball et al., 2009; Chandler et al., 2005; Edmonson, 1999; Smith, 2008). Building an intentionally supportive class culture that focuses on student mastery of professional competencies is vital when using the cognitive apprenticeship approach to teaching.

Sequencing: The Importance of Instructional Design

In this writing intervention, students received support for various stages of learning through sequenced instructional design, clearly written expectations, and differentiated instruction using a hierarchy of writing concerns. Each weekly assignment built upon the previous one, essentially dividing the writing project into specific tasks. This is consistent with current thoughts on writing instruction, acknowledging that writing is iterative rather than linear (Bean, 2011; Gazza & Hunker, 2012; Luthy et al., 2009). In addition to the benefits of sequencing assignments, dividing the complex task of writing a paper into discrete chunks may have supported learning by ensuring that instructional activities were not too complex, thereby reducing the cognitive load (Sweller, 1994). Students were led through the step-by-step writing process: literature search, critical reading, defining a problem, summarizing and notetaking, APA citation, synthesis, thesis development, outlining an argument, drafting, revision, line editing, and reflection. The direct instruction of discrete skills involved in the writing process gave students a clear picture of what was required at each stage to develop their written argument.

Another example of supportive online instructional design was the provision of detailed assignment guidance each week that explained what they were being asked to do, why the work was professionally relevant, and a heuristic for how they might proceed with accomplishing the task combined with a model paper, and rubrics. This information was provided in video and text formats to accommodate a wide range of users and their preferences (Borgman, 2018). These supports took the guesswork out of faculty expectations and gave students a suggested structure for approaching and completing each assignment. Again, the research literature also corroborates the importance of clarifying student expectations using these methods (Behrens et al., 2016; Carter et al., 2018; Gazza & Hunker, 2012; Naber et al., 2014; Troxler et al., 2011).

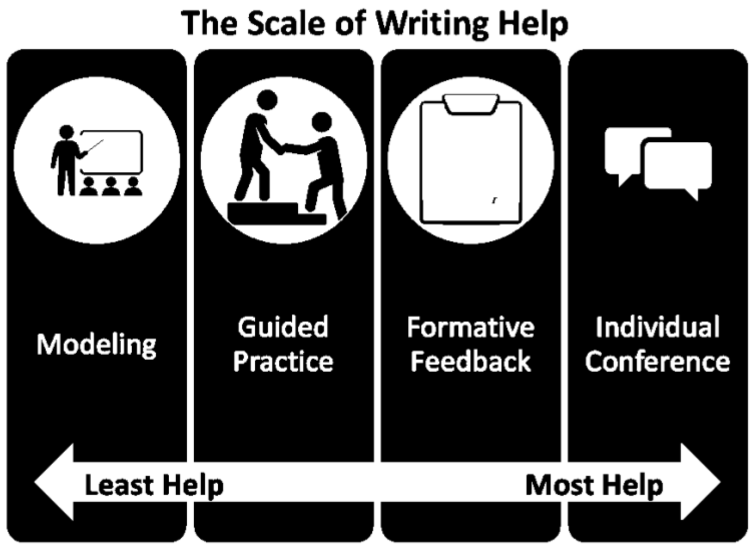
Method: Faculty Used a Scale of Help to Scaffold Students' Learning

One of the main principles of sociocultural theory is that learning is social by nature. Vygotsky (1978) defined the *zone of proximal development* (ZPD) as the area of learning where an individual can accomplish a task with help but has not yet achieved independent mastery. With appropriate support from a more experienced person, Vygotsky posited that a learner could eventually become proficient with a task they previously could not accomplish alone. In other words, learning occurs within a social context, and learners benefit from the direct guidance of individuals with more knowledge and expertise through shared language and experience. Bruner (1966) described the act of supporting the learner by simplifying a task and providing guidance as "scaffolding," recognizing that the support can be withdrawn when a learner can perform a skill independently. This study illuminates the vital role of scaffolding in developing students' writing capacity, with the instructors providing individualized support for students throughout the course.

Providing a Flexible Scale of Help

The term *scale of help* was developed by Marie Clay (2005), founder of Reading Recovery®, to categorize the level of scaffolding a teacher provided from least to most help. The baseline of help given to students in the Writing Workshop was direct instruction and modeling via multimedia content, assignment guidance tools, peer review, and a course design that facilitated an iterative writing process. The second level of support was delivered via three synchronous webinars: an orientation to the unique course design, how to organize paragraphs, and line-editing techniques. In addition, the webinars furnished direct instruction and guided practice to the whole group. The third level of help was personalized feedback students received from faculty on each weekly assignment. The fourth level of help was a writing conference with the faculty. These individualized sessions allowed faculty to explain their written comments in more detail, model a strategy they wanted the student to use, help organize students' thinking, guide students through the proper citation of sources, or address student questions or confusions. The scale of writing help, as used in the online writing intervention, is represented in Figure 3.

Figure 3
The Scale of Writing Help



Note. This scale is based on Marie Clay's (2005) concept of contingent help, where a teacher offers just enough support to assist students in completing a task, with the goal being students' independence and transfer of learning. This scale is adapted for the online writing context.

The scale of help allowed faculty to customize the course to meet the needs of students from a broad range of backgrounds and literacy experiences. Although most students were reasonably independent, this flexibility accommodated students who needed regularly scheduled appointments to those who only had an occasional question via email. Because faculty could request various levels of interaction, students received the support required to maximize their learning within the ZPD and alleviate excessive periods of frustration or inactivity. The reviewed literature confirmed the value of scaffolded social mediation in improving students' writing development (Baleghizadeh & Gordani, 2012; Grigoryan, 2017; Hawisher & Pemberton, 2019; McCutchen, 1996). Differentiating learning within a required, discipline-specific writing course supplied even the most fragile writers with the level of instruction they needed to succeed without the notion that they were "remedial" students or less capable than their peers. This curricular approach assumes writing is developmental rather than remedial and requires direct instruction instead of assuming students should enter college as fully developed writers (Hathaway, 2015).

The Value of Formative Feedback During the Writing Process

Faculty spent most of their instructional time giving students regular, formative feedback on weekly assignments and final drafts to develop their writing capacity. Formative feedback from a more experienced writer enabled students to enhance their understanding of writing as a strategic, iterative task to communicate meaning to a broader audience and improve their writing development (Jefferies et al., 2018; McCutchen, 1996). McCutchen found that without formative feedback, many writers would not become strategic and would continue to view writing as merely putting words on a page. Additionally, formative feedback allowed instructors to guide students' development of discipline-specific conventions and scholarship (Ivanic, 1998; McCutchen, 1996; Mitchell, 2018).

Supporting Reflection and Metacognition

The Writing Workshop used reflection to stimulate students' metacognition about their writing progress, self-efficacy, and transferred use of cognitive tools in the workplace (Gazza et al., 2018; Prestia, 2019). Students engaged in reflection through a letter of response included with each submitted draft, explaining how to receive and incorporate instructor feedback in their revision process. Also, in a final reflection assignment, students were given the opportunity to reflect on their writing goal for the course, how they approached the writing project, which strategies worked well, how they addressed challenges, how they applied what they learned to their practice, and setting new goals for the future. The reviewed literature bears witness to the importance of reflection to successfully enculturate novices into the profession (Chaudoir et al., 2016; Tyndall & Scott, 2017). Reflection allows students to integrate their learning through experience and interactions with peers and instructors to internalize the knowledge, skills, and values required to become active members of the professional community.

Content: Requisite Knowledge for Mastery

The final component of cognitive apprenticeship addresses the content. In the Writing Workshop, students were taught an iterative writing process, the principles of APA style, research summarizing, and synthesis, peer review, and revision strategies organized around the hierarchy of writing concerns. This hierarchy, divided into higher-order and lower-order writing concerns, guides students to approach revision in an ordered way with clear priorities. This organizational approach to revision work and providing feedback has been discussed by other authors (e.g., Bean, 2011; Harvard Writing Project, 2007). Students also learned specific processes to frame a problem, improve their focus, organize paragraphs, and support an argument with evidence. These writing techniques provided students with "tricks of the trade" in presenting evidence in a focused, organized, impactful way to a scholarly audience. In sociocultural terms, the socially mediated strategies students learned in this writing course became what Vygotsky would consider "cognitive tools" or a structured system of thinking that became internalized (Kozulin, 2002, p. 19). According to Marie Clay (1991), as a student adopts these tools as their own, they will eventually create a self-extending system whereby using these strategies will facilitate the student's self-regulated and ongoing writing development.

Implications

There are four important implications for practice based on the reviewed literature and the results of this study. First, nursing faculty should offer students required writing and writing-intensive courses based on cognitive apprenticeship principles. Second, this study affirms

Wornock's (2009) assertion that the migration of writing pedagogy to an online context is effective. Faculty can use best practices from research on composition and writing instruction to inform their online instruction.

Third, a competency-based approach that provides students with a flexible path to mastery can operate within a traditional time-based semester online. Instructors who support the development of nursing students' writing and thinking skills can empower students from a wide range of educational backgrounds. The scale of help is a promising strategy for students from underrepresented and low socioeconomic groups to enter the profession and enable their ongoing success in graduate school and as future leaders, scholars, faculty, and researchers.

Fourth, this study indicates that using automated essay scoring enabled by artificial intelligence can provide an efficient, reliable, and valid way to evaluate students' writing performance for educational research. This has significant implications for evaluating writing, not only allowing this study to be replicated but also extended into longitudinal studies that track the development of writing performance across a curriculum. Additionally, this instrument may help researchers further explore the relationship between writing performance, critical thinking, clinical judgment, and decision-making. The administration of automated essay scoring at the beginning and end of a course or program can also provide students with data points to reflect upon their writing progress over time.

Limitations

The limitations of this study primarily relate to the selective sample and quasi-experimental design. This course involved nursing graduate students at a private four-year school, and further study is needed to generalize these findings outside of that population. Additionally, this was a quasi-experimental study with no control group, raising the possibility that there might be uncontrolled confounding variables influencing the results.

Conclusion

Nursing faculty have struggled with finding recommendations for writing instruction that have been evaluated for their potency. This study illustrates how a discipline-specific online competency-based writing course can significantly improve graduate nursing students' writing capacity and development. In 1984, Benjamin Bloom challenged educational researchers to explore group interventions that parallel the outcomes of high-quality tutoring. One-on-one tutoring has been shown to create a maximum effect on student learning compared to other instructional methods, with an effect size of two. The cognitive apprenticeship approach, as used in the Writing Workshop, shows excellent promise in meeting Bloom's challenge. This study showed significant growth in students' writing performance with an effect size of two, matching the desired effects of tutoring. These results provide evidence that a competency-based, fully online writing intervention, with its roots in cognitive apprenticeship, can have a profound impact on students' writing performance and self-efficacy in only one semester.

Declarations
The authors declare no conflicts of interest associated with this study.
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Appendix A
Self-Efficacy and Task Value Survey Questions

Instructions: As you respond to the items in this survey, please visualize any past writing experiences you've had while writing at the post-secondary (university or college) level. Experiences you had prior to university or college may contribute to how you self-assess your writing abilities in the areas described in the instrument.

Rate what you think is your ability to successfully achieve each task presented in the question with a score of 0 meaning you are "completely sure you cannot" successfully perform that item and 10 meaning you are "completely sure you can" successfully perform the item.

Writing Essentials
1. Even when the writing is hard, I can find ways to overcome my writing difficulties.
2. I can successfully use scholarly, academic words and phrases when writing in my courses.
3. I can combine or synthesize multiple sources I've read to create an original product or text.
4. I am confident that I can successfully complete scholarly writing assignments in master's level nursing courses.

Relational Reflective Writing
5. When I write, I can think about my audience and write so they clearly understand my meaning.
6. When I receive feedback on my writing, no matter how it makes me feel, I can use that feedback to improve my writing in the future.
7. When I reflect on what I am writing, I can make my writing better.
8. When I read articles about my topic, the connections I feel with the ideas of other authors can inspire me to express my own ideas in writing.
9. When I look at the overall picture I've presented in my writing, I can assess how all the pieces tell the complete story of my topic or argument.

Creative Identity
10. I can use creativity when writing a scholarly paper.
11. I feel I can give my writing a creative spark and still sound professional.
12. I feel I can develop my own writing voice (ways of speaking in my writing that are uniquely me).
13. Even with very specific assignment guidelines, I can find ways of writing my assignment to make it original or unique.

Task Value
Rate your answers to the following statements with 0 meaning "not at all" and 10 meaning "extremely."
14. I think I will be able to use what I learn about scholarly writing in The Writing Workshop in other courses in my graduate program.
15. It is important for me to learn how to write like a nursing scholar.
16. I am very interested in the content of The Writing Workshop
17. I think the course material in The Writing Workshop is useful for me to learn as a professional in healthcare.
18. I like learning how to become a better writer.
19. Understanding the scholarly writing process is very important to me.

Notes: Survey questions, except for the task value items, are from the "Situated Academic Writing Self-Efficacy Scale" by Mitchell, K. M., McMillan, D. E., Lobchuk, M. M., & Nickel, N. (2021). Development and validation of the Situated Academic Writing Self-Efficacy Scale (SAWSES). *Assessing Writing*, *48*(2), 100524. https://doi.org/10.1016/j.asw.2021.100524
Task value items are adapted from "A manual for the use of the motivated strategies for learning questionnaire" by Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A manual for the use of the motivated strategies for learning questionnaire.* Technical report no. 91-B-004. The Regents of The University of Michigan.

Student Ratings and Course Modalities: A Small Study in a Large Context

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Abstract
This article examines the impact of course modality on student evaluation of courses and professors. Data were collected through the *Student Perception of Instruction* end of course rating form at the University of Central Florida (UCF), which contains nine items and maintains student anonymity. The findings indicate that while course modality accounts for only 1% of the variance in student evaluations, there is strong internal consistency and reliability in the rating scale. The distribution of ratings showed a concentration of scores at the high end, resulting in a high variability coefficient. However, when the long tail of low ratings was removed, the mean increased and the distribution became more symmetric, affecting various psychometric indices. The correlation matrices among the items revealed a single factor solution for each modality, suggesting that students tend to rely on a general impression when rating their courses. The multidimensional scaling process identified underlying categories such as structure, course climate, engagement, and consideration, even though students did not explicitly differentiate these elements in their responses. The study concludes that course modality has minimal influence on overall student ratings, a finding consistent across different time periods, including the COVID-19 pandemic. Although a single factor captures students' general evaluations, underlying categories shape their responses. The article also presents a classification model that predicts student ratings based on the scale items. This research addresses the complex dynamics of student evaluations, highlighting the nuanced relationship between course modality, student perceptions, and the underlying factors influencing their ratings.

Keywords: digital learning, student ratings, course modality, asymmetry

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As long as there has been post-secondary education, students have critiqued their educational experience. In recent decades this has become a standardized course rating form resulting in high stakes data for faculty evaluation, student selection of courses, and administrators who make personnel and programmatic decisions. However, educational technology, the COVID pandemic, questions about the value of higher education, and other issues have altered the conversation toward rethinking the rating process. One symptom of the change is the website ratemyprofessor.com that uses course evaluation to frame a faculty member's national reputation. This is the metaphorical tip of the iceberg because now students evaluate their courses on social media sites including Twitter, YouTube, Facebook, Instagram, TikTok, and others where their opinions gain traction. As we scrutinize the factors that impact student ratings, it is important to remember the observer dependence of the process, the proliferation of course modalities, the instructor's role, and what the ratings can do to improve the teaching learning process. All parties have a stake, but the psychological contracts involved make the situation complex. Contemporary education is much more than the sum of its parts because it is interconnected, interactive, diverse, adaptive, self-organizing, and emergent.

The Foundational Research

According to Wang and others (2009), student ratings of instruction evoke contradictory and conflicting responses dating back to the beginning of course evaluation. For instance, an entire issue of the *American Psychologist* addressed the validity, reliability, stability, usefulness, and dimensionality of the ratings (Greenwald, 1997). Dating back even further to the 1970s, the Dr. Fox phenomenon characterized an instructor who feigns student empathy, eliciting high ratings with strategies that have little or no relationship to effective teaching practice (Wang et al., 2009 via Williams & Ware, 1977). Further work in this area was extensive, using measurement and psychometric procedures to model the rating process (Algozzine et al., 2004; Gump, 2007; Marsh & Roche, 1997; Pounder, 2007; Wachtel, 1998). Generalized factor analysis approaches addressed underlying dimensionality (Bangert, 2006; Clayson, 1999; Cohen, 2005; Feldman, 1976; Lannutti & Strauman, 2006; Marsh & Roche, 1997; Smith & Anderson, 2005). Hypothesis-based studies used confirmatory models while other investigators incorporated methods such as cluster analysis (Ginns & Ellis, 2007) and visualization techniques (Abrami & D'Apollonia, 1991; Apodaca & Grad, 2005; Cohen, 2005; Ginns et al., 2007).

Causal and predictive approaches applied path analysis and structural equation modeling (Chang, 2000; Ginns et al., 2007; Greenwald & Gilmore, 1997; Renaud & Murray, 2005; Rinderman & Schofield, 2001; Shevlin et al., 2000) that augmented regression and correlational analysis (Cohen, 2005; Davidovitch & Soen, 2006; Eiszler, 2002; Nasser & Fresko, 2006; Read et al., 2001; Renaud & Murray, 2005; Sheehan & DuPrey, 1999; Stapleton & Murkison, 2001). A body of research applied hypothesis-testing models such as analysis of variance (Crumbley et al., 2001; Maurer, 2006; Renaud & Murray, 2005; Riniolo et al., 2006; Smith & Anderson, 2005) and chi square contingency analysis (Howell & Symbaluk, 2001). Another approach involved deductive analysis typified by studies that used criticism techniques to clarify the roles of students and instructors (Gump, 2007; Kolitch & Dean, 1999; Oliver & Sautter, 2005; Pounder, 2007). Any attempt to summarize this body of research converges on defining elements that underlie students' conceptions of excellent and poor instruction. The high-stakes nature of evaluations impacting university decisions such as tenure and promotion caused instructors to take their ratings more seriously. Contemporary analysis focuses on the validity of the process, examining students' decisions to engage meaningfully as well as how these ratings interact with, and are confounded by, multiple characteristics in the educational environment.

Evolving Contemporary Research

Course Modality, Level, and Content

The main purpose of this study is to address the impact of course modality on student rating evaluations. There is evidence that students in online courses are marginally less satisfied than with the in-person modality (Brocato et al., 2015; Capa-Aydin, 2016; Filak & Nicolini, 2018; Lowenthal et al., 2015; Mather & Sarkans, 2018; Sellnow-Richmond et al., 2020; Turner et al., 2018). While online students respond well to flexibility, convenience, and autonomy, they feel impacted by diminished feedback and interaction. Other findings show that students are more critical of professors teaching quantitative courses in general. Larger classes receive lower ratings as do those with heavy workloads (Lowenthal et al., 2015; Royal & Stockdale, 2015; Turner et al., 2018; Uttl & Smibert, 2017). There is conflicting research—Yen et al. (2018) found no differences in student ratings based on course modality. The consensus, however, is that course modality does have an impact on how students evaluate their educational experience, but it is not an overriding concern.

Instructor Characteristics

Factors such as instructor personality, temperament, and demeanor influence course ratings. Investigators examined distinct roles teachers take on and how this may affect their evaluations (Badur & Mardikyan, 2011; Foster, 2023; Kim & MacCann, 2018; Wang et al., 2009). Influencing issues include whether instructors are addressed by their first name or title and last name, how well-prepared they are, interest they show in their students' learning, and the attitude they display. An additional consideration is how instructors respond to evaluation and how they use the results (Floden, 2017; Golding & Adam, 2016). Some professors use the data to improve their courses or their teaching style. Others, however, discount the end of course evaluation process believing the opportunity costs outweigh any added value, but Mandouit (2018) concluded that student feedback is an important contributing factor and powerful stimulus for instructor reflection.

Student Characteristics

Social issues impact a student's decision to complete their end of course evaluation. According to Ernst (2014), they consider a multidimensional environment when determining if they will engage in the process: anonymity, avoiding social scrutiny, and the amount of time required. In addition to deciding *if* they should complete an evaluation, other issues determine *how* they complete the process. As student ambivalence increases, so do the number of dimensions they use to evaluate their courses (Dziuban et al., 2012). Griffin (2016) found that autonomy in courses leads to higher satisfaction, thus resulting in higher evaluation results. One research study found a strong association between a student's seriousness and dedication and the ratings they assign to the course or professor (Gunduz & Fokoue, 2021).

Bias and Validity Concerns

Recent studies emphasize concern about bias and validity in the student rating process. According to multiple sources, female professors receive lower ratings compared to their male counterparts (Boring et al., 2016; Boring et al., 2017; Buser et al., 2022; Chatman et al., 2022;

Flaherty, 2019; Heffernan, 2021; Mengel et al., 2019; Mitchell & Martin, 2018; Ray et al., 2018). For example, Ray and colleagues (2018) found that women instructors are held to a higher standard and must work harder to be viewed as competent. Even when female instructors exhibit similar performance to their male counterparts, they are rated significantly lower (Chatman et al., 2022). Often language is rooted in student evaluations that can lead to gender and racial biases (Genetin et al., 2021).

Aside from the bias regarding race and gender, students' perceptions of their own achievement impact their ratings. Researchers have confirmed this (Boring et al., 2016; Buser et al., 2022; Flaherty, 2022; Kogan et al., 2022; Scherer & Gustafsson, 2015; Stott, 2016; Stroebe, 2016; Tejeiro et al., 2018). Additionally, there is an imprecision in the relationship between student evaluations and instructor quality (Esarey & Valdes, 2020). Students may not have formed a well-grounded construct of what constitutes good teaching and might rate their professors solely based on extraneous elements such as confirmation bias, misaligned expectations, or indifference (Kornell & Hausman, 2016).

Because student evaluation is used to make high-stakes decisions (Flaherty, 2018; Kogan et al., 2022; Stark & Freishtat, 2014; Stroebe, 2016), there are assertions that the process results in grade inflation (Stroebe, 2016). With research indicating that women and racial minorities experience most student evaluation equity issues, more questions about the process arise. Therefore, validity constitutes the overriding concern with the course evaluation process (Hornstein, 2017).

A Final Thought on Research

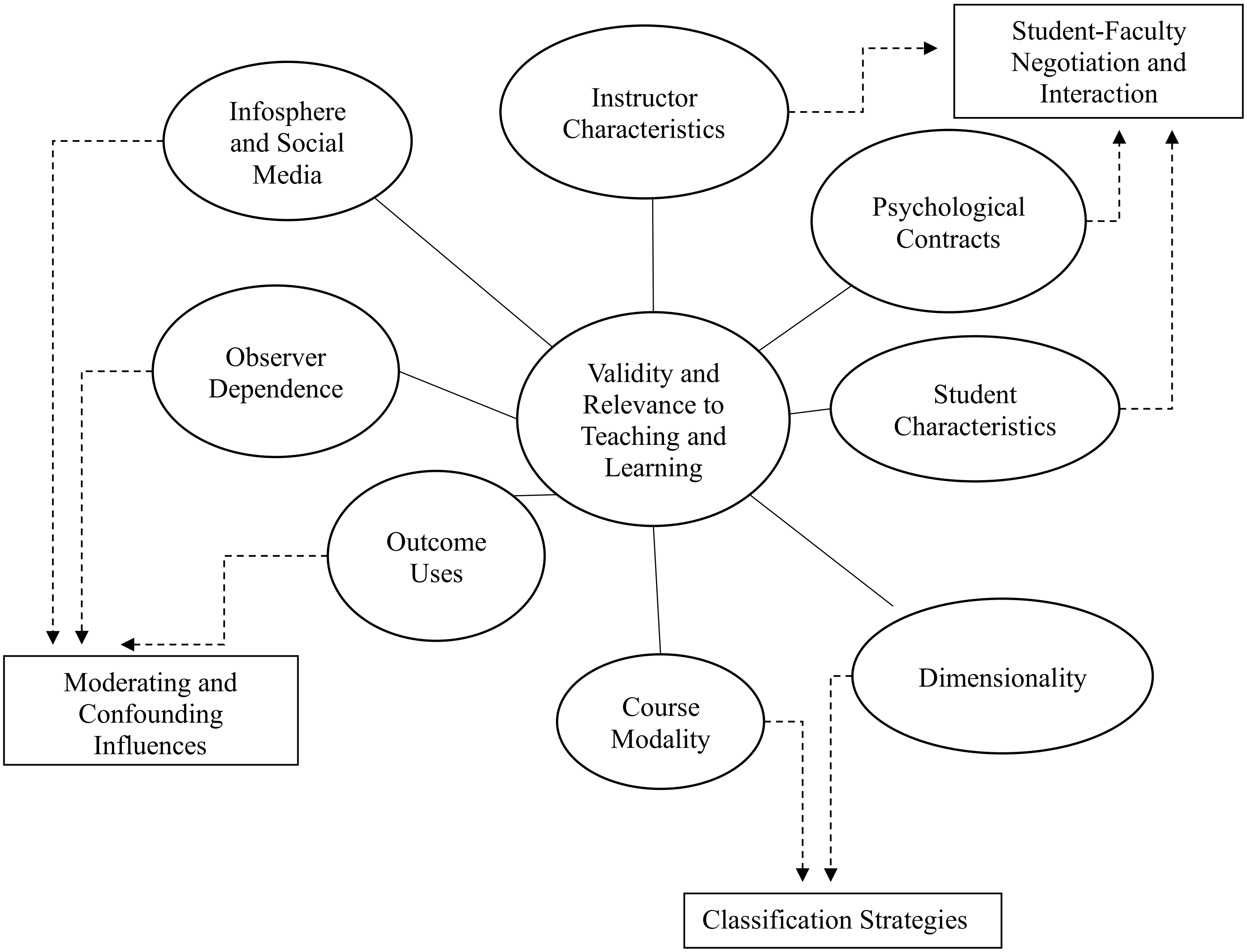
Like so many things in our accelerating educational culture, the student rating process has undergone significant reconfiguration. The initial research canon dealt with one modality, face-to-face instruction, where mitigating factors, such as class size, college, department, and discipline were bounded by the classroom walls and limited in the analysis methods that were available. However, in the decades after, there was an expansion of newly developed psychometric and multivariate techniques applied to the rating process. This was the psychometric period where excessive analysis sophistication may have obscured the end game in assessing meaningful teaching and learning. Most recently, the research emphasis traces social, cultural, and preconceived biases held by students toward instructors and courses. The digital age has changed the rules of the game and the boundaries for what is off limits. Apparently extraordinarily little is out of bounds. The reality is, however, the number of papers published on this topic is simply overwhelming. Consider ChatGPT's (2023) response to that number of articles question:

> A search on Google Scholar using the key words "student ratings" yields over 2.7 million results…using the key words "student ratings" AND "higher education" …yielded over 167,000 results.

By any stretch of the imagination, this makes a traditional review of research intractable and no longer realistic. Our current review is evidence of this. The references we have on the topic represent far less than 1% of ChatGPT's estimated 167,000. The chance we missed something important is certain. Kabudi, Pappas, and Olsen (2021) proposed another approach using surrogate large language models, or generative artificial intelligence, identifying prototype categories from which AI can organize a search that identifies research clusters and their interconnectedness. Of course, the constraining factor hinges on organizing the search parameters. A different organizational scheme will yield different results. For instance, one might accomplish it by data analysis methods used, topic, modality, or any other structure. With this process, a graphic result emerges—one that facilitates an investigator understanding the research environment. The platform manages the overwhelming and tedious workload; however, a similar result can be obtained with semantic intelligence, which is what the current authors have done. Each one designed their concept of the complex systems underlying our meager review of research. The composite result is presented in Figure 1, but note that all models are approximations to theories, constructs, and concepts.

The model is hub and spoke revolving around the validity core impacted by components that self-organize into student and faculty negotiation and interaction, classification strategies and moderating and confounding influences. Through a careful review we have assigned (using intuition and judgement) proximity vectors to the spokes. Closer elements indicate greater impact. We will discuss this with a thought experiment later, but this literature model is constrained by two dimensions and individual component interaction with the foundational base. Obviously, those influencing components (eight of them) can and do interact with each other in an extremely complex pattern that is difficult to deconstruct. We are confident they influence student ratings but unraveling the high order model is beyond the scope of this research. Therefore, we become apologists for conducting a small study of student end of course ratings.

Figure 1
An Underspecified Model of Elements That Impact Student Ratings



The Study and Research Methods

This study depicted in Figure 2 is small not because of the sample size that, accounting for missing data, surpasses 660,000 student responses to their courses at the University of Central Florida for the years 2017 through the 2022 fall semester (N = 664,473). The work is small because course modality is the primary independent variable (with a sidebar for COVID's impact), ignoring the remaining influences identified from the literature (Figure 1). There are reasons for this. The most significant is the complexity issue. The second justification for modality research is the number of studies on the topic. With the onset of the pandemic, multiple course contexts emerged in an extraordinary attempt to keep university doors open (Appendix B).

The “big data” approach in this study, however, renders concepts like statistical significance and standard error moot, reframing sampling, estimation, and hypothesis testing into modeling, small pattern recognition, and machine learning. The research model (Figure 2) defines a study where the student rating process undergoes examination across modalities to identify information, meaning, and outcomes that transcend analysis strategies. This is a weakness but a strength as well because it attempts to clarify whether, and how, course modality impacts students’ framing of their educational experience. We made other decisions to prevent this article from becoming unwieldy by omitting the derivation and formulas for the analysis, but references for the reader are provided should they choose to pursue them. We have, however, included a rationale for each data analytic procedure.

The Data Collection Protocol

The end of course student rating form entitled *Student Perception of Instruction* was the source of data for this research (Appendix A). The scale resulted from a series of faculty, student, and administration groups working collaboratively to modify and improve the process. The instrument contains nine items. The final design was approved by the faculty and student senates and was first administered in 2013. In addition to the protocol redesign, the committees addressed the strengths and weaknesses of this approach and specified the ethical use of the data for faculty evaluation and professional development. The instrument is student-anonymous, preventing identification of individual respondents. Administration takes place online for all classes, irrespective of modality, managed by the university’s division of information technology that also summarizes the results by course and presents the findings to the faculty members, augmented with normative data. Instructors and departments make individual determinations about data use, but these data are used in promotion and awards.

The Analysis Procedures (Figure 2)

1. Modality impact was assessed by summing the nine items with a maximum score of 45 and a minimum of 9 (5 = excellent, 1 = poor). The mean differences across course modalities were analyzed with a one-way linear model, discounting significance level in favor of the ETA squared effect size estimation (Richardson, 2011). The index gives the percentage of variance accounted for in the dependent measure (total score) by the independent variable (course modality). However, recommendations for interpreting ETA are rules of thumb so that judgment by the investigator about impact is required.
2. The impact on the total scores of the three COVID periods (pre-2017–2019, 2019–2020, and post-2021–2022) were determined with methods identical to those used with course modality described above.
3. The Alpha reliability coefficients, average item total correlation, skewness index, and coefficient of variation for the rating scale results for each modality were calculated – the classical measurement model (Crocker & Algina, 1986). In any study, a requirement is that the investigators become familiar with their data. What are the moments of the distributions? Are there missing data and if so, are they of consequence or can they be ignored and not appreciably impact the findings? What are the distributional characteristics? What are the measurement properties?
4. The domain sampling characteristics of the instrument were indexed using the measure of sampling adequacy (MSA). This is the measurement sampling issue.

Statistical sampling answers the question, “Do I have a good sample of subjects from an identified population? Domain sampling answers the question, “Do I have a good sample of items from a measurement domain in which I am interested?” It is the other sampling issue (Dziuban & Shirkey, 1974; Kaiser & Rice, 1974). Without verification the results can misrepresent the underlying measurement issues that are fundamental to valid research.

5. The latent components of the student responses to the rating scale were determined for each modality. The question was one of multidimensionality, and, if it existed by modality, what were the pattern differences. This was accomplished with the factor analytic model by examining the Eigenvalues of the item correlation matrices for each modality. As a criterion for dimensionality Eigenvalues greater than one are customarily used for factor retention. Once the factor(s) were removed from the system and the residual correlation matrix determined, the MSA was calculated to determine if what remained was random noise (Dziuban & Shirkey, 1993; Hill, 2011; Kaiser, 1968; Kaiser & Rice, 1974). The Eigenvalue criterion is another rule of thumb that is used extensively, but it remains to the researchers to determine if that method makes sense for the objectives of the study. This analysis technique bases itself on the proposition that the multiple relationships among the rating scale items can be explained by a smaller set of underlying constructs that are not directly observable. Should more than one factor or component result, the interpretation becomes more complex and relies on the knowledge, insight, and intuition of the investigator. There is subjectivity in the process because of the observer dependence phenomenon. There is a world of interpretation difference between one factor and more than one.
6. The Euclidean distances among the items for each modality on the instrument were derived and subjected to the multidimensional scaling procedure (MDS) to create a visual portrayal of the relationship of the items across teaching contexts. This was an augmented approach to assess how students characterize their educational experience (Borg & Groenen, 2005). In a metaphorical sense this involves examining student ratings at the “quantum level” where one can visualize what is not available to the naked eye. MDS initiates by identifying pairwise similarities between objects, in this case the items of the rating scale. Next, the distances among items are converted into coordinates that can be mapped into a lower dimensional space. The objective is to minimize the differences between the original similarities and those specified by the derived coordinate mapping.
7. Finally, a predictive model was developed for whether students assigned an overall rating of excellent to their courses using classification and regression trees (CRT) (Brieman et al., 1984). The variables assessed for productive power were college, department, course level, modality, term, and the remaining items on the rating instrument. The objective was to develop the simplest and most accurate decision rule for a student rating a course excellent. CRT recursively separates the data into smaller subsets determined by the predictors. At each step of the iterative process variables are selected that most efficiently sort the dependent measure into classes by reducing the variance. The splitting process continues until a predetermined stopping criterion is reached or variance reduction is no longer achieved.

Figure 2
A Hub and Spoke Model of the Research Process

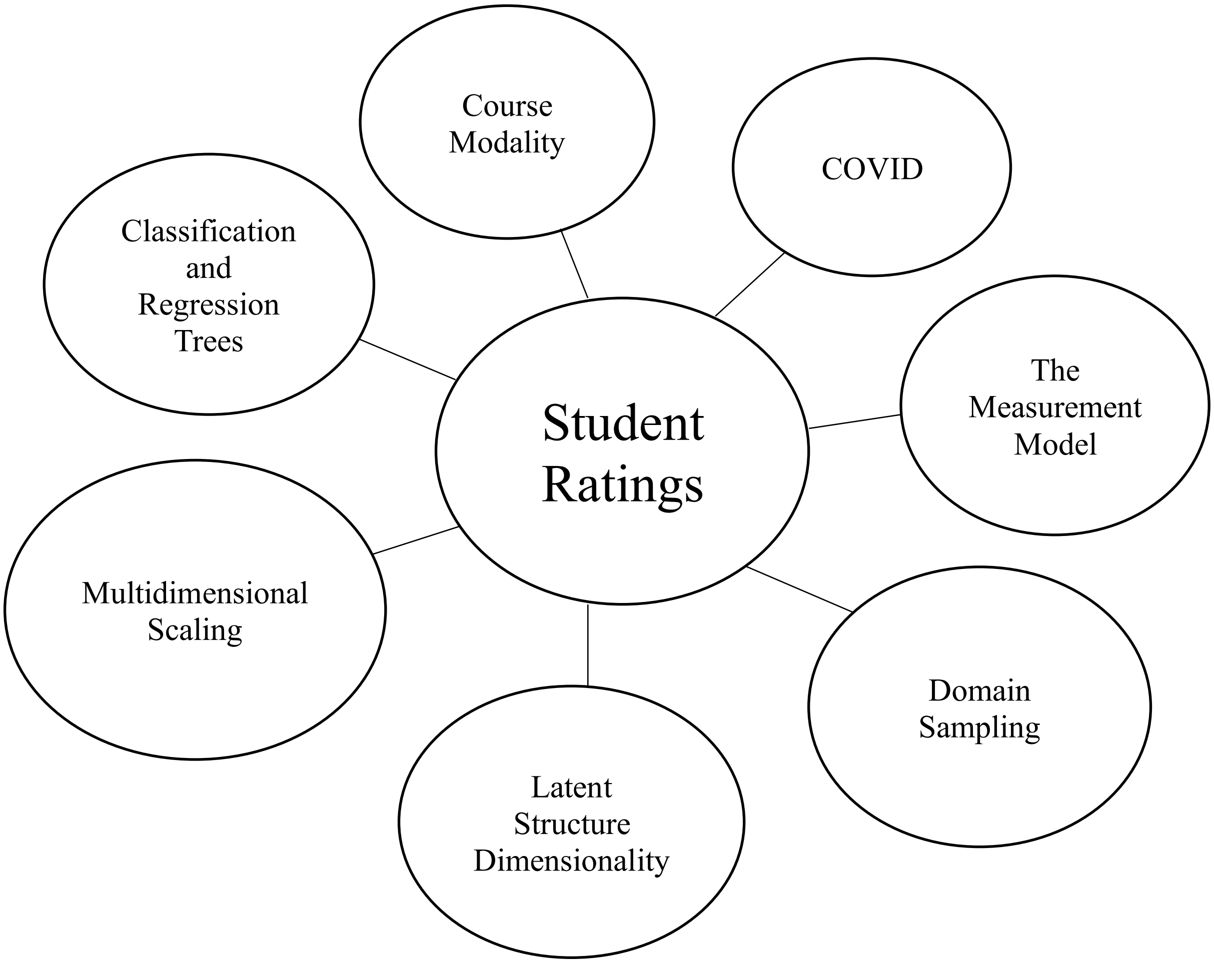


Table 1 and Figure 3 present the end of course rating scale total scores for each modality. The means show minimal variation with an overall value of 32.3 and a standard deviation of 9.0. The ETA squared effect size shows that modality accounts for 1% of the variance in how students evaluate their courses; however, the alpha reliability coefficient of .94 indicates strong internal consistency. The average item total correlation was .78 supporting the reliability finding. Examining indices for classical measurement models the results get a "pass." However, the skewness indices in Table 1 show a "piling up" of the scores at the high end of the distribution with a summary value of -.64. Figure 3 confirms this visually. We are looking at the long tail with relatively few students using the low extreme of the scale. This level of asymmetry inflates the variance of the distribution producing a variability coefficient of 29—a value considered high. The high-end concentration creates a mean of 32.3 that is 72% of the total possible score. The median (34) represents 76% of the possible total and the mode of 4 is 80% of the highest possible assignable rating value of 5. But what if we cut off the long tail by removing scores in the first quartile? With the long tail gone the mean increased to 36.8, 82% of the possible total and the median increased to 37, 82% of that. The mode of 4 was unaffected by the shape of the distribution. Note that as the altered distribution became more symmetric the mean and mode converged. The effects on other indices were noteworthy. The standard deviation decreased to

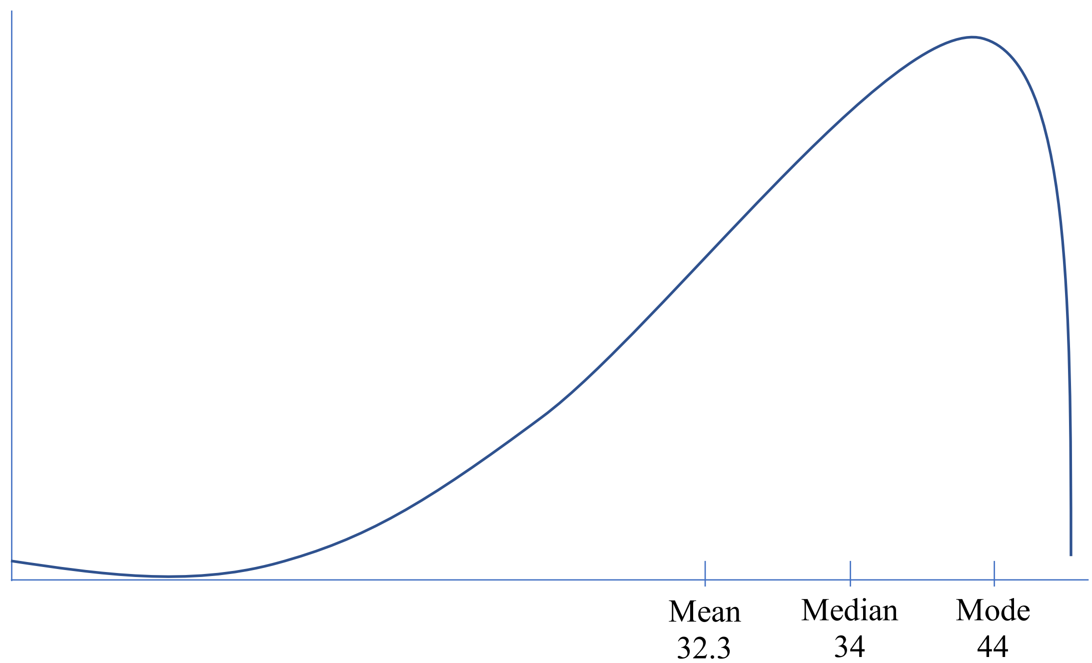
5.2, a drop of 42%. The skewness decreased to -.26, down 60%. Reliability was still high at .84 but showed a decrease from the original .94 and the item average item total correlation dropped to .54—a decrease of 31%. The coefficient variation decreased to 14 dropping 52% from the value in the asymmetric distribution. Distribution characteristics for student ratings of their courses influence the results and how they should be interpreted.

Table 1
Total Score Summary Across Course Modalities

Modality	N	Mean	S.D.	Cronbach's Alpha	Average Item Tot. Cor.	Skewness	Coef. of Var.
P	313,306	32.3	9.0	.94	.77	-1.6	28
WW	176,440	32.9	8.7	.94	.77	-1.4	26
M	64,795	33.3	8.7	.94	.76	-1.4	26
RS	17,875	28.9	9.6	.95	.79	-0.6	33
RA	11,134	30.7	9.0	.94	.78	-0.8	29
V	16,750	30.6	9.3	.95	.79	-0.8	30
R	8,912	30.4	9.3	.94	.78	-0.7	31
RV	5,654	27.7	9.6	.95	.79	-0.3	35
V1	49,607	32.0	9.2	.94	.78	-1.1	29
Total	664,473	32.3	9.0	.94	.78	-0.64	29

*Eta-squared = .01

Figure 3
Student Ratings—The Long Tail



A comparison of the total score differences by COVID periods in Table 2 indicates a similar result to the modality analysis. Remember, we have toggled back to the asymmetric version of the distribution for the remaining results. However, in this case the ETA squared showed that none of the variance in total score course ratings were attributable to the pandemic related educational program adjustment at UCF.

Table 2
Total Score Summary Across COVID Periods

COVID Period	N	Mean	S.D.	Average Discrimination	Skewness	Coef. of Var.
Pre-COVID	287,770	32.4	8.9	.77	-0.6	27
During COVID	187,735	32.4	9.0	.76	-0.7	28
Post-COVID	189,038	32.1	9.1	.78	-0.6	28
Total	664,473	32.3	9.0	.78	-0.6	29

*Eta-squared = .00

Table 3 presents the results of the domain sampling characteristics of the rating scale items for each modality and for the overall cohort. The measures of samplings adequacy (MSA) were all in the mid .90s, which according to Kaiser & Rice (1974) comprise an excellent sample of items for the domain. MSA is known to be sensitive to the number of variables, sample size, and number of factors; however, apparently not impacted by distributional characteristics. The average correlations across all items for each modality were in the .60s. Both findings indicate that from a measurement and psychometric perspective these are satisfactory results.

Table 3
Domain Sampling for the Course Modalities

Modality	N	MSA	Avg. Correlation
P	313,306	.94	.64
WW	176,440	.94	.64
M	64,795	.94	.63
RS	17,875	.95	.67
RA	11,134	.95	.65
V	16,750	.95	.66
R	8,912	.94	.65
RV	5,654	.94	.66
V1	49,607	.95	.66
Total	664,473	.94	.64

Table 4, Figure 4, and Table 5 present the Eigenvalue summaries for the correlation matrices among the items for each course modality. The average correlation was calculated according to the Kaiser (1968) procedure. Remembering that the rule of thumb is to retain factors for transformation and interpretation corresponding to those values greater than 1, Table 4 demonstrates a Spearman case where there is only one factor. This finding has precedent in the literature (Dziuban et al., 2018). For each modality, the single factor accounts for approximately 70% of the total variance in the system. Figure 4 depicts an Eigenvalue graph suggested by Cattell (1966) for determining the number of factors to retain. He posited that extraction should be terminated at the point where there is a noticeable break in the curve. This procedure supports the one-factor solution. According to this analysis model, students discount the individual elements on the scale and simply "go with their general impression." The results in Table 5 show the MSA and average correlations for the residual matrix. All MSA values were in the .50 range, indicating that nothing but random variation (noise) remained. The average correlations confirm this with all values being 0 to the first decimal place. One factor cleaned out the system.

Table 4
Eigenvalues for the Course Modality Factor Solution

	P	WW	M	RS	RA	V	R	RV	V1	**Total**
1	6.12	6.12	6.04	6.32	6.21	6.29	6.21	6.29	6.26	6.15
	68%	68%	67%	70%	69%	69%	69%	69%	69%	68%
2	.73	.77	.77	.74	.71	.72	.73	.74	.71	.74
3	.48	.45	.49	.43	.45	.43	.44	.43	.43	.45
4	.45	.42	.46	.37	.38	.40	.40	.38	.42	.44
5	.34	.35	.35	.32	.33	.33	.34	.33	.33	.34
6	.30	.27	.29	.25	.28	.28	.27	.24	.29	.29
7	.24	.26	.25	.23	.26	.24	.24	.23	.24	.25
8	.21	.20	.21	.20	.22	.18	.21	.20	.19	.20
9	.14	.15	.15	.14	.15	.14	.16	.15	.14	.14

Figure 4
Eigenvalue Scree Test for the Number of Factors

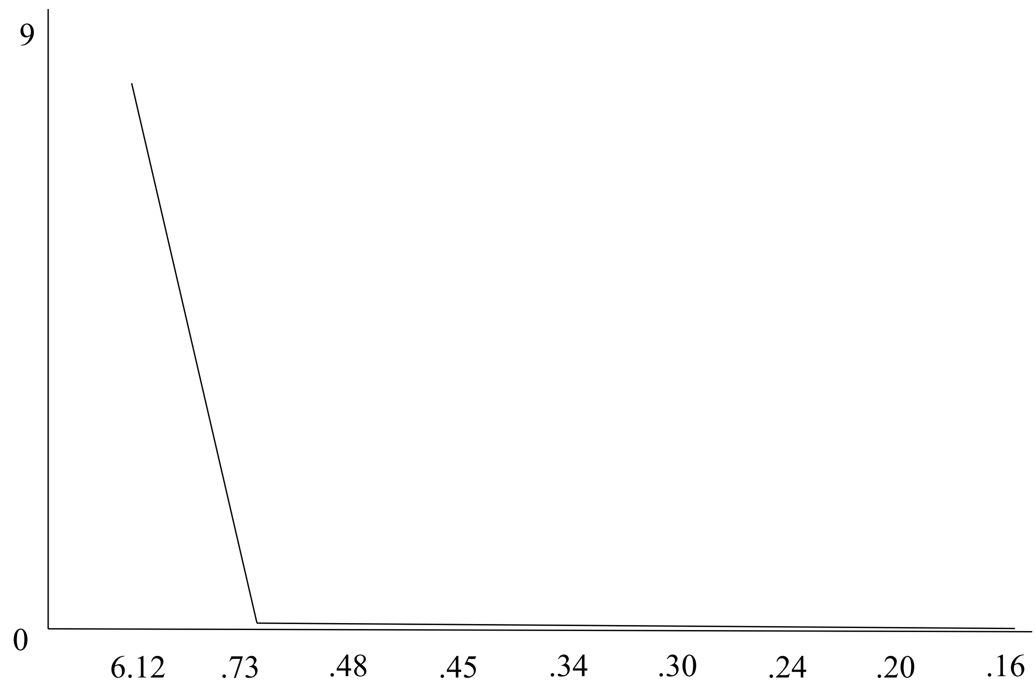


Table 5
Residual Correlation Domain Sampling Results

Modality	N	Residual MSA	Avg. Residual Correlation
P	313,306	.51	-.02
WW	176,440	.53	-.03
M	64,795	.52	-.05
RS	17,875	.58	-.02
RA	11,134	.54	-.03
V	16,750	.52	-.02
R	8,912	.59	-.02
RV	5,654	.57	-.04
V1	49,607	.51	-.03
Total	664,473	.55	-.02

Tables 6, 7, and 8 contain the coordinates for a two-dimensional multidimensional scaling of the items for each modality, the overall cohort with the stress on the system and the squared correlation between ordering with the Euclidian distances and those of the scaled solution. Table 6 shows close coordinate correspondence for the first dimension across modalities with an average correlation among them of .97 (94% variance accounted for). The same is true for Table 7 for the second dimension with an average correlation of .87 (76% variance accounted for). Table 8 confirms acceptable stress levels for each modality (approximately .10) and high squared multiple correlations (all in the mid .90s). The multidimensional scaling solutions for each course modality were close versions of each other. A forced two-dimension analysis is reasonable and facilitates interpretation.

Table 6
Coordinates for Dimension One of the Multidimensional Scaling of the Items

Items	P	WW	M	RA	RA	V	R	RV	V1	**Total**
Organization	1.7	1.9	1.8	1.7	1.8	1.6	1.5	1.9	1.8	1.9
Expectations	1.5	1.6	1.6	1.8	1.8	1.7	1.7	1.5	1.7	1.7
Communication	0.6	0.3	0.8	0.6	0.5	0.7	0.8	0.7	0.2	0.2
Respect/Concern	0.7*	0.6	1.0*	0.2	0.7	0.0	0.1	1.1*	0.4*	0.3*
Interest	1.7*	1.5*	1.4*	1.5*	1.4*	1.3*	1.8*	1.6*	1.7*	1.7*
Learning Environment	0.4*	0.5*	0.5*	0.7*	0.7*	0.2*	0.8*	0.7*	0.1*	0.1*
Feedback	0.6*	1.8*	0.8*	1.5*	1.7*	1.8*	1.1*	0.3*	1.4*	1.4*
Achievement	0.4*	0.4*	0.5*	0.5*	0.7*	0.4*	0.3*	0.3*	0.1*	0.1*
Instructor Effectiveness	0.0	0.2*	0.1	0.0	0.3*	0.2*	0.1*	0.1*	0.1*	0.2*

Average r = .97
*Denotes negative values

Table 7
Coordinates for Dimension Two of the Multidimensional Scaling of the Items

Item	P	WW	M	RS	RA	V	R	RV	V1	**Total**
Organization	0.6	0.0	0.2	0.9*	0.5*	1.2*	0.8*	0.7*	0.5	0.6
Expectations	0.4*	0.5	0.4*	0.0	0.4*	0.3*	0.0	0.3	0.4*	0.5*
Communication	0.4	0.7	0.3	0.1*	0.1*	0.3	0.0	0.6	0.7	0.6
Respect/Concern	2.3*	1.6*	2.0*	2.1	1.7	1.9	2.1	2.0	2.0*	2.0*
Interest	0.3	0.9*	0.1*	0.2	0.9	0.7	0.4	0.4*	0.1	0.0
Learning Environment	0.1*	0.2*	0.2	0.1*	0.2*	0.1*	0.1*	0.3*	0.2*	0.1*
Feedback	1.5	1.1	1.7	0.9*	0.9*	1.1*	1.3*	1.5*	1.3	1.3
Achievement	0.1*	0.2	0.2	0.1*	0.3*	0.2*	0.3*	0.1	0.0	0.0
Instructor Effectiveness	0.0	0.1	0.1	0.2*	0.1*	0.1*	0.0	0.2*	0.1	0.1

Average r = .87
*Denotes negative values

Table 8
Stress and R-Squared for the Multidimensional Scaling of the Items (Modality and Total)

	P	WW	M	RS	RA	V	R	RV	V1	**Total**
Stress	.11	.10	.10	.08	.08	.07	.08	.06	.12	.11
RSQ	.94	.94	.94	.97	.96	.97	.97	.98	.93	.94

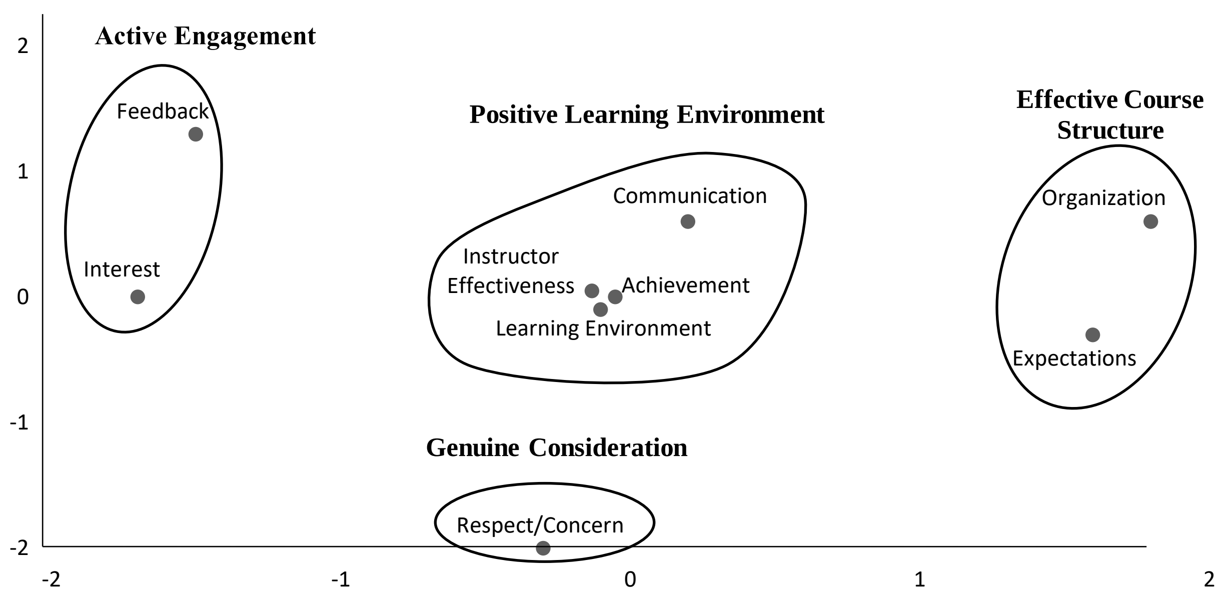
Figure 5 presents the rating scale items located in the two-dimensional space according to their coordinate values. According to the map, students respond to the quality of their educational experiences by:

1. Effective Course Structure
2. A Positive Learning Environment
3. Active Engagement
4. Genuine Consideration

This result corresponds to our literature and design in Figures 1 and 2, however, in this case the effective learning environment is supported by four different elements.

Figure 5

A Two-Dimensional Scaling of the Student Rating Items



Stress = .11
RSQ = .94

The results for the classification and regression tree are presented in Table 9. The dependent variable was whether students assigned an overall rating of excellent. The independent variables were characteristics of the educational environment—course modality, college, department, term, and level, plus the remaining 8 items on the end of course rating scale. When the analysis converged, the process eliminated all possible predictive variables except for two. If students believe that an instructor *achieved the course objectives* and *created an effective learning environment*, the probability of them specifying an excellent course is .82. Little else impacts their decision.

Table 9
A Decision Rule for a Faculty Member Receiving an Overall Rating of Excellent (n = 342,386) if a student responds

	Excellent	Very Good	Good	Fair	Poor
Achieve Objectives	√				
Learning Environment	√				

*The probability of an overall rating of Excellent = .82
Split half validation

Final Thoughts About the Results

This study sought to identify outcomes about student end of course ratings that were independent of analysis strategies. Unfortunately, the results only partially answer that question. Some findings are consistent, but some are not. From a measurement perspective, the ratings conform to quality specifications. They are internally reliable, produce small standard errors, feature items that are positively correlated with the total score, and present excellent psychometric (domain sampling) characteristics. However, except in relatively rare instances, students tend not to assign poor ratings to their classes. The upper end of the scale is used extensively creating noticeable asymmetry. This long tail circumstance creates measurement artifacts that when removed make meaningful assessment of teaching effectiveness difficult if not impossible because the ratings are so similar. If one were to grant the rating validity assumption, then most instructors are “very good” or” excellent” with a small percentage of poorly rated outliers.

Course modality exerts minimal influence on students’ overall ratings accounting for virtually none of the variation. The same finding was true for the three COVID pandemic periods. Further, when students rated their classes, a general component was identical for all modalities. The factor model was unable to identify any underlying response patterns. However, at a more granular level the scaling process was able to partition the single factor by structure, course climate, engagement, and consideration. Although students did not differentiate these elements directly in the data, they underlie their responses. This is the conundrum, only one factor but categories under the hood. Finally, the classification model produced a simple and clear prediction protocol. Nothing in the university or course organizational structure predicted this, but the rating scale items did.

Some Thought Experiments

Complexity

This study is about removing friction from the course evaluation system in a manner that helps us better understand teaching and learning. The process is complex because the whole exceeds the sum of the parts and is in constant flux. Consider our two hub and spoke models in Figures 1 and 2. Instead of constraining them into two dimensions, what if we cast them in three spaces with the spoke modules becoming orbiting satellites where the environment changes from moment to moment? This seems more reasonable and what Page (2009) described as dancing landscapes that are often unpredictable but at times self-organizing. If a university class is emergent (we believe it is) and its composition arises from the interactions among multiple individual elements such as instructor, students, curriculum, achievement, opportunity, technology, and modality then quality may not be captured by a single rating session. Taleb (2018) portrays complexity this way:

> The main idea behind complex systems is that the ensemble behaves in ways not predicted by its components. The interactions matter more than the nature of the units. Studying individual ants will almost never give us a clear indication of how the ant colony operates. For that, one needs to understand an ant colony as an ant colony, no less, no more, not a collection of ants. This is called an "emergent" property of the whole, by which parts and whole differ because what matters are the interactions between such parts. And interactions can obey very simple rules. (p. 69)

A class is a small world network where individuals are connected, and others are independent of each other. This contributes to complexity. There are both positive and negative feedback loops in a class—some reinforcing and some canceling. This is not amenable to a simple solution, but it is an important problem. If it were simple the answer would be linear and predicable, but a university classroom is unpredictable and nonlinear—this is not a new idea.

Psychological Contracts and Observer Dependence

Perhaps a useful way to conceptualize a class is through a series of psychological contracts that frame the expectations students have for their instructor and conversely the expectations an instructor holds for students (Dziuban et al., 2012). Effective teaching and learning require well-formed contracts built on positive relationships and mutual understanding. What if a class is not a unitary thing but a series of individually negotiated contracts between the instructor and students that are constantly renegotiated? If this assumption holds then each student is reacting to and evaluating a separate learning experience where data aggregation is not meaningful.

This frames observer dependance where the class is not a fixed construct but defined by student perception of it—for instance, ideas corresponding to quality, color, taste emotion, time perception, personal identity, memory, morality, political views, success, humor, and self-awareness. This concept formed the basis of Snygg and Combs (1949) work on symbolic interactionalism that is closely related to a phenomenal field where people create their personal meanings with subjective, rather than objective, experiences. Searle (1995) also referenced observer dependence—contending that qualities of an object (a class) depend on the perspective of the observers' assumptions or expectations. Pirsig (2006) concurs by examining the nature of quality and the fundamental difference between the subjective and objective experience arguing that quality cannot be fully understood with metrics. Is it possible that student ratings result from a series of individually negotiated contracts that are moderated by some degree of confirmation bias. Snygg and Combs (1949) provide a graphic example of the phenomenon:

> Several years ago, one of the authors was driving a car at dusk along a western road. A globular mass about two feet in diameter suddenly appeared directly in the path of the car. A passenger in the front seat screamed and grasped the wheel, attempting to steer the car around the object. The driver tightened his grip and drove directly into it. In each case the behavior of the individual was determined by his own phenomenal field. The passenger, an Easterner, saw the object in the highway as a boulder and fought desperately to steer the car around it. The driver, a native of the vicinity, saw it as a tumbleweed and devoted his efforts to keeping his passenger from overturning the car… the behavior of each was determined, not by the objective facts, but by his own phenomenal field. (p. 14)

Course Modality as a Treatment Effect

Multiple studies cited in this paper examined course modality as a treatment effect that impacts student ratings. Treatments assess the influence on dependent measures among groups that receive a particular intervention. To ensure outcome integrity confounding factors must be eliminated or controlled for statistically. However, modality of a college course is subject to uncontrollable effects such as availability of physical space (if required), scheduling issues, instructional design and technology support, curricular discipline, university, college and department policy, and student motivation and economic status. Each one of these is a confounding factor. Perhaps better concepts for course modality might be context, learning environment, pedagogical approach, boundary object, or idealized cognitive model—none of which can be reasonably considered treatment effects but rather nuanced notions of modality. Certainly, the COVID pandemic led to class definitions that are fluid, flexible, and in a continual churn. While some have been successful, some have not fared nearly as well and were quickly abandoned. Learning happened in an uncontrolled spontaneous environment outside the class and university making any attribution to outcomes based on modality virtually impossible. Our data indicate that modality accounts for virtually no part of the variation in student ratings. In our judgement, Rosch's (1973) prototype theory is the best characterization. These prototypes serve as benchmarks against which we evaluate other examples of a category that can be basic, superordinate or subordinate. The basic level prototype is the most generally accepted and acknowledged category—superordinate refers to a broad, general class that encompasses subordinate categories that fall within its domain. For example, for a typical online prototype designation, learning management system (LMS) superordinate categories might be Moodle, Canvas, and Blackboard, with subordinate categories:

1. Content Management Systems (CMS)
2. Assessment and Testing
3. Collaborative Learning
4. Adaptive Learning
5. Gamification
6. Mobile Learning
7. Analytics and Reporting

Within the context of this study the prototype is modality. The superordinate category is learning logistical arrangements and the subordinates are:

- Face-to-face (F2F)
- Mixed mode/blended with reduced F2F
- Blended with active learning
- Blended with no more than 20% F2F
- Lecture capture with live option
- Lecture capture
- Video-streamed
- Emergency remote instruction
- Fully online

Prototypes can clarify our understanding of classes and their definitional boundaries by providing specifications for subordinate course categories that are the operational versions of modality.

If we are correct that prototypes are the best descriptions of modality, we should be mindful that they are not fixed or universal. They are context dependent, have blurred boundaries, and may vary according to situational circumstances. Therefore, this does remove course modality as a candidate for a treatment effect. However, modalities as prototypes comprise a functional framework for helping understand contemporary teaching and learning.

Back to Asymmetry

In the results section we highlighted the asymmetric characteristics of student rating data that causes interpretation difficulties. We used an arbitrary shortening of the long tail to demonstrate the impact on skewness. This was a device for demonstrating the change in central tendency and variability. However, other outcomes were impacted by increasing the symmetry. The effect size went to zero. The average correlation among items dropped from .63 to .33. The MSA decreased to .81 and reliability decreased to .86. The factor model produced two components, communication and engagement, that were highly correlated. However, the multidimensional scaling produced identical coordinate maps for the both the symmetric and asymmetric data sets. The fact is, however, that cutting off the long tail invalidated the data because student ratings are markedly asymmetric. Parenthetically asymmetry is a significant contributor to inequality and unequal opportunity in fundamentally all forms of human endeavor, culture, and society (Andersen, 2018; Benjamin, 2020; Boghosian, 2020; Eubanks, 2019; Friedman & Laurison, 2019; Giridharadas, 2018; Gumbel, 2020; Isenberg, 2017; McGhee, 2021; Mlodinow, 2009; Mukherjee, 2016; O’Neil, 2018; Safir & Dugan 2021; Taleb, 2005; Taleb, 2007; Taleb, 2012; Taleb, 2018; Wilkerson, 2020). As we consider the student voice and end-of-course ratings in higher education, we should address the apparent asymmetry involved in modality prototypes.

This is particularly important at this time when so many aspects of higher education and faculty life are under assault and the current student generation has lost much of its enthusiasm for attending post-secondary education. Consider the following from Bryant (2022) paraphrased by Bush (2023):

> The last decade of social change, low birth rates, diminishing support from state governments, COVID-19, and student demands have slowly and severely weakened higher education’s market value. Experts identified these events as the first death knell of a college enrollment crisis. The consequences look bleak--56% of high school graduates have no plans to attend college or are uncertain that they will ever attend. (p. 1)

Disappearing Class Boundaries

There can be no question that higher education is experiencing a revolution. Floridi (2014) explained it as the spoken word, the written word, the printed word, and the digital word that now encompasses the generative artificial intelligence word. Mukherjee (2016) framed it as the atom, the bit, and the gene. We are on the precipice of monumental understanding of the cosmos, information, and life. But what is so astounding is that both these revolutions are related, interconnected, and intimately bound up with each other. Scientific and linguistic boundaries are melting away, so we should not be surprised that what comprises a college class is undergoing a similar transition with its boundaries leaking, disappearing, and being absorbed into the information age. With learning technology making information instantly available, how we conceptualize education is radically altered.

In the digital age, students (meaning everyone) have access to a vast array of resources, platforms, and educational materials. They can learn beyond the confines of a single class or university curriculum, pursuing levels of knowledge and insight well beyond what a semester provides. Students can connect with likeminded people around the planet through online forums, discussion boards, virtual communities, and social media, expanding interconnectedness and creating an agile and community-based learning environment. However, there is a caveat. Although college classes may be escaping their evolutional boundaries, they still provide a learning framework for a systematic educational progression. The information age stretched the roots and twisted the vectors of traditional college organization. Although the bounded class is vanishing and boundary-crossing learning is becoming the norm, there is added value to structured learning and interaction; however, as Page (2006) describes complexity in the modern age, the learning landscape is dancing.

Conclusion

The Future of the Future

Teachers

Teachers are the human capital and reputational foundation of higher education. They shepherd information, knowledge, insight, and wisdom. Those of us who have worked at our craft know the joys, excitement, and pleasure that come from the “classroom” but also know how exhausting, frustrating, and fragile it can be. Nothing feels better than teaching well. Nothing feels worse than doing it poorly—and we have all done it poorly at some point in our careers. There is an anonymous aphorism, “I thought I understood it until I tried to teach it” and another attributed to Thomas Edison, “There were days of such discouragement that I ached to give it all up.” Teaching is a demanding profession. Faculty members contribute so many resources: expertise and knowledge, research and innovation, communication skills, mentoring and guidance, intuitional reputation, community service, critical thinking, networking, diversity, advising, thought leadership, alumni relations, and human kindness. The list is long, but it only scratches the surface. Understanding the breadth and depth of what faculty undertake year after year is vitally important. The most important outcome of teaching, long-term impact, is the real measure of how effective an instructor has been over her or his career. Good teachers have bad days, so context becomes a parceled-out covariate.

Change Happens

The resiliency, dedication, and creativity of university faculty over the past decades has been remarkable. In addition to the pandemic and its yet-to-be-determined long-haul impact on America's higher education system, advances in educational technology have been dramatic. A brief list might include online and blended learning, open educational resources, mobile learning, microcredentials, adaptive learning, gamification, active learning, large language models, internationalization, student centered learning, and cloud-based learning. However, like all our lists in this article this one does not pretend to be comprehensive. But consider this quote (Gelsinger, 2018):

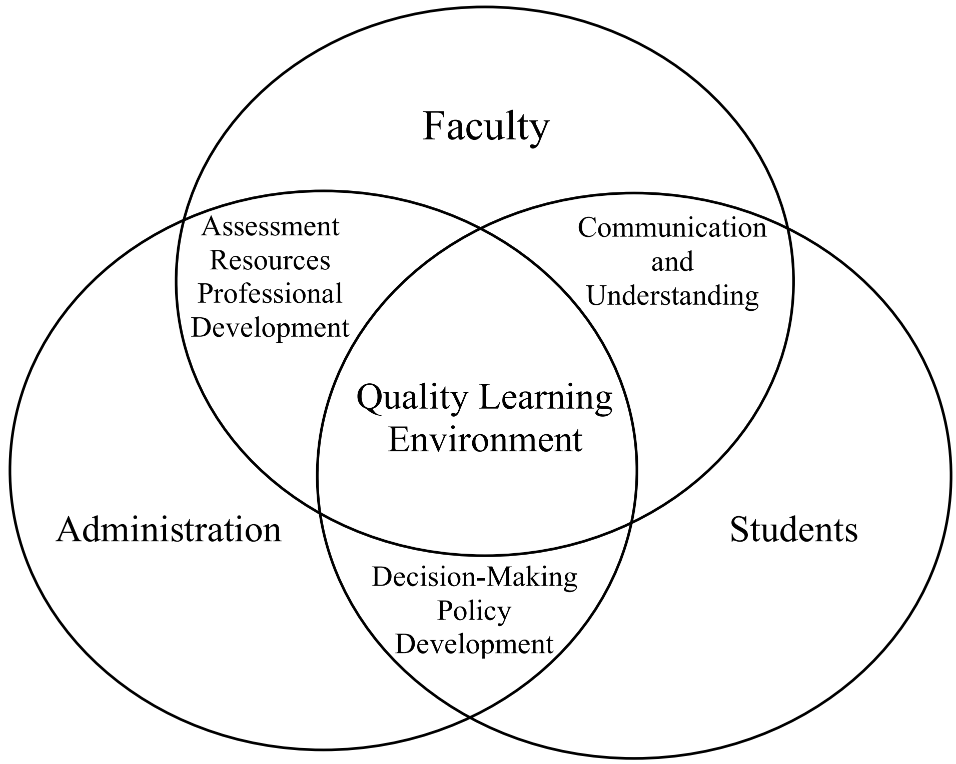
> It may feel like the pace of technology disruption and change these days is so dizzying that it could not possibly get any more intense. Yet here's the science fact: the pace of change right now is the absolute slowest it will be for the rest of your life. Fasten your seatbelts. It's going to be a fascinating ride. (p. 7)

At times, change is forced upon us, and we must adapt or be passed by. However, there is another amorphism: "The more things change the more they stay the same." That seems to be true with student ratings of instruction. We can find articles that date as far back as 60 years ago about designing a good end of course evaluation form. Since then, there have been creative approaches to making evaluations of teaching part of the educational culture, but the emphasis remains on the form. Perhaps we should start with fundamental questions. Why do we do it and how will the results be used? A starting point might be Muller's (2018) checklist:

1. What is it that you really want to assess and are there any valid indicators available?
2. How will this information be useful? Does it have potential harmful effects?
3. Does the process involve metrics and if so, how many will there be?
4. Do you need standardized measures?
5. Will the process be transparent?
6. What are the opportunity costs?
7. Who is initiating the evaluation process?
8. Who will do the developmental work?
9. Will the metrics become goals and no longer be metrics?

These are difficult questions, but their answers provide a framework for thinking reflectively and critically about the evaluation of teaching. Figure 6 presents a possible organizing paradigm.

Figure 6
The Future of Teaching Effectiveness



To implement the process in Figure 6, several things are required: first, faculty members, students, and administrators need to develop a definition or prototype for effective teaching and learning. This requires a variety of feedback mechanisms with a comprehensive framework, safe environments, and more than one assessment that enables continuous progress. Make the best possible use of technology and create a combination of recognition and accountability. This is a very tall order but one that is long overdue. Predicting and designing the future is difficult, however. Consider the protagonist Clay's response to predicting the future in the book *Mr. Penumbra's 24-Hour Bookstore* (Sloan, 2013):

> World government…no cancer…hover-boards.
> Go further. What's the good future after that?
> Spaceships. Party on Mars.
> Further.
> *Star Trek*. Transporters. You can go anywhere.
> Further…
> I pause a moment, then realize: I can't. We probably just imagine things based on what we already know, and we run out of analogies. (p. 60)

The end of the course rating form has been the standard for an exceptionally long time. We need a thoughtful national conversation about good ideas for change. Johnson (2011) tells that to do that, we need three things: first, identify the adjacent possible—the next reasonable thing we can accomplish; second, commit to a slow hunch, meaning a long-term commitment; finally, build a liquid supportive network. A good place to start the network would be the Online Learning Consortium (OLC). In summer 2023, they held a symposium on blending learning, reinvigorating that modality. Why not for evaluation of effective teaching?

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Appendix A

Student Perception of Instruction

Instructions: Please answer each question based on your current class experience. You can provide additional information where indicated.

All responses are anonymous. Responses to these questions are important to help improve the course and how it is taught. Results may be used in personnel decisions. The results will be shared with the instructor after the semester is over.

Please rate the instructor's effectiveness in the following areas:

1. Organizing the course:
a) Excellent b) Very Good c) Good d) Fair e) Poor

2. Explaining course requirements, grading criteria, and expectations:
a) Excellent b) Very Good c) Good d) Fair e) Poor

3. Communicating ideas and/or information:
a) Excellent b) Very Good c) Good d) Fair e) Poor

4. Showing respect and concern for students:
a) Excellent b) Very Good c) Good d) Fair e) Poor

5. Stimulating interest in the course:
a) Excellent b) Very Good c) Good d) Fair e) Poor

6. Creating an environment that helps students learn:
a) Excellent b) Very Good c) Good d) Fair e) Poor

7. Giving useful feedback on course performance:
a) Excellent b) Very Good c) Good d) Fair e) Poor

8. Helping students achieve course objectives:
a) Excellent b) Very Good c) Good d) Fair e) Poor

9. Overall, the effectiveness of the instructor in this course was:
a) Excellent b) Very Good c) Good d) Fair e) Poor

10.What did you like best about the course and/or how the instructor taught it?

11. What suggestions do you have for improving the course and/or how the instructor taught it?

Appendix B

UCF Modality Codes

Code	Modality
P	Face-to-face
M	Mixed mode/blended with reduced F2F
RA	Blended with active learning
RS	Blended, with no more than 20% F2F
RV	Lecture capture with live option
V	Video streamed
R	Lecture capture
V1	Emergency remote instruction
WW	Fully online

Introduction to OLJ Volume 27, Issue 3

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On behalf of the Online Learning Consortium (OLC), it is my pleasure to provide a brief overview of the third issue of 2023. However, before introducing these papers, I would like to note the ongoing success of the journal. With the support of OLC, the *Online Learning* Journal now ranks in the 94th percentile of all journals in education and through this support remains fully open access. I would like to preface this introduction with a warm thank you to OLC and encourage readers to learn more about OLC here: https://onlinelearningconsortium.org/join/free/

The September issue of the Online Learning Journal includes 13 articles from our regular submission process. These articles discuss supporting refugees in online settings, the importance of relationships in remote education settings, online engagement and how it may vary by cultural context, cognitive presence, online mentoring, modelling online student satisfaction, diversity, equity, and inclusion, and more.

In “Leveraging Digital Literacies to Support Refugee Youth and Families’ Success in Online Learning: A Theoretical Perspective Using a Socioecological Approach” authors Mary Rice and Aijuan Cun of the University of New Mexico argue that typical narratives about refugees begin with a deficit approach, focusing on struggles of refugee youth in digital learning contexts. This article seeks to redress this emphasis on challenges and to identify and theorize a more holistic asset-based approach. To do this the authors review prior research and apply Bronfenbrenner’s socio-ecological framework outlining shared responsibility in digital and online learning. The authors apply socio-ecological thinking to systems in online learning highlighting the individual, interpersonal, organizational, community, and public policy theoretical and practical implications for design and teaching with refugees in online environments.

The importance of relationships between participants in online learning systems is also central to our next article, “Building Community Online: Moving toward Humanization through Relationship-Focused Technology Use” by Staci Ann Gilpin of University of Wisconsin, Stephanie Rollag Yoon, and Jana LoBello Miller of the University of Minnesota. The authors note that 80% of teacher candidates in the U.S. are female and that applications to teacher preparation programs are dropping. This decline in interest in teacher preparation shows up in online course provision with teacher preparation representing only about 5% of online courses for undergraduates. It is therefore perhaps not surprising that there is a growing teacher shortage in the U.S. The paper seeks to address two related questions using qualitative methods. The first question asks how relational-focused implementations of synchronous discussions influences online learning communities and learning (and how this might lead to more inclusive online learning environments). The second question investigates how teacher candidates' experiences with online learning communities affect their teaching identities (and how these identities might be more compatible with persistence and effectiveness in teaching careers). The authors posit a direct link between feminist pedagogy, building relationships in online learning, and expanding access and equity, leading to higher persistence rates in online learning, especially focusing on teacher candidates. Results suggest that relational-type student-led small group online discussions are a promising pathway as they expand accessibility and equity through community development and culminate in learning while also positively influencing future teachers' identities.

As a result of the COVID pandemic many institutions with little experience in forms of distance learning were abruptly required to transition to emergency remote instruction. Confronted with the locally novel challenge of offering instruction via information technologies, these institutions began to grapple with longstanding questions in distance education, such as what does it mean to be engaged in this form of learning? The next paper in this issue, "The Influence of Collaboration, Participation, and Experience on Undergraduate Learner Engagement in the Online Teaching-Learning Environment" by Nour Al Okla, Eman Ahmed Rababa, Shashidhar Belbase, and Ghadah Al Murshidi of United Arab Emirates University investigate the factors that influence undergraduate learners' engagement in online classes and how instructors can improve learner engagement. The authors conducted an expansive review of the literature to identify various models of learner engagement including cognitive, behavioral, affective, and social dimensions. Through a survey, the authors reveal participants' engagement levels in the online environment were shaped by their collaboration, learning opportunities, utilization of educational technology, and the learners' relationships with their instructors and colleagues. Somewhat surprisingly, prior experience with online learning did not correlate with higher levels of engagement. This may reflect the fact that online learning is somewhat new to the region and institutions may need time to develop all of the infrastructure that support mature online programs such as consistent faculty development, course design, and faculty and student supports.

A second paper that investigates online learner engagement in specific cultural contexts is "Engagement in Online Learning among Thai and German Students: The Role of Classmates, Instructors, Technology and Learning Environments across Country Contexts" by Christin Grothaus of Mahidol University, International College, Thailand. Grothaus argues that engagement is not a monolithic construct and that cultural differences shape how students experience engagement in online courses. The author also notes that while any previous researchers have called for more investigations of cultural forces impacting technology mediated environments most studies on engagement and educational technology are of quantitative nature, particularly studies conducted in Asia. Grothaus therefore asserts that qualitative cross-cultural studies such as this one is lacking. The author inquires how German and Thai students perceive online learning and engage with it considering behavioral, cognitive, and affective dimensions of engagement. Further, the study investigates the role of instructors, peers, tools, in shaping student engagement across the two groups. Finally, the paper seeks to understand differences and similarities in engagement in online learning across groups and how these are related to the country and cultural context. Using interviews with 11 Thai and 9 German students, the author reveals cultural differences in online student engagement supporting their hypotheses.

The next paper in this issue relates to teacher preparation, in this case with a focus on special education. In "Special Educator Course Format Preferences," the author Rachel Brown-Chidsey of the University of Southern Maine seeks to understand how online learning options can best be designed to meet the needs of pre-service teachers in special education, another area that suffers from severe teacher shortages. The authors reviewed literature relating to the preparation of special education instructors and paraprofessionals and developed a survey designed to reveal their preferences for the organization of online education, noting that the flexibility and convenience of online learning appealed to these educators. A majority of survey respondent reported that the last course they enrolled in was a campus-based course. However, a majority of these respondents indicated that their most preferred course format was asynchronous and online. Results also illuminate other nuances in preference dependent on educator status and course duration. The authors conclude that to address the shortage of special educators, university programs could benefit from identifying and offering courses in formats that are preferred by special educators, especially more online courses.

The next two papers in the issue investigate cognitive presence, a construct drawn from the Community of Inquiry model meant to reflect the cyclical nature of learning in collaborative online settings. The first of these, "(Meta)Cognitive Presence for Graduate Student Teacher Training," by Mary Stewart of California State University San Marcos, is helpful in defining cognitive presence in an accessible way and in examining how students move through its phases, triggering event to exploration, integration, and resolution. Stewart's study focuses on a deliberate attempt to design a course that would lead to higher levels of cognitive presence and employs qualitative research methods to investigate how articulating these mechanisms can help doctoral students to understand and transfer their knowledge to help their own future students. This is accomplished through a meta-cognitive pedagogical reflection that her students completed asking them to document the different phases of cognitive presence they experienced in her course. The data for the study consists of these reflections and Stewart coded and recoded this data to answer her research questions. The data reveal that cognitive presence does not only manifest in the expected learning activities, such as threaded discussions, but shows up in other areas of the course and made also be invisible to instructors and researchers who do not explicitly ask about it. A meta-cognitive activity such as employed by Stewart is a helpful mechanism for supporting and revealing the development of this model of collaborative online learning as described by the cognitive presence construct.

The second paper on cognitive presence is "Examining the Development of K–12 Students' Cognitive Presence over Time: The Case of Online Mathematics Tutoring" by Stefan Hrastinski, Stefan Stenbom, Malin Jansson and Olga Viberg of KTH Royal Institute of Technology, Sweden, and Mohammed Saqr of the University of Eastern Finland. These authors provide an in-depth investigation of the sequences that may occur in the online collaborative learning process as described by the cognitive presence construct. Using learning analytics and a content analysis framework designed for a mathematics context, the authors document how the phases of cognitive presence unfold during tutoring interactions. They note that, while the idealized sequence can be found in the data (triggering event, exploration, integration, resolution) other sequences were actually more common. These finding provide additional empirical support for the model and position other researchers to investigate how the practical inquiry process unfolds in other educational contexts.

In "Two Stories to Tell: Different Student Outcome Measures Correlate with Different Instructor Adaptations to COVID-19," authors Quentin Charles Sedlacek of Southern Methodist University, Lily Amador, Emily Beasley, Krysta Malech, Viviana Vigi, Corin Gray, Corin Slown, of California State University Monterey Bay, and Heather Haeger of the University of Arizona explore equity issues related to COVID-inspired pedagogical changes. The authors review research indicating that indicated that the challenges related to the transition to emergency remote instruction disproportionately harmed students who were already marginalized in higher education and/or those who had only limited access to technology needed for online learning, many of whom were enrolled in Hispanic-serving institutions. They further discuss prior research describing the kinds of changes faculty made to adapt to emergency remote instruction and student perceptions of the quality of emergency remote instruction. The contribution of the current study is to combine a summary of instructional adaptations and to describe their impacts on students. Specifically, the authors investigated the types of instructional adaptations students noticed in their courses—the instructional adaptations positively associated with self-reported motivational gains and other affective outcomes; and instructional adaptations negatively associated with “equity gaps”—defined as course grades.

The next two papers look into supporting and mentoring students at a distance at the graduate and undergraduate levels. In “Technologies, Strategies, and Supports Helpful to Faculty in the E-mentoring of Doctoral Dissertations” Swapna Kumar of the University of Florida, Doris Bolliger of Texas Tech University, and Elizabeth Roumell of Texas A&M University investigate communications, research process, student support, and institutional support used by faculty who provide mentoring to doctoral students studying in online and blended settings. This paper provides a comprehensive snapshot of remote support for doctoral students and is useful as a starting point for understanding the technologies and processes involved in e-mentoring that is increasingly used in doctoral level education.

Next is “The Supervisor of Undergraduate Dissertations in a Web-Based Context: How Much Support and How to Give it?” by Najib Bouhout, Sidi Mohamed Ben Abdellah University, and Aziz Askitou Mohammed Premier University, Morocco. These authors investigate the educational and motivational support provided by faculty supervising undergraduate dissertations. They draw from Mishra and Koehler’s Technological-Pedagogical-Content-Knowledge (TPACK) model and develop their own framework that describes and explains faculty support for undergraduate dissertation work. The authors consider many of the same variables investigated in the previous paper (institutional supports, technologies, etc.) and add specificity about what is supported (motivation, educational processes). Interestingly, the authors find that institutional support variable impacts faculty’s TPACK and has downstream impacts on their support for students.

The next paper is “External and Internal Predictors of Student Satisfaction with Online Learning Achievement” by Shixin Fang, Yi Lu, and Guijun Zhang of Fudan University. These authors note that there are relatively few studies on online student satisfaction in East Asian or Chinese college populations. While myriad studies of satisfaction have been undertaken in online settings (as we are reminded by another paper in this issue), cultural differences may shape online educational experiences. The authors suggest that the mechanisms that may determine student satisfaction could be different among Asian students. The investigators therefore adopted Rovai’s persistence model but revised it based on Chinese students’ cultural context of online learning. This paper suggests a new theoretical framework, including student characteristics, internal, and external factors to model and explain Chinese student satisfaction in online learning. Using a sample of 5,980 students the authors find support for their model and conclude that faculty play a bigger role in predicting student satisfaction that do external factors such as technology access.

In “Using a Variety of Interactive Learning Methods to Improve Learning Effectiveness: Insights from AI Models Based on Teaching Surveys” authors Zohar Barnett-Itzhaki, Dizza Beimel, and Arava Tsoury of the Ruppin Research Group in Environmental and Social Sustainability, Israel, use AI to investigate interactive online instruction. Specifically, they ask how the use and variety of interactive active learning methods in online courses is associated with student course evaluations, as well as learner perceptions of both instructional effectiveness and clarity of the teaching. Using data from more than 30,000 course evaluations, they find that not only the extent of use, but also the variety of interactive learning methods significantly affects the perceived clarity of teaching and learning effectiveness. The study includes implications for both teaching and future research.

The final paper in this issue is "Faculty Perspectives on Inclusion, Diversity, Equity, and Access (IDEA) in Online Teaching" by Ryan Miller, Cathy Howell, Beth Oyarzun, Shawn Knight, and Jacob Frankovich of the University of North Carolina at Charlotte and Florence Martin of North Carolina State University. The authors argue that issues of inclusion, diversity, equity, and access within online teaching are not well understood empirically nor the focus of much faculty development in higher education. Using interview methods, the team conducted a qualitative case study with 21 faculty members to investigate how online instructors across disciplines experience and approach equity issues within their online teaching. The researchers revealed a disconnect between competencies and experience related to online teaching and IDEA issues. Faculty participants cited their comfort in exploring IDEA issues in face-to-face courses but not in online courses and were more comfortable discussing IDEA features in synchronous online courses than asynchronous online courses. These and other findings point to an urgent need for new faculty trainings on competencies related IDEA issues integrated with online instruction.

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Leveraging Digital Literacies to Support Refugee Youth and Families' Success in Online Learning: A Theoretical Perspective Using a Socioecological Approach

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Abstract

Previous research about refugee students' experiences with online learning has focused on the challenges faced by refugee youth, their families, and schools without addressing what strengths families might bring to this type of learning. Further, while previous research has touched upon refugee youth and their families' substantial digital literacies, these strengths have not been widely applied in support of online learning. In this paper, we advocate for a holistic, asset-based approach to support and develop refugee families' digital literacy practices for use in online learning experiences. In doing so, we hope to countermand the suggestion that online learning is something refugee families can never benefit from or will only benefit from under an extremely narrow set of conditions. We begin by reviewing previous research about refugee populations and their digital literacies. Then we share Bronfenbrenner's socio-ecological framework for thinking about shared responsibility in digital and online learning that does not rely on individual students, families, schools, or communities as independent actors. Next, we apply the socio-ecological thinking that we propose to online learning for refugee families across various systems and share theoretical, design, and pedagogical implications. We conclude by offering some implications for research and reiterating the importance of asset framing and shared work in serving refugee and other vulnerable populations well.

Keywords: Online learning for refugee families and youth; digital literacies of refugee families and youth; socio-ecological thinking in K-12 online learning; models for K-12 online learning

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Distance learning, even with digital and online tools, was not a product of the COVID-19 pandemic. The first documented use of distance learning in K-12 education was in 1910 (Barbour, 2021). Subsequently, technological developments such as online technologies have enabled fully online K-12 schools as well as the use of online learning in various parts of the world during natural disasters, such as earthquakes, and health disasters, such as SARS in 2003 and H1N1 in 2008 (Barbour, 2021). However, the goal of these emergency-based uses was typically to preserve instructional continuity for learners rather than provide the entire range of services of critical importance for some populations. Although COVID-19 did not produce online learning, it did create large-scale closure of school buildings and therefore, the context for increased reliance on digital and online tools for learning. The widespread and extended nature of school building closures and the challenges produced by severe illness and death created a need for practitioners, researchers, and policy makers to pay greater attention to the important role of schools to provide community stability in addition to providing instruction. However, while such large-scale, long-term closures could have been reasonably foreseen, given global patterns and recent outbreaks of SARS and other diseases, educational institutions and governments largely failed to plan appropriately to provide all the services that schools can provide while using online and distance modalities (Barbour, 2021; Rice & Zancanella, 2021).

In the context of inadequate preparation, the COVID-19 pandemic meant that an estimated 1.5 billion children globally began receiving instruction using online devices, applications, tools, and/or programs with very little notice or advance preparation (*Education Week*, 2020; UNESCO, 2020). The intention of policy leaders was that, by using online and digital learning, youth would be able to continue learning without disruption. However, it became apparent that not all young people and their families were able to benefit from remote online learning. During school building closures, many learners who did not have access to internet connections or internet-ready devices, and populations who had been historically underserved in schools struggled the most to benefit from efforts to deliver instruction online (Maldonado & De Witte, 2020, United Nations Educational, Scientific and Cultural Organisation [UNESCO], 2020). For example, in a brief paper submitted to the Australian Government Department of Education, Skills and Employment, Lamb et al., (2020) argued that while vulnerable children and families needed additional support to learn using digital and online tools, they were the least likely to receive these supports. It is also likely that these vulnerable families experienced additional negative effects from the pandemic such as increased illness and death, which would have made learning in any modality difficult.

In another policy brief, Kollender and Nimer (2020) argued that instruction relying on the availability of digital and online programs and tools during COVID-19 brought opportunities for institutional discrimination against a specific population—refugees—because these learners were unable to find, enroll in, and access basic resources to begin learning. The population of refugees and their families is important to consider because in 2020, an estimated 80 million people were forcibly displaced across the globe, with 40% of these being youth under the age of 18 (U.N. Refugee Agency, 2020). Also, the number of unaccompanied refugee youth making requests through the United Nations has been about 100,000 per year for several years (UNHCR, 2015). The refugees described in this article refer to the youth and their families who were originally from different countries in the world and resettled in a host country (e.g., the United States).

These refugees have been forced to flee their country due to war, violence, persecution, or climate change (UN Refugee Agency, 2020). These displaced individuals come from and migrate to many countries. For example, 43.7 million have immigrated to the United States for various reasons, and this number comprises 13.6% of the US population, although Canada is the country currently receiving the most refugees (Zong et al., 2019). While "refugee" is a broad term representing a broad population with considerable diversity in migration experiences, many of these youth and their families experience trauma during the migration resettlement process when they arrive in a new country, regardless of their reason for fleeing the countries where they were living (e.g., Perreira & Ornelas, 2013; Bloem & Loveridge, 2018).

Some previous research has explored refugee families' experiences during their resettlements in host countries. For example, refugee families experience language barriers because most families speak English as a new or additional language in their households (Renzaho et al., 2011; Walsh et al., 2011; Watkins et al., 2012). Not all members of refugee families had formal educational experiences prior to leaving their country and it is common for families to have experienced interrupted schooling in their countries of origin. The lack of access to education prior to migration exacerbates refugee families' struggles with learning in a host country (Brown et al., 2006; Dryden-Peterson, 2015; Dooley, 2008; Isik-Ercan, 2012; Mille et al., 2005). While acquiring a new language and facing a different culture, refugees also experience challenges in formal educational settings (Harris & Marlowe, 2011; Kanu, 2008; Miller et al., 2018). Recent research has examined refugee families' displacement and health issues during the COVID-19 pandemic (Banati et al., 2020). Most of the research related to refugee families' life experiences focused on the challenges faced by the families during resettlement in a host country. However, refugee families' cultural practices and literacies in their current domestic settings also need scholarly attention (Cun, 2020; Bolander, 2023). Specifically, families have developed digital literacies that honor their cultural practices and values. These practices and values are assets when valued as multiple ways of knowing and communal responsibility (Flint & Jaggars, 2021). Understanding these assets as part of their digital literacies should be included in developing plans for refugees and their families. To understand what we mean by *digital literacies*, we offer the following definition.

> We should view digital literacies in a larger frame that resists over-attending to operational techniques and skills and, instead, emphasizes mobilizing and building on what learners acquire and know from their wider cultural participation and affinities (Lankshear & Knobel, 2015, p.18).

Understanding families' digital literacies has become more crucial in the digital age and in the pandemic-stricken world because of the pervasiveness of the expectation to use online and digital means to connect, work, and learn.

Studies about working with refugee students' during the COVID-19 pandemic have been quicker to document deficits of refugee youth, their families, and schools and slower to mention strengths. For example, Mudwari et al., (2021) investigated online learning of Bhutanese adolescent refugees and identified factors that influenced their disengagement with learning, which included encountering perceptions about limited digital literacies of parents. Kasper (2021) examined teachers' perspectives about teaching refugee students and found that teachers experienced challenges when helping students they believed had "limited digital literacy" (p.56). While pointing out the challenges experienced by refugee newcomer students, Santiago et al.,

(2021) highlighted that "schools must attend to digital literacy" (p.355). However, existing literature also indicates the issues related to the internet, such as refugee students' lack of access to internet n Syria (Menashy & Zakharia, 2022, p.3) and internet connectivity problems (Nisanci et al., 2020) were also barriers that posed thorny problems for teachers and schools.

Although these studies have touched upon refugee students' digital literacy, they concentrate attention on what the families do not have or do not bring to the online learning experience. However, the fact that studies mention digital literacies at all suggests a gap in research on this topic. The purpose of this paper is to advocate for a holistic, asset-based approach to support and develop refugee families' digital literacy practices for online learning. In doing so, we hope to prevent the suggestion that online and digital learning is something refugee families can never benefit from or will only benefit from under an extremely narrow set of conditions. We begin by reviewing previous research about refugee populations and their digital literacies. Then we share Bronfenbrenner's (1977; 1979) socio-ecological framework to think about shared responsibility in digital and online learning that does not rely on individual students, families, schools, or communities alone. Next, we apply the socio-ecological thinking that we propose to online learning for refugee families across various systems and share theoretical, design, and pedagogical implications. We conclude by offering some implications for research and reiterating the importance of asset framing and shared work in serving refugee and other vulnerable populations well.

Review of Literature

In this review of literature, we report previous studies of refugee's digital literacies in both home and formal education settings prior to the COVID-19 pandemic. We then turn to studies of refugee children's learning with digital and online tools during the pandemic. In so doing, we set up a contrast between the assets that had been identified in previous research outside of the pandemic and the challenging experiences that young people had in trying to be successful in online learning during the pandemic. This comparison opens space for presenting the socio-ecological framework (Bronfenbrenner 1977; 1979) to support future planning for shared work to make learning with online tools and programs viable for refugee children and families in various contexts.

Refugees' Digital Literacies in Home Settings

Even where refugee families have not participated extensively in formal online learning, studies have explored refugee families' efforts to engage in various digital literacies in home settings prior to and during the pandemic (Duran, 2016; Gilhooly & Lee, 2014; Kaur, 2016; Kendrick et al., 2022; Traxler, 2018; Vollmer, 2017). In these settings, adults and children had used the internet to achieve a variety of personal and practical goals. Notably, Lloyd and Wilkinson (2019) examined how refugee youth navigated information in their everyday lives and found that the participants enacted digital literacies to search for information related to job opportunities and maintain relationships with family members overseas. These researchers suggested that the refugee youth's use of these types of practical digital literacies facilitated their informal learning.

Similarly, Gilhooly and Lee (2014) used data from three Karen brothers to highlight the youth's use of their existing digital literacies for different social practices, such as "maintaining and building coethnic friendships," or "connecting to the broader Karen diaspora community" (p.391). The authors described the Karen brothers as resettled refugees in the United States

(Gilhooly & Lee, 2014). The brothers' parents had to leave Burma due to ongoing wars and all three brothers were born in refugee camps in Thailand. In 2007, their family resettled in the United States. While living in the host country, digital tools allowed them to communicate with their friends and other Karen community members across geographic borders. The findings of these studies reveal that refugee families and children's digital literacies are not always new skills to acquire. Instead, many refugee individuals have utilized their digital literacies for various social practices in home settings. As Warriner and colleagues (2020) stated, "a more nuanced view of who refugee-background learners are, their existing linguistic resources, and their uniquely challenging life experiences will help teachers recognize possible ways to leverage resources such as multilingualism, familiarity with multimodal practices, digital literacies, or life experience" (p.38). Indeed, acknowledging and valuing the students' existing digital literacies within their microsystem environments can help contribute to practical implications.

Scholars have conducted research to offer space for refugee students to gain more experiences related to digital literacies in community settings (Emert, 2013, 2014; Johnson & Kendrick, 2017; Omerbašić, 2015; Vecchio et al., 2017). For example, Emert (2013) described a community-based summer literacy program for refugee students to employ digital tools, such as Windows MovieMaker®, to compose their digital stories. Students in this program gained digital literacy experiences while constructing multiple identities as collaborators, experts, and meaning makers. Similarly, Johnson and Kendrick (2017) involved refugee students in their digital storytelling project in a school district and found that the students represented themselves and enhanced their confidence while engaging in multimodal literacies.

In their research, Johnson and Kendrick (2017) argued that digital storytelling served as a literacy pedagogy offering more possibilities for refugee students to express their identities, strengths, and experiences. Also, Omerbašić (2015) explored Karen refugee girls' digital literacy practices, which facilitated their language maintenance and helped them engage in translocal practices. Participants in the study were originally from "the Thailand/Burma border" (p.475) and resettled in the United States. After describing the ways that participants engaged in literacy practices on social media (e.g., building social networks and posting comments on Facebook), Omerbašić (2015) offered several pedagogical recommendations, such as providing opportunities for refugee students to reflect on their digital literacy practices and encouraging them to collaborate on digital projects as being beneficial for students. All these studies acknowledged the refugee families' various digital literacies through asset-based lenses, revealing that refugee youth and families were skillful at engaging in various digital literacies, such as establishing social networks, communicating with friends and community members who shared similar cultural backgrounds, and mobilizing languages across geographic boundaries. These studies also have shown the educational value of efforts to support refugee students in making sense of self, telling their stories, and engaging multimodal literacies in various ways, such as through summer literacy programs, digital storytelling projects, and afterschool programs.

Digital Literacies in Formal School Settings

Limited research has examined refugee students' digital literacies in formal school settings (Kendrick et al., 2022). In one such study, Karam (2017) studied a case of a refugee student's digital literacies in a ninth-grade classroom and found that the adolescent used multimodal and multilingual resources to construct identities in digital spaces. The researcher recommended providing opportunities for refugee students to "exercise their agency in negotiating their engagement in classroom tasks" (p. 520). In another study, Bigelow et al.,

(2017) collaborated with teachers to design a curriculum unit which allowed refugee youth to use their home languages and employ various modes to make their remixed digital texts related to their culture. Even though the term "digital literacies" was not the focus of their study, their work depicted students who used languages, selected modes, and composed posts on Facebook® to learn and communicate. In a more recent study, Kendrick et al., (2022) investigated the digital literacies of refugee youth through digital storytelling and found that drawing upon the students' everyday digital literacies helped engage these students in English language learning and identity conduction.

Together, these studies have shown how refugee youth brought their linguistic and cultural practices to formal classrooms. Further, these studies illustrate the affordances that digital tools might provide for offering more possibilities to refugee students to draw upon various semiotic resources. These resources can be leveraged to connect to their everyday lives and experiences, as well as exercise their agencies, and simultaneously bring various digital literacies to classroom settings.

Also, these studies indicate a strong presence of refugee students' digital literacies practices in home, community, and school settings. However, little of this literature has examined digital literacies and practices wider than the individual classroom level. Valuing students' digital literacies and advocating for students to have access to online learning experiences requires efforts from families, communities, schools, and teachers, but these important actions also need policy makers' attention. What is needed is a conception of home, school, community, and policy that shows how digital literacies might be identified, built upon, and leveraged in online learning.

Refugee Children and Families Remote Learning During the Emergency of the Pandemic

While some of the research about families' digital literacies has produced asset-based findings, previous research about refugee's experiences and learning outcomes in the remote learning done online during the pandemic emergency has focused on documenting the challenges that refugee children and their families faced during the period of the pandemic where most school buildings were closed. Scholars have noted how many of these challenges existed prior to the pandemic and made it more difficult for them to access educational opportunities at all, let alone online educational ones. For example, Banati et al., (2020) documented chronic poverty, protracted violence, conflict and displacement, weak health, and inadequate protection systems as barriers faced by refugees who were living in middle- and low-income countries during the early part of the pandemic. The authors argued for greater attention to identifying and providing access to support in addition to online learning support (e.g., devices, internet connection) for giving these children and their families a real opportunity for success. For many researchers, being poor accompanied an assumption that if children could not access devices, internet, and instructional materials on their own, they should not expect to be able to learn online. Although these published articles focused on the challenges experienced by the families during the Covid-19 pandemic, that focus not mean that the families did not have cultural assets in their households—it could also mean that researchers were not focused on looking for these strengths.

Mudwari et al., (2021) also documented adolescent refugees from Bhutan living in Australia and the disengagement and isolation they felt in trying to access and benefit from online instruction. These authors posited that without opportunities to use schooling to integrate into a community, refugee adolescents were left without a vision for their potential in a community. These findings were like what Tobin and Hieker (2021) found when they studied fully and partially online learning in refugee camps and urban settings in Greece, Jordan, Kenya, and Rwanda. These researchers argued that online instruction cannot be the only educational services offered to students. In their view, blended (partly online) learning programs need to be context-specific, modular, optimized for mobile technologies, and delivered by prepared and supported teachers to be effective. However, that chain of needs requires shared responsibility and close coordination by teachers and school leaders.

In addition to what schools can do for refugee students, there has also been research about how families coped and managed the challenges they faced. Santiago et al., (2021) studied refugee families in the United States and found that they relied heavily on recreational activities, including video games, painting, cooking, their faith and religious routines, and family connections to move forward during the pandemic. These refugee families were able to engage in other activities, even those that required technological access and internet, while they struggled at school. Being successful in completing schoolwork and reaping the benefits of school required more than merely offering online instruction. Ensuring that online learning is viable for refugees demands comprehensive strategies to integrate and resettle these families. For example, Ngwacho (2020) described the need for the African country of Kenya to improve online educational opportunities for vulnerable populations, including those families displaced by war, by increasing internet connectivity and access to open-source educational resources as well as access to quality water, sanitation, and health resources (Ngwacho, 2020). In response to these understandings about the integrated nature of instructional and non-instructional supports for successful online learning, we suggest a multi-layered and community-responsive approach to supporting refugee families.

Understanding Socio-Ecological Theory

Previous research on digital literacies has revealed some assets that individual refugees and families bring to online learning. However, research about how these youth and their families experienced remote online learning during the pandemic has focused on depicting social challenges and barriers that must be overcome. To bridge the gap between what refugee families bring and what schools, communities, and governments can or should provide, we drew on socio-ecological theory as the theoretical framework to support our exploration. This theory was initiated by the psychologist Urie Bronfenbrenner, and it has been used to study human development, which is shaped by ecological environments (Bronfenbrenner, 1977, 1979). Bronfenbrenner (1977) defined the ecological environment as "a nested arrangement of structures" (p.514). His initial work includes four environmental systems: microsystem, mesosystem, exosystem, and macrosystem (Bronfenbrenner, 1977). At the microsystem level, an individual's development is usually influenced by their immediate surroundings, such as families. For example, exposure to various texts available in a child's home can help the child with literacy development. Next, the mesosystem is conceptualized as "the interrelations among major settings containing the developing person at a particular point in his or her life" (Bronfenbrenner, 1977, p.515). For example, students' digital literacy practices in home contexts may impact their academic literacy learning in school settings. The relationships among different settings in a person's development are emphasized in this system.

The third system, the exosystem, includes "one or more settings that do not involve the developing person as an active participant, but in which events occur that affect, or are affected by what happens in that setting" (Bronfenbrenner, 1979, p.237). An example of the system environment includes educational policy agencies. While children are not directly involved in educational policy-making processes, the decisions made by policymakers can influence the children's learning, development, and achievement in school settings.

Fourth, the macrosystem is "the overarching institutional patterns of the culture or subculture" (Bronfenbrenner, 1977, p.515). An example of the system includes cultural practices that influence a growing child's sense-making of self, values, and beliefs. These cultural practices usually play crucial roles in a child's interactions and involvements in their social surroundings at the micro-, meso-, and exo-levels.

The fifth system, namely chronosystem, was added to examine "the influence on the person's developmental changes over time in the environments in which the person is living" (Bronfenbrenner, 1986, p.724). This additional system emphasizes how these changes within the above-described system environments can influence a child's development across their lifespan (Bronfenbrenner, 1995). Table 1 provides an elaboration of this theoretical framework to help examine refugee students' digital literacies, which are shaped by different system environments. Table 1 also offers additional details about the theoretical, design, and pedagogical implications for applying this thinking to work with refugee families in online learning settings.

Table 1

Summary of Systems, Understandings, and Implications

System	Theoretical Understandings about the Intersection of Online Learning and Digital Literacies	Practical Implications for Designing Digital Literacies Curriculum for Online Settings	Practical Implications for Teaching Digital Literacies in Online Settings
Individual	Refugee youth have different strengths, interests, and preferences in terms of digital literacies.	Refugee youth recognize space to share their histories and demonstrate understandings in online settings using digital tools.	Expressing individual interests related to digital and culturally relevant literacies and drawing teachers' attention to consider more effective ways for teaching all learners in the online space.
Interpersonal	Refugee families bring a desire to build social networks, draw on multimodalities to function, and multilingual skills to online settings as well as culturally relevant literacies.	Refugee families can help their children value their existing literacies and support them in represent these literacies digitally that are usually invisible in formal education, which emphasize standardized curriculum.	Families deserve communication with teachers about digital and culturally relevant literacies and help teachers reflect on their teaching practices and provide more ways for better supporting students in the online space.
Organizational	Schools have roles as decision makers in choosing materials for online learning and in promoting a range of digital literacies that account for the needs and strengths of refugee families.	Schools can acknowledge the students' and families' existing digital literacies and provide more possibilities for students to draw upon their existing digital literacy to build new knowledge.	Schools should support teacher professional learning about online learning for refugee families that accounts for the literacies and technological expertise that might bring to schooling or that they are interested in developing.

Community	Communities have obligations to acknowledge and support the digital literacies and access to online learning for all students.	Communities should reach out to more families and provide more online learning resources for the families to sustain their culturally relevant literacies and advocate for the families.	Communities should support schools in designing programs that support refugee families in gaining access to resources that support the use and development of their digital literacies and access to online learning.
Public Policy	Policy makers should support digital literacies through online learning by building infrastructure for online learning. They should also frame online learning policies to include all learners and be inclusive about standards for digital learning and literacies.	Policy makers should make policies that encourage the development of accessible, responsive digital instruction materials for online settings.	Policy makers should include digital literacies as part of efforts to support teacher professional learning about online teaching.

Applying Socio-Ecological Thinking to Systems in Online Learning

Previously in this paper, we offered evidence that understanding refugee youth and families' digital literacies needs additional theoretical consideration. In this section, we focus on applying socio-ecological thinking to the systems that Bronfenbrenner (1977; 1979) outlined in the context of online learning for refugee youth and families. These systems are the individual, interpersonal, organizational, community, and public policy arenas. The perspectives on assets are also discussed in these arenas. Advocating for refugee students' digital literacies and online learning needs efforts from families, schools, communities, and other stakeholders as contextual influences in the areas all impact on individual student's learning. The discussion of asset-based perspectives is integrated into each area to show that every area needs to value refugee students' strengths and assets tied to their digital literacies and online learning. Figure 1 provides examples of key ideas for using socio-ecological theory to draw on families' digital literacies to support online learning.

Individual

Planning quality experiences with a range of online learning models that support refugee youth, and their families requires understanding these learners as a population and as individual learners. In line with previous research, these young people will have different strengths, interests, and preferences in terms of digital literacies (Emert, 2013; Karan, 2017; Kendrick et al., 2022; Omerbašić, 2015; Vecchio et al., 2017).

Archambault and colleagues (2022) have recommended personalization in digital learning as an important pillar of success in the range of online settings. While some definitions of personalization focus more on programs and tools that pinpoint cognitive deficit, an asset-based model for these refugee youth must draw on personalization frameworks that center on the child rather than what is to be learned. Such frameworks ask questions in the following order: (1) Who is the child? (2) What are their needs but also, what are their strengths? (3) What programs and services exist to serve the child? (4) What is useful for the child to learn? and then; (5) How should the learning be achieved? (Cun, 2020; Smith et al., 2004; Teemant et al., 2005). Notice how this framework places the issues of pedagogy *after* the need to learn about the child.

Individual refugee youth may possess various strengths and needs associated with cognitive development, but important linguistic and social strengths and needs also exist because of their refugee status and their position as multilingual learners (Smith et al., 2004). For example, some of these children may not have been able to access formal schooling for some time, but they may have developed various strategies for supporting their own informal learning. In cases where youth have been traveling unaccompanied for some time, they may have strengths around making temporary social connections to achieve short-term goals, collaboration to meet group goals, and creative ways to solve problems (Dooley, 2008). Moreover, while some youth may be reluctant to discuss their journeys, many will be willing to tell their stories with digital tools and use their experiences as a basis for expanding their literacies (Emert, 2013; Cun, 2022). They may also respond to stories about other refugee youth presented with various types of on- and offline media (Cun, 2020; Perea, 2020). Such strategies draw from individual assets and position those to be of benefit to other systems (interpersonal, organizational, community, public policy). For refugees and other vulnerable populations, learning cannot be left to the individual system.

In line with attention to the individual level, youth should be encouraged to express individual interests related to digital learning and other types of literacies. When individual strengths are considered for digital learning, teachers have more opportunities to understand the need to engage with families; they also are positioned to learn strategies that help them serve all students more effectively (Smith et al., 2004; Teemant et al., 2005). For example, teachers who seek to understand why refugee children may display an unwillingness to work with certain groups might learn something about cultural customs for group organization or historic rivalries that support decision making for instruction. Such was the case in research from Roy and Roxas (2011) where teachers engaged with individual refugee children about their traditional dress and learned information that helped them plan more responsive instruction for all students.

Interpersonal

Families are children's immediate surroundings and potentially impact their learning and development (Bronfenbrenner, 1977). Children are exposed to various types of social interaction in home environments, such as child-parent interaction (Dexter & Stacks, 2014; Filipi, 2015; Pianta, 1997) and conversations among siblings (Gregory, 1998, 2001; Williams & Gregory, 2001). As digital devices have become an essential tool in people's daily lives, children have also been exposed to various digital texts and social practices at home (Rice & Cun, 2021; Marsh, 2011; Marsh et al., 2017). Previous research has shown that refugee families engage in digital literacies for various social and cultural practices (Duran, 2016; Gilhooly & Lee, 2014; Kaur, 2016; Kendrick et al., 2022; Traxler, 2018; Vollmer, 2017). To these families, digital devices are not merely used for entertainment, such as watching TV, but even more to mobilize languages and maintain family relationships across geographical boundaries (Cun, 2022; Gilhooly & Lee, 2014; Lam, 2009). In other words, refugee students and families have established various socially centered digital literacies, represented in multiple modes and languages in their households.

Even though refugee students use their digital literacies at home, these literacies are often marginalized in the formal educational discourse, which prioritizes standardized curriculum and testing (Cun, 2022; Henderson & Palmer, 2015; Leung & Lewkowicz, 2006). As described previously, refugee students have different strengths, interests, identities, and preferences in terms of digital literacies in their households. We recommend that families' strengths be considered alongside strategies to learn in online settings using digital tools. Valuing refugee families' digital literacies and designing instruction based on their individual strengths and identities can provide more meaningful and effective ways to support students. Additionally, representation of refugee families' digital literacies needs to be included in the online learning curriculum to empower refugee students and to help their peers and teachers have a better understanding of refugee families.

There are also practical implications for teaching digital literacies in online settings. We recommend expressing individual interests related to digital and culturally relevant literacies and drawing teachers' attention to consider more effective ways of teaching all learners in the online space. Omerbašić (2015) described pedagogical practices, such as offering space for refugee students to reflect on their digital literacies. Aligning with this recommendation, we also suggest that helping students express their daily experiences related to digital and culturally relevant literacies in classroom settings is important. Pahl and Rowsell (2019) explored children's artifact making and argued that children's artifacts made at home can invite their teachers and researchers to learn about the children's cultural practices and families' migration journeys. In online learning settings, as students can attend classes from home, teachers can use the affordance of digital tools to invite refugee students to present their cultural artifacts in the virtual space. Another strategy is to invite families to join classes in online settings rather than problematizing family participation. The aim is not to ask parents to watch their or other children learn in the classroom. Rather, the goal is to invite parents to view "themselves as valued partners with teachers" (Nistler & Maiers, 2000, p. 670) and share their culturally relevant literacy practices. This pedagogical suggestion can also promote home-school connections, which play essential and crucial roles in children's literacy development (Moll et al., 1992; Wilson, 1991; Walsh et al., 2018).

Organizational

Although schools have a responsibility to provide instruction, schools have stewardship roles that go beyond invoking a list of skills for mastery—even when learning is done online (McAlvage & Rice, 2018). These responsibilities are wide ranging and include services like vision screening, meal programs, library access, adult learning, playgrounds, and other unstructured places to congregate, and find information about community activities. While some learners may navigate school successfully without accessing other supports available through schools, refugee youth and other vulnerable populations can benefit from these services greatly, many of which were absent during the pandemic (Mudwari et al., 2021; Tobin & Hieker, 2021). Without access to the full range of services that schools provide, refugee youth are poorly positioned to benefit from online instruction.

As organizations, schools can also make efforts to acknowledge the youth and their families' existing digital literacies and provide more possibilities for students to draw upon their existing digital literacy to build new knowledge. These efforts might be combined in useful ways. For example, schools have roles as decision makers in choosing materials for online learning and in promoting a range of digital literacies (Rice & Ortiz, 2021). These materials can be selected to account for the needs and strengths of refugee families (Cun, 2020). Refugee parents can be meaningfully involved in these processes when schools provide physical or digital access to meetings and translators to help families communicate.

As organizations, schools can also support professional development about online learning for refugee families that considers the literacies and technological expertise that refugee youth might bring to schooling or that they are interested in developing. Based on previous literature, topics for such professional learning might include (1) storytelling with digital tools, (2) practical problem solving with a variety of online tools and strategies, (3) maintaining friendships and relationships across time and distance using online tools and platforms, (4) accessing culturally important or linguistically-supported digital texts, and (5) drawing on appropriate social-emotional resources (with the understanding that some students may gravitate toward ideas that are spiritual or formally religious in nature).

Community

In addition to home contexts, communities are also considered students' immediate surroundings, which can impact individual development at the microsystem level (Bronfenbrenner, 1977). The resources available in communities can facilitate children's literacies (Epstein & Salinas, 2004; Oriyama, 2012; Reese & Goldenberg, 2008; Singh, Sylvia, & Ridzi, 2015). Even though some community settings, such as religious places, might offer literacy resources in more than one language, most literacy resources are provided in English in most communities in the United States (Reese & Goldenberg, 2008). Consideration of diversity in terms of language and culture needs attention in communities.

Bronfenbrenner (1977) defined the mesosystem as "the interrelations among major settings containing the developing person at a particular point in his or her life" (p.515). Researchers have established university-community partnerships and offered various programs to help children and youth with literacy learning. A group of previous studies has explored refugee students' literacy learning and identity construction through summer literacy programs and digital storytelling projects (Emert, 2013, 2014; Johnson & Kendrick, 2017; Vecchio et al., 2017). Collaborations between universities and communities bring more possibilities to support refugee students.

There are implications for designing high quality online learning within the community system. Families should be able to access learning and other literacy resources in communities beyond the school building. Further, it is important to offer these resources in languages that families speak and not just a colonial or dominant language.

An additional recommendation is to include the representation of refugee families' social reputation with other refugee families and outside of the refugee group. While it is important to offer services and support, true use of this system should position families with resources to offer through their social networks and share with friends in local neighborhoods and beyond (Cun, 2020; 2022). Valuing the families' Funds of Knowledge (Moll et al., 19992) related to resource sharing in communities can help advocate for the families and help others see that refugee families are not expecting merely to access digital learning, but they can also give support.

As a practical concern, we suggest that communities consider physical spaces where families can access resources. Refugee families did not just lose access to school buildings as potential resources. They also lost access to community centers, libraries, museums, religious places, and other community settings in the wake of the pandemic. Many physical locations limited their hours, and some remained closed during the pandemic. Some families might be scared to go back even if these resources are open again. Families cannot receive the support they need for community building under these circumstances. Therefore, we see a need for multiple collaborations among communities, K-12 schools, and universities to help refugee youth and families understand the resources available for digital literacies development, learning in general, and perhaps other support, such as health information.

Previous studies have shown that community-based literacy programs, digital storytelling projects, and afterschool clubs through university-community and university-school partnerships have positive impacts on refugee students' digital and multimodal literacy development (Emert, 2013, 2014; Johnson & Kendrick, 2017; Omerbašić, 2015; Vecchio et al., 2017). We suggest that these programs described can be offered in online spaces to help refugee students continue digital literacies and online learning in home and community settings, but the socio-ecological model suggests that various systems will have to connect, collaborate, and communicate with families for this to be successful. Merely posting a video conference link will not be enough to draw participation and provide adequate services.

Public Policy

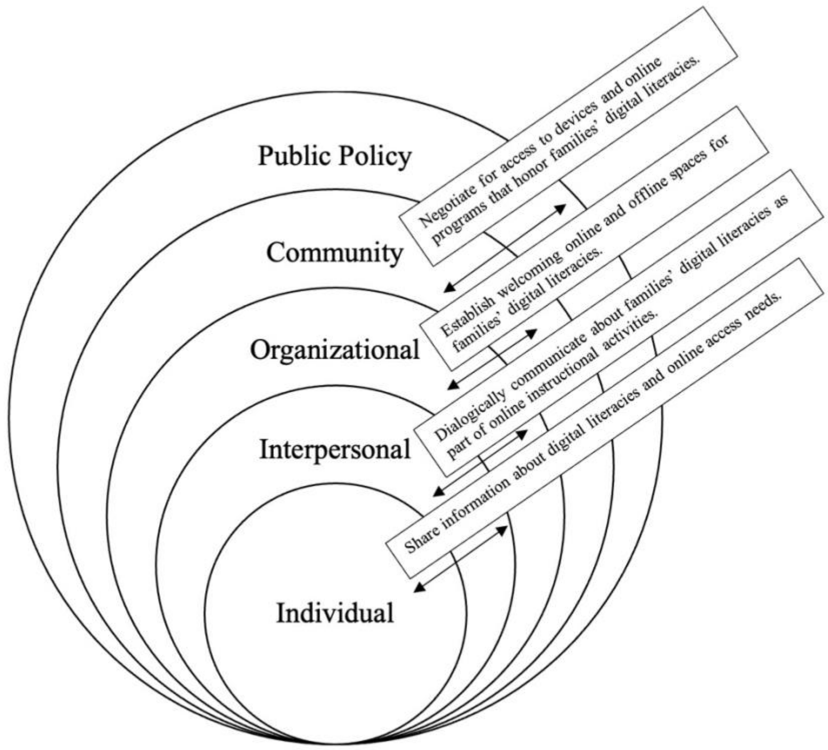
States and nations can support digital literacies through online learning by building infrastructure for online learning. It cannot be left to individuals or individual families to obtain internet access on their own. Such a system ensures that vulnerable populations will not be able to access online learning, regardless of any other planning done on their behalf (Ferri et al., 2020; Mac Domhnaill, 2021). Where internet access and access to devices are unavailable, it is public policy to plan for distance education that does not rely on online and digital means until such access can be made available (Barbour, 2021).

Moreover, public policy makers must frame online learning policies to include all learners. They must be inclusive about how they set standards for demonstrating success online. While refugee learners may not be able to demonstrate competencies for some school tasks immediately, it is important for policy makers to remember that this population of learners stands to benefit the most from services and instruction provided. For example, Gambi & De Witte (2021) found that students from vulnerable populations, including refugees, demonstrated considerable resiliency in recovering test scores when they received support services. In fact, these vulnerable students receiving support recovered more of their scores than higher achieving students who were not receiving services.

Refugee youth are positioned to benefit from policies that leverage digital literacies to privilege persistence and growth over mastery, consider learner preferences and input into what digital literacies might support their learning, focus on concern for social and emotional health, and are open about how the assessments with and of their digital literacies will affect the opportunities of individuals, families, organizations, and communities (Cardeli et al., 2020; Smith et al., 2004).

Finally, public policy makers should include digital literacies as part of their efforts to support teacher professional learning about online teaching (Rice & Zancanella, 2021). This is important because of the need to find out what digital literacies refugee youth already have so these can be extended and expanded. For some applications like TikTok® or WhatsApp®, refugee youth might already have some sense of how to compose communications and consume videos, or they may even know technical aspects of how to make and broadcast content. But they may not know how to use a short video to engage with instructional content and frame a video as a response to an academic task. Policy making activities must include these distinctions and name the acts of meaning making with digital and online tools as *digital literacies* instead of general technology skills. This specific naming is important for accessing practical and scholarly resources, design, and funding of appropriate research projects, and calling upon professional organizations to support teachers in their initial learning and subsequent development.

Figure 1
Illustration of Using Socio-ecological Theory to Draw on Families' Digital Literacies to Support Online Learning



Additional Considerations and Potential Limitations

While we have provided evidence of the need for this model and for how it might operate in decision making within and across systems, we acknowledge that model is imperfect. There might be challenges for designing research that has the primary goal of generalization or upscaling. Also, we acknowledge that while this model accommodates individual considerations like cognition, it is not a cognitive model, so it is unlike many other models of online learning such as the Community of Inquiry (Cleveland Innes et al., 2018) or Academic Communities of Engagement (Borup et al., 2020). Additionally, the social-ecological model (Bronfenbrenner 1977; 1979) accommodates various family types including intergenerational families, but previous writings about the model have not always made that clear.

Finally, if readers see how the model might be beneficial for thinking about other vulnerable populations, we see that as a strength rather than a weakness, although we emphasize that we saw a particular need to understand how the socio-ecological approach is badly needed with reference to refugee populations because of their multiple cultural, linguistic, religious, racial, and other identities that intersect in ways that can lead to their being devalued and dismissed as viable online learners.

Recommendations for Research

Taking an asset-based approach to refugee families and their literacies in the context of online and other forms of digital learning could lead to strong research opportunities that move beyond identifying challenges these families face and then either explicitly or implicitly suggesting that refugees are not capable of or could not benefit from learning online. These research opportunities include extended commitments to refugee families in studying their educational experiences, using more relationally engaged methodologies and strategies, and applying a more contextually dense framing around working with and within the various systems.

Extending Commitments to Refugee Families

Conducting research studies with refugee communities is not merely to collect data and leave the sites. Instead, the socio-ecological model suggests a research ethic that makes participants the primary beneficiaries. Many previous research studies have examined the challenges and needs of refugee families and communities (Banati, Jones, & Youssef, 2020; Brown, Miller, & Mitchell, 2006; Isik-Ercan, 2012; Walsh et al., 2011;). Indeed, these needs are parts of refugee families' stories that cannot be ignored. However, refugee families' stories are more than just their needs. More research attention is needed to explore refugee families' digital literacies and online learning through asset-based approaches where they are regarded to have something to contribute, both at the time of the research and in the future. This will mean spending more time with families and being more reflective about how refugee families can share what they know, and all the systems can benefit from their participation.

Relationally Engaging Methods and Strategies

Positioning vulnerable populations such as refugee families requires new conceptual frameworks to consider findings, but also requires new orientations for research. These techniques might include types of ethnographic and phenomenological work, but also methodologies that support community engaged research practices such as action research, narrative inquiry, and self-study of practice (e.g., Rice, 2023). These methodological strategies allow for deeper views into how refugee youth and families engage in clever problem solving and reveal their goals for themselves and others. These strategies also provide additional space for sharing responsibilities and benefits in research.

Contextually Dense Framing

Our final suggestion for research centers on the need for more conceptually dense framing of refugees and their families. This includes a need to describe the populations more fully in terms of why and how they have migrated as well as their previous educational experiences, their expectations for learning and living where they are residing, and also critical examinations of how framing discourse is used, either to identify refugees as deficient or undeserving or to expand interest in what refugees and the other systems have that they can bring to bear for the success of all. In short, researchers should commit to frameworks that are considerate of the complexities in educating children, especially vulnerable children, and that advance the potential children and families as well as individuals in other systems (e.g., teachers within the school organization).

Conclusion

The purpose of this paper was to draw attention to the need for asset-based thinking about refugee populations and their potential to be successful across the range of online learning by drawing their digital literacies and related strengths. Critically, we emphasized the need for online education to be about more than instruction for these youth, while also acknowledging the need for a strong curriculum that favors *the who* over *the what* during instruction. To achieve these goals, we drew on Bronfenbrenner's (1977; 1979) socio-ecological model based on systems—individual, interpersonal, organizational, community, and public policy—that overlap to produce learning contexts for students. We intend our work to be used by policy makers and educators to build strong systems that refugee youth need to use and expand their digital literacies and be successful online learners.

Declarations

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

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Building Community Online: Moving toward Humanization Through Relationship-Focused Technology Use

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Abstract
This qualitative study aims to improve accessibility and equity in digital spaces by identifying the prevalent mismatch between online course design, student culture, and its connection to instructional design for teacher preparation programs. Utilizing feminist theory, we explore the intersection between community, identity, and learning within relational-focused small group online discussions for students enrolled in two online teacher preparation courses. Data for this study includes observations of teacher candidates, artifacts of their meetings, and reflective responses. The results indicate that relational-focused small group online discussions provide opportunities to expand accessibility and equity through community and deep learning while impacting future teachers' identities.

Keywords: online learning, online discussions, relationships, identity, feminist theory, feminist pedagogy

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The online student population continues to grow as students look for convenience and flexibility, with the COVID-19 pandemic accelerating transitions from face-to-face to online delivery modes. The Strada Center for Education Consumer Insights (2020) surveyed 22,000 diverse American learners of all ages. Findings indicate that 59% of learners prefer online-only or hybrid models over exclusively face-to-face experiences, with the preference even stronger for Women and Black learners. Even though these groups prefer online and blended, they are underrepresented in online courses. When attending online courses, their persistence rates are lower than for onsite courses (Strada Center for Education Consumer Insights, 2020; Cheslock et al., 2018; Ortagus, 2017; Kaupp, 2012). One factor is the text-based asynchronous discussion board that all students across cultures widely report disliking. Students typically complete these transactional discussions individually, leaving them sometimes feeling isolated. This isolation is linked to a loss of engagement and connection in classes, having a negative impact on learning (Liu et al., 2009). Building and maintaining connections for all students requires using a culturally responsive lens (Ladson-Billings, 2021) that removes barriers that limit communication, relationships, and connection. (Luyt, 2013; Ojeda et al., 2014). These barriers include transactional interactions over relationship-focused interactions. Reflecting on this connection between online learning spaces and student access, we focused on relationship and community-focused student-centered instruction in our courses, emphasizing cooperation in learning and teaching. Exploring feminist principles led us to utilize small, student-led learning communities facilitated by synchronous video conferencing technologies.

As three teacher-educators, we see this need within our context of working in teacher-education programs. We aim to improve accessibility and equity in digital spaces for diverse teacher candidates. By shifting our instructional design, we offer a solution to the prevalent mismatch between online course design and student culture. To overcome this mismatch, we explore structural changes to online discussions that address academia's bias toward white culture, which often includes an individualistic approach to pedagogy (Ojeda et al., 2014). Though traditional theories have not intentionally sought to place diverse learners second in the educational environment, the fact that these theories tend to reflect the middle-class, white male experience (Flannery & Hayes, 2001) unintentionally does just that. Through examining feminist theories, we came upon a more inclusive mode of online course design that supports all learners by humanizing the learning experience (Feminist Pedagogy for Teaching Online: A Digital Guide, n.d.). Yet, as we embrace feminist approaches, we often grapple with bringing a communal and student-centered approach that embraces collaboration, communication, and relationships to our online spaces. Leaning on the recommendation of Chick and Hassel (2009), we put our teaching philosophies and values at the forefront while working collaboratively to push technology's limitations to the back, sometimes perceived and other times misplaced. An additional layer of importance surrounds this study due to the ongoing teacher shortage (Center for American Progress, 2019) and the need for teacher preparation programs to retain prospective teachers now more than ever. This work aims to improve teacher candidates' online discussions to build community, support learning, and increase program success for all.

Aligned with our commitment to access for students, we recognize the need to acknowledge the lens we bring to our work (Romero-Hall, 2021). We come to our teaching and learning understanding that teaching and research are mutually dependent, each informing the other. We must be mindful of this in our work as feminist scholars and teachers" (Light et al., 2015, p. 8). Our research backgrounds in pedagogical design, online learning, multimodality, sociocultural theory, and feminist theory impact our collective knowledge and practices. Ultimately, we are interested in pushing our pedagogy forward as we engage with opportunities for students to develop relationships that support their learning. Through the connections that we made at the intersection of our shared knowledge of theory, histories of research, and ongoing reflection of pedagogy, we came to an intentional focus on how a feminist approach to our online pedagogy in student discussions could shape students' experiences related to connection and have an impact on their overall experience, leading to persistence.

Literature Review

The increased interest in online courses is promising as these courses are often equivalent in quality to face-to-face courses (Bowers & Kumar, 2015) and provide access to higher education for students who otherwise may not attend with the COVID-19 pandemic, likely increasing the prevalence and demand for online and blended format courses (Inside Higher Ed, 2021). To illustrate, a study by Bay View Analytics (2021) highlights how some students experienced the online environment out of necessity during the pandemic, found they liked learning this way, and now prefer it for part or all their courses. Online is no longer a trend; it is mainstream. However, studies show students have 10% to 20% lower persistence rates for online courses than for face-to-face courses (Jaggars & Xu, 2016: Hart, 2012; Xu & Jaggars, 2011). Part of the low persistence rates is perhaps because online courses continue to fall below face-to-face courses in terms of opportunities for student-to-student interaction (Paulsen & McCormick, 2020). Instructors often seek to address this deficit through text-based asynchronous discussion boards, even though students frequently report dissatisfaction with these discussions due to their isolating and transactional nature (Kauffman, 2015; Majid et al., 2015). The solitary nature of online learning then often takes on an all too familiar form. Students log on, do the assigned discussion boards, and submit assignments. Absent are laughter, organic conversations, learning from one another, student leadership, incidental sharing of photos and holiday plans, and the development of relationships that spill over into email/text exchanges and support students through the tough times. In fact, in online courses, relationships and community are sometimes nearly void. In the end, students and instructors are frustrated.

We also recognize issues of equity and inclusion that arise in online courses must be addressed as a central part of our practice as they contribute to lower persistence rates. As the demand for online learning grows, so does the “demographically diverse student population,” including rural students, full-time workers, and stay-at-home mothers. If not for online courses, many would not be able to pursue higher education. There is also a preference for online and hybrid learning opportunities for BIPOC and female students (Strada Center for Education Consumer Insights, 2020), as these groups who educational institutions previously marginalized can now access higher education in ways they could not get before the expansion of online learning. Yet often, these groups are underrepresented in higher education and even less well-represented in online courses (Cheslock et al., 2018; Ortagus, 2017). Even when students from historically underrepresented groups attend online courses, their persistence rates are lower than for onsite courses (Strada Center for Education Consumer Insights, 2020; Cheslock et al., 2018; Ortagus, 2017; Kaupp, 2012). We argue that the current situation of inequality was not an accident; it was designed. As asserted by Yeboah and Smith (2016) Smith, instructors need to be more intentional about designing online courses that consider cultural diversity and allow students to build relationships that lead to increased persistence. An opportunity exists for instructors to place value on collaboration, communication, and relationships supported in any learning environment by utilizing small learning communities (Gay, 2018; Plotts, 2020a, 2020b; Woodley et al., 2017). Chick and Hassel (2009) add that the feminist principles of shared power and leadership further support the development of relationships in small learning communities when they are student-led.

At the same time, developing research calls for synchronous video conferencing technologies to support these relational conversations (Berry & Kowal, 2020; Paulsen & McCormick, 2020; Ragusa & Crampton, 2018). But when a synchronous component becomes part of an asynchronous course, this jeopardizes the flexibility and convenience online students desire (Raza et al., 2020; Seaman et al., 2018; Drefs et al., 2015; Simpson, 2013), along with the anonymity others prefer (Berry & Kowal, 2020). Some may not have the necessary bandwidth (Johnson & Cuellar-Mejia, 2014; Stanford, 2020) or access to quiet spaces (NYU Steinhardt, 2020) to participate fully. Recognizing these complexities of synchronous discussions and looking for ways to use technology to fully support a sense of community is necessary to bring equity to online learning communities. We argue that much of the research around persistence rates in online learning does not focus on the link between students' relationships with peers in ways that supports their learning and the interconnected role of identity, power, and the impact this texture has on their overall successful course completion.

As online communities are built, instructors can enable or constrain how students access the digital space, engage in dialogue, and ultimately share their identities. For example, digital tools in online learning spaces provide space to bring and play with multiple identities (Savin-Baden, 2010) by using multiple modes, ultimately allowing for more learning (Delahunty et al., 2014). This also aligns with feminist theory as networked communication offers the potential for disconnected performances of gender, disrupting power structures and space to present oneself as animals, robots, monsters, and other characters of multiple, indeterminate gender (Dean, 2006). Yet, the rigid nature of some online spaces, digital tools, or the instructional use of tools can limit student engagement by controlling how students interact and project themselves (Chick & Hassel, 2009; Garcia & Nichols, 2021). The way interactions are set up also allows students to connect and share in authentic ways and to lead or be placed in a position where they are simply sharing with the class in a way that feels isolating or performative (Chick & Hassel, 2009). As students share information in digital spaces, they must also contend with an unlimited potential audience (Andrews & Smith, 2011), digital footprints (Dennen, 2021), and context collapse when their multiple identities come together in one online space, all causing tensions related to maintaining privacy (Dennen & Burner, 2017: Davis & Jurgenson, 2014). Students may feel supported or isolated depending on how opportunities to share information are created.

Information specific to fields of study is also important to consider as it contributes to the diversity of online learners, likely impacting their responses to pedagogical practices and course offerings. Online learners seeking teacher licensure that were part of this study are similar to online learners in other fields and, simultaneously, unique. Students in a teacher preparation course are not just college students but also becoming teachers. As teacher educators curate learning experiences for teacher candidates, they can model instructional design that students will carry over to their K-12 classrooms. For instance, technology facilitates the creation of community in digital spaces, as we model in our courses. Lindstrom (2021) notes that experiences such as this have been shown to shape the attitudes and beliefs of teachers and have a more significant impact on their future integration of technology than other factors, such as access.

Unlike other areas of study, nearly 80% of teacher candidates in education are female, and the vast majority are white. At the same time, the number of teacher candidates is steadily decreasing, leading to teacher shortages (Center for American Progress, 2019). This decrease is attributed, in part, due to perceptions of teaching as an undesirable career (Center for American Progress, 2019). Currently, the field of education is the least popular degree among undergraduates, with approximately 5% of the online courses offered to undergraduates being in education (National Center for Educational Statistics, 2019). However, online learning might be untapped in its potential to address the teacher shortage by providing access to teacher preparation programs for prospective teachers, particularly those from more diverse backgrounds, which also indicate a preference for online learning (Strada Center for Education Consumer Insights, 2020). If online learning impacts the teacher shortage, it must be done in ways that nurture student success.

Within our study, we embrace feminist principles and bring forward a communal and student-centered approach that embraces collaboration, communication, and relationships in online learning spaces. Feminist theory influences our online pedagogy by emphasizing the need for learning to be collective, flexible, and relational (hooks, 1994; Kamler, 2001) while treating students as co-educators (Romero-Hall, 2021) rather than teacher-centered, transactional, and individual. Diversity and inclusion are key values of a feminist classroom (Bricker-Jenkins & Hooyman, 1987) as feminist theory recognize hierarchies of power (Chick & Hassel, 2009; hooks, 1994), the intersectionality of identities (Carbado et al., 2013, hooks, 2000; Ludlow, 2002), and recognizes learners are more than their physical or digital presence (Romero-Hall, 2021). These tenets align with Freire's (1993) definition of humanization, as they center on a need for dialogue between teachers and students, relying on the trust of students and the co-creation of text through ongoing reflection and action. At the same time, we see these qualities of humanization taken up in new and relevant ways through an explicitly feminist lens (hooks, 1994, p. 52). Bringing these tenets of feminist theory together, we see a direct link between feminist pedagogy, building relationships in online learning, and expanding access and equity, leading to higher persistence rates in online learning.

Through this qualitative study, we aim to improve accessibility and equity in digital spaces by investigating the impact of relational-focused small group online discussions on students enrolled in teacher preparation courses. An additional layer of importance surrounds this study of teacher candidates. Online learning might be untapped in its potential to address the teacher shortage by providing access to teacher preparation programs for prospective teachers, particularly those from more diverse backgrounds. Add to that, teacher candidates are not just learning; they are also learning to teach, and the pedagogy they experience in their coursework has been shown to impact the pedagogy they bring to K-12 spaces. Therefore, the potential exists to foster a new generation of social justice educators who can work for systemic change in K-12 schools due to their experiences in teacher education courses with a pedagogy grounded in feminist values like that shared in this study. This study is focused on the following research questions: 1) How does a relational-focused implementation of synchronous discussions impact online learning communities and learning? and 2) How do teacher candidates' experiences with online learning communities impact their teaching identities?

Methods

This qualitative study (Erickson,1986) focuses on 20 undergraduates and 10 graduates at a small midwestern liberal arts college who were enrolled in two online teacher preparation courses. Aligning with national teacher candidate trends, the majority of participants self-identified as white (95%), female (90%), and native English speakers (95%) (Ingersoll et al., 2014). Ages ranged from 18-40. Students in the study participated in three-to-four small group, student-led, online discussions facilitated by synchronous video conferencing technologies. Staci was the instructor for both courses. Stephanie and Jana were familiar with the program but did not teach these courses. Staci facilitated the synchronous discussions with teacher candidates over a 7-week summer term. Table 1 shares our working definitions of the feminist pedagogy tenets we incorporated into the discussions.

Table 1
Feminist Pedagogy Tenets

Feminist Pedagogy Tenet	Our Working Definition
Accountable collaboration	Mutual support and collaboration among students and instructor
Alternative histories & narratives	Realizations that life happens parallel to academics
Community building	Building community to ensure relationships, value, and belonging
Embodiment	Students as individuals that are more than their physical or verbal digital presence
Intersectional identity	Students are provided space to reveal identities and their barriers or opportunities for learning
Learner agency	Students as co-educators

Note: Adapted from Jaramillo Cherrez and Romero-Hall (2022).

Table 2 lays out the discussion structure, including instructor and student actions, with the second column connecting the actions to specific feminist pedagogy tenets.

Table 2
Our Discussion Structure

Instructor and Student Actions	Identified Feminist Pedagogy Tenets
1. At the beginning of the courses, Staci assigned students to ***small groups*** of 3-5.	Community building
2. To optimally support the development of a community, students were in the ***same small group*** all semester.	Community building
3. Students were provided overarching lesson topics/objectives, the readings/viewings, and a starter prompt/directive while ***students took turns facilitating the discussions***.	Learner agency

4. ***Students took notes on a shared Google Document***, where they ***shared their related experiences, questions, and resources.*** An optional ***icebreaker prompt*** was included along with ***check-in*** to see how everyone was doing. Staci could provide feedback through further questions or resources after meetings.	Accountable collaboration Alternative histories & narratives Embodiment Intersectional identity
5. The discussions counted toward approximately 20% of the student's final grades in the courses.	Alternative histories & narratives
Note: Staci used a form of ***ungrading*** (Kohn & Blum, 2020). Students received feedback as either *met/not met*. Suppose they met with their small group and submitted a Google Document with notes they received *met*. All groups received *met* and were provided extended time to meet without penalty.	

Data for this study was collected during the duration of the courses. The collection included:

1. Artifacts (student discussion notes from their live meetings, student-created resources, and instructor lesson plans)
2. Field notes/jottings documenting Staci's interactions with students around the discussions (e.g., formal and informal via email, phone calls, and zoom).
3. Written student reflections of their experiences participating in the discussions were part of the reflective writing prompts that Staci typically includes in her courses. For instance, students were asked to reflect on "How have your peers and the activities you completed with them in this course impacted your learning?"

Our analysis focused on three of Gee's (2011) Building Task Tools: the Significance Building Tool, the Identities Building Tool, and the Relationships Building Tool. Using these tools, we looked across candidate reflections to identify themes related to our research questions, including the significance candidates placed on their discussion experiences and how they connected this experience to their teaching and learning identities. After identifying these themes, we triangulated our data by comparing our analysis with the student discussion notes and jottings Staci took from interactions with candidates to confirm. Our analysis highlights specific quotes from candidates as they align with the overarching themes.

Findings

Based on this data, we have identified three interpretations or themes that inform our conclusions: (1) Transformation, (2) Student Actions, and (3) Collaboration. Table 3 summarizes our data triangulation and connections to Gee's (2011) Building Task Tools while providing a related student quote for each of the three themes.

Table 3
Data analysis summary

Theme	Quote	Gee's Building Task Tool	Connected Artifacts
Transformation	Student A, Female — *After I led the final discussion, I feel like I am at a point in my life where I can do really good work in a group and alone. This makes me feel very versatile as an educator because that is the balance you need to have to be successful.* Student D, Female — *The support, collaboration, and encouragement, from my VLC group drove my engagement and participation in what you'd typically consider a "discussion board". In my past experiences, discussion boards were easy to "piggy back" off of other people's responses. VLC truly did require full engagement and participation in the weekly readings and topics.* ***Overall, I will 100% take the concept of VLC's and incorporate them into my classroom learning, rather than require my students to post to a discussion board****. I believe that face to face conversations are much more effective and meaningful than posting to a forum and* ***I fully plan to incorporate these into my plans in the upcoming school year***	Identity Building Task	Student Discussion Notes Staci's Jottings

Student Actions	Student B, Female — *It is really nice to get to know others from different campuses and apply all of our knowledge and experience together collaboratively! The discussion experience has been nothing short of fun and educational. I hope that other instructors can learn from this instead of a discussion board because those can get long, drawn on and boring.* Student E, Female — *My peers made sure to give me suggestions that I could use to make my assignments better.*	Significance Building Tool	Student Discussion Notes Staci's Jottings
Collaboration	Student C, Male — *We will keep in touch with each other through email. We will be there for any support someone might need.* Student F, Female – *We always keep in touch on our group chat (text messages and Snapchat). We check in on one another to make sure everyone is on track.*	Connections Building Tool	Students Discussion Notes Staci's Jottings

Transformation

One theme we identified across students' reflections was the transformation they showed in their perceptions of themselves and their competence around the content. The Identities Building Tool (Gee, 2011) suggests asking "what socially recognizable identity or identities the speaker is trying to enact or to get others to recognize" (p. 199). Across our data, we found examples of text where students identified ways that they saw themselves change toward a version of how they see themselves as teachers. They began providing one another with instructional support in ways that helped themselves and others learn the course content. Others shared they planned to use relational-small group discussions in their future classrooms. Some students mentioned this experience helped them become more confident students and future teachers. Student A in Table 3 indicated, *"this makes me feel versatile as an educator."* By naming their future self as a flexible educator who will engage in these practices, the preservice teacher shows an identity they believe they have come to through their interactions.

Student Actions

Another theme related to the relational nature of the discussions nurtured student actions as they reported both enjoying the discussions and finding them helpful. Gee's (2011) Significance Building Tool focuses on how words "build up or bring forward the significance for certain things" (p. 198). Throughout the data, students emphasized the *importance* of their collective experience in these groups. Students shared that video conferencing technology made understanding course material, applying learning, and fully considering differing viewpoints easier. To illustrate, in Table 3, Student B shared, *"It is really nice to get to know others from different campuses and apply all of our knowledge and experience together collaboratively."* Student E stated, "My peers made sure to give me suggestions that I could use to improve my assignments*."* Finally, a student reported, "this *discussion experience has been nothing short of fun and educational."*

Collaboration

Moreover, a theme emerged related to students discussing how the discussions were safe and supportive spaces with evidence of community development, including trust, belonging, solidarity, and reciprocity. Gee's (2011) Relationship Building Tool asks how words "are being used to build and sustain or change relationships" (p. 199) within groups. Students highlighted the importance of being in a group and its impact on how they identified with their groups; as Student C in Table 3 explained, "*We will keep in touch with each other through email. We will be there for any support someone might need."* The use of "we" across this description highlights how the group members feel connected to each other rather than only reflecting on a personal "I" experience. The other words, focus on a forward motion of how this relationship will extend beyond the class.

Discussion

The results of this study build on the assertions of other scholars (Gay, 2018; Plotts, 2020a, 2020b; Woodley et al., 2017), indicating that relational-type small group online discussions provide opportunities to expand accessibility and equity through community development and content learning while also impacting future teachers' identities. The connection between feminist tenets of collaboration, community building, intersectional identity, and learner agency (Cherrez & Romero-Hall, 2022) became increasingly evident in the ongoing development of relationships in student-led (Chick & Hassel, 2009) small learning communities.

As we synthesized the analysis, we noticed links between collaboration, identity, and learning that point toward students' humanizing experiences. As the instructor, Staci took on a passive role, making minimal contributions to the discussions. Instead, community and connection were developed by the student-led nature of the discussions that set the conditions for shared metacognition and application, culminating in learning. In part, future teacher identity development was also nurtured by their learning experiences. The peer interactions were valued and put students at ease, creating spaces for students to develop identities to include learner and teacher as they led discussions, supported their peers, and received feedback. Simultaneously, there was evidence of students acting as teachers for their peers and experiencing the community as learners influenced how they see themselves creating community as future teachers, which aligns with Lindstrom (2021), who highlights how teachers' experiences such as this have shown to shape their attitudes and beliefs and impact their future pedagogy as K-12 educators.

Importantly, this back-and-forth between learner and teacher is a humanizing stance we want future teachers to embrace as they see themselves as both participants in their learning as students and co-constructors of knowledge through dialogue with their future students.

While most students highlighted value in the small group discussions, some tensions are essential to note. A student noted, "*I had some struggles with a classmate that was focused on ensuring they provided a detailed "right" answer rather than having a discussion between classmates which I had found challenging. I feel that took away from conversations that would have been more effective in the learning process."* Another finding that is important to note is the teacher candidates in this study did not share any concerns about scheduling live meetings with their peers. Nor issues related to anonymity, access to high-speed Wi-Fi, or quiet spaces. These are all important considerations and common concerns shared by instructors, and these reasons are given as to why synchronous discussions are not part of online course design (Raza et al., 2020; Seaman et al., 2018; Drefs et al., 2015; Simpson, 2013; Berry & Kowal, 2020; Johnson & Cuellar-Mejia, 2014; Stanford, 2020; NYU Steinhardt, 2020). Perhaps, since this study was conducted during the early stages of the COVID-19 pandemic, the institution the teacher candidates in this study attended supported them in addressing many of these issues. Further, since most of society was "shut down," it might be that students were mostly homebound, so synchronous meeting scheduling was not an issue. But as society reopens, we wonder if these access issues might reemerge. As a result, we consider how to address the experiences shared regarding peer interactions and steps to take to ensure student access is not impacted. Based on our findings, we offer three key instructional moves grounded in feminist pedagogy that teacher educators should incorporate in their pedagogy to improve accessibility and equity" — these recommendations are nothing new in terms of general pedagogical practices; however, they are often absent from the design of online discussions.

Offer Choice

Both synchronous and asynchronous tools have benefits and limitations. As we continue to extend this work, we find that when giving students a choice between synchronous or asynchronous, most chose synchronous because it was more meaningful. But, having the choice is essential, honoring those students who found it challenging at particular times and needed flexibility. For students that desire real-time and dynamic interaction that is available (Kadkia & Owens; 2016; Majid et al., 2015; Mehall, 2020), along with the flexibility and convenience others crave (Raza et al., 2020; Seaman et al., 2018; Drefs et al., 2015; Simpson, 2013), threats to the anonymity are mitigated (Berry & Kowal, 2020), and issues of bandwidth are addressed (Johnson & Cuellar-Mejia, 2014; Stanford, 2020). Also, access to quiet spaces to participate fully (NYU Steinhardt, 2020) becomes more readily available for students through the option to participate using asynchronous communication that does not require the same kind of quiet environment needed for synchronous communication. For example, to create a text-based response to an asynchronous discussion board, one might do this from their mobile device while sitting outside at a park or other public space, as less bandwidth is required, so a cell signal or other public WIFI would likely work. Yet, to engage in a video conferencing discussion, one would likely need to be indoors in a quiet space where they could access high-speed internet from their computer. Finding a quiet space like this might not always be possible. In sum, providing students with options is paramount and connected to the feminist pedagogy tenants of *alternative histories* and *intersectional identity* by creating flexibility concerning time, space, and modality. Thus, addressing hierarchies of power and making space for students' multiple identities while nurturing *learner agency*.

Students Lead

Our data highlights the ongoing need to offer students opportunities to lead. Shifting the facilitation back into the hands of students and letting them steer the conversation is a more inclusive pedagogy (Chick & Hassel, 2009; Correia et al., 2019), focused on opportunities for them to bring in their own experiences and connections related to the course content as they support one another's learning (Buelow et al., 2018; Page et al., 2020). Within each small group, instructors should consider identifying discussion leaders on a rotational basis so that all students are engaged in a leadership role at some point and facilitate a discussion (Gilpin et al., 2022). Instructors then have the opportunity to mentor and coach students one-to-one when they are leaders, which can be empowering and transformative (Woodley et al., 2017). Also, instructors should consider providing students with the space to design the discussion prompts/activities (Gilpin et al., 2022). Students report enjoying discussions and feeling more connected to the conversation in which content-specific questions come directly from their peers—giving them choice and agency in the direction they go with course topics (Woodley et al., 2017). Overall, *learner agency* in the discussion design and leadership is another essential feminist pedagogy tenant to include in the design of online courses; doing so also again addresses hierarchies of power and makes space for students' multiple identities.

Provide Permeable Structures

As highlighted earlier, providing student leadership provides access for more students. This is related to our third implication of providing permeable structures or frameworks that allow students to bring their identities in easily identifiable ways. So, while our framework provides structure, our findings, aligned with our lived experiences as educators, point to how we must balance that with what Jana calls "hands-off teaching." Hugo (2000) describes this as "power with rather than power over" (p. 206). Allowing power within the online course to be more evenly distributed across members is an empowering opportunity for traditionally marginalized learners (Cole, 2009). As we extend this work, we have observed that when students create their norms, set their own best times and modalities to meet, and have opportunities to lead on their own, while also having a voice in the design of discussion activities, the learning is more meaningful, engaging, and, therefore, accessible (Gilpin et al., 2022). Staci needed to ease into "hands-off teaching," so initially, she co-created discussion norms in collaboration with students. Through this process, they asked students what was important to them, got feedback, and revised. This is also a great way for instructors to get to know their students—who they are, their interests, and their values (Plotts, 2020a; Woodley et al., 2017). Instructors may also share a draft of the structures as a starting place and ask students for feedback before revising. Chick and Hassel (2009) suggest instructors dialogue with students about their expectations to include the role of the instructor and students beyond an exercise of norm-setting. Instead, as a way to encourage student authority and bring space for students' voices early on in an online course. Even with "hands-off teaching," it is still imperative that instructors read, view, and listen consistently to all student dialogue posted on discussion boards or shared in synchronous meeting notes (Gilpin et al., 2022). And when necessary, instructors should clarify, ask questions, and support students in engaging with content, ensure all are following their discussion norms, and feel the discussions are safe spaces for all (Gilpin et al., 2022). By doing so, all students are welcome and learn through the very design of the online space, which is a hallmark of a feminist classroom.

Limitations

There are limitations in this study that should be noted. These limitations flow from the design and results, connect to the research base, and provide a way forward. Perhaps the most pronounced limitation is that the students enrolled in the courses were upper-level and graduate students; thus, students may have found the course content more interesting and valuable. Further, the majority of students identified as white and female. Therefore, the first two limitations, taken together, call for future research to expand to include a more extensive and diverse study beyond teacher candidates, which would make this work more generalizable. Also, the study's design could be further improved through additional data collection methods beyond the open-ended responses, artifacts, and jottings. For example, semi-structured interviews (Erickson, 1986) could glean more in-depth information about these discussion experiences, their relational nature, and their impact on student learning. A study such as this would contribute to the triangulation of future findings. Each limitation provides an opportunity to improve and expand the research about online discussions, particularly those framed in feminist pedagogy.

Conclusion

This study's results build on other scholars' arguments (Chick & Hassel, 2009; Gay, 2018; Plotts, 2020a, 2020b; Woodley et al., 2017) as the results indicate that relational-type student-led small group online discussions are a way forward as they expand accessibility and equity through community development and culminate in learning while also impacting future teachers' identities (e.g., the practices they bring to their K 12 classrooms). This work is crucial now as we reckon with widespread teacher shortages and grapple with ways to recruit and retain a diverse teaching corp. To improve persistence rates, institutions must respond tothe ever more diverse and complex identities students bring to digital learning spaces. We call for these practices in online learning for teacher education. As hooks (1994) reminds us, this type of teaching calls for *"welcoming the opportunity to alter our classroom practices creatively so that* *the democratic idea "of education for everyone can be realized"* (p. 189). This sense of making change and engaging in the work of building community is never done. Thus, the structural changes we bring forward in this paper are a starting point and not an ending, as the work of making digital spaces more inclusive and humanizing will never be done.

Declarations

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*The institutional review board at the College of St. Scholastica, USA approved this research. The lead author was a faculty member there when the data was originally collected.

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The Influence of Collaboration, Participation, and Experience on Undergraduate Learner Engagement in the Online Teaching-Learning Environment

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Abstract
This study aimed to investigate the factors that influenced undergraduate learners' engagement in the online environment in higher education institutions in the UAE. This quantitative study used an online survey that was distributed to undergraduate students at three universities in the UAE. Altogether, 126 responses were received, coded, and prepared for analysis. The findings indicated that the participants' engagement levels in the online environment were influenced by their collaboration, learning opportunities, utilization of educational technology, and the learners' relationships with their instructors and colleagues. The results also showed that there was no statistically significant relationship between the learners' participation in online activities and their engagement levels. These findings have pedagogical implications in dealing with the complex and dynamic nature of the construct called *learner engagement* in the online environment and suggest providing undergraduate learners with real-life learning opportunities to enhance their collaboration, use of technology, and effective communication.

Keywords: Online learning, undergraduate learners, learners' perceptions, learner engagement.

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Learner engagement has been acknowledged as a factor of paramount influence on learner performance and academic success (Akbari et al., 2016; Johnson & Sinatra, 2013; Mercer, 2019; Zhang & Yang, 2021). There hasn't been consensus among researchers on a single definition to explain the idea of learner engagement, despite the significance of it in all educational settings (Cavanagh, 2015). This can be due to the construct's intricate concept. Skinner and his associates offer a concept of learner engagement (2009) as “the quality of students’ participation or connection with the educational endeavor and hence with activities, values, individuals, aims, and places that comprise it” (p.495). Another attempted definition describes learner engagement as “the involvement of the student’s cognitive and emotional energy to accomplish a learning task” (Halverson & Graham, 2019, p. 145). These definitions emphasized correlation between learner engagement and academic achievement, satisfaction, and disposition towards effort and time investment in the learning process (Wang & Zhang, 2020).

The impact of learner engagement on students’ achievement and motivation when using flexible and varied online resources has drawn scholarly attention (Dahalan et al., 2012). As a result, the learners may then have the chance to engage in active learning through their own practice and experience (Barkley & Major, 2020; Hiver et al., 2021; Lambert et al., 2017). In this context, the construct of learner engagement has gained more importance during the COVID-19 pandemic. During the recent changes in the educational systems due to the influence of COVID-19, blended and online learning have been common practices in many countries (Oraif & Elyas, 2021). However, student engagement should not be the only a formality of classroom interaction or course requirement, rather it should be a source of meaningful learning (Berry & Kowal, 2022).

Due to the COVID-19 pandemic, the government of the United Arab Emirates suspended all face-to-face teaching and learning; the case of the UAE was not different from other countries in the world. The Ministry of Education in the UAE decided to shift all school and university programs in both public and private sectors to the online mode of learning in March 2020 (The United Arab Emirates Government Portal, 2022). The online mode of teaching and learning caused a sense of uncertainty and a lack of motivation among many learners in different stages (Mosleh et al., 2022). Moreover, lack of experience among teachers, students, and parents in managing the online learning mode produced a chaotic learning environment that affected the learners’ emotions, engagement, and motivation during the transition to the online learning programs (Hasan & Bao, 2020). This situation also created new challenges regarding the modified curriculum, delivery mode, and designed activities (Maraqa et al., 2022). All these challenges have influenced learners’ motivation and engagement in the online environment and imposed additional responsibility on the educators to adapt to the new situation and assist the learners to be more motivated and engaged during difficult times (Omar et al., 2021). This situation creates the need for new methodologies to assist the learners in the process of adaptation to the new learning environment (Al Mahdawi et al., 2021). In order to use the most efficient learning and teaching techniques to enhance the students’ experiences and accomplishment of learning outcomes, it is also necessary for instructors and educators to gain a deeper knowledge of the concept of learner engagement (Gallagher et al., 2017).

Although learner engagement has been extensively investigated in various educational settings and different learning (traditional and online) delivery modes (Carroll, 2021; Martin & Bolliger, 2018) over the past decades, most studies have investigated the different types of learner engagement, the indicators of learner engagement (using and testing various scales), and the correlations between the levels of learner engagement and the learners' academic achievement and motivation (Prince et al., 2020). Many studies have also investigated the different dimensions of learner engagement including the cognitive, behavioral, social, and emotional dimensions in the online environment (Carroll et al., 2021; Hiver et al., 2021; Martin & Bolliger, 2018; Omar et al., 2021). However, there seems to be confusion among researchers when it comes to researching the factors that influenced learner engagement in various contexts as they measure engagement indicators (e.g., Ogunyemi et al., 2022; Ray et al., 2021), rather than engagement facilitators. Moreover, studies on learner engagement in the Arab region in general, and the UAE in particular, seem to be scarce (except for studies like Omar et al., 2021). As a result, the significance of the study stems from the fact that it fills a gap in the literature in which research on learner engagement, particularly in the online environment, seem to be lacking. Further, the study aims at providing an understanding of the factors that may influence undergraduate learners' engagement in a relatively novel delivery mode in the region.

The purpose of the current study is to investigate the variables that affected undergraduate students' participation in online courses at UAE higher education institutions. Hence, the study provides a deeper understanding of the complicated notion of student engagement and the elements that influenced learner engagement in the online undergraduate education context. The purpose of the study is to investigate undergraduate learners' engagement, involvement, and the factors that influenced the level of their engagement in the online learning process. The study intends to answer the following research questions:

1. What are the factors that influence undergraduate learners' engagement in online classes?
2. How can instructors improve learner engagement in online undergraduate classes?

This study addresses the factors that influenced the learners' engagement in an environment that was considered novel to the UAE context. Furthermore, while the construct of learner engagement has been studied in traditional learning environments, it has not been investigated in light of the factors that influenced it in the context of UAE. The current study sheds light on the complexity of the construct of learner engagement and provides insight into the learners' perceptions of the factors that influenced their engagement in the new online learning environment. It also offers educators and teachers with recommendations for the best strategies and methodologies for increasing learner engagement and improving their learning experience in online undergraduate classes.

Literature Review

According to Reeve et al. (2004), learner engagement refers to students' active participation and involvement in a variety of learning environments and activities. This active energy may help students connect with the activities they are meant to be participating in (Russell et al., 2005). The construct of learner engagement has gained more significance as it is related to different factors, including academic, social, emotional, cognitive, and behavioural aspects (DeVito, 2016). It is also a variable that is influenced by various relationships, such as the learners' relationships with their learning contexts, including their home and school environments, as well as their relationships with their colleagues, instructors, and stakeholders (Reschly & Christenson, 2012). All these factors make learner engagement a significant concept that needs to be studied and comprehended.

Significance of Learner Engagement

Learner engagement has been related to variables like learners' achievement, learning investment, persistence, satisfaction, and the opportunity to formulate an effective learning community (Barkley & Major, 2020; Conrad & Donaldson, 2011; Lambert et al., 2017; Wigfeld et al., 2015). Such conceptualizations helped researchers study learner engagement with different frameworks and models to assist educators in understanding and evaluating this complex and dynamic construct despite a lack of a unified definition or cohesive description of the construct (Fredricks et al., 2004). The importance of learner engagement is weighed against the negative influences of learner disengagement at various levels (Finn & Zimmer, 2012).

Learner engagement may not only stem from personal and individual factors, but also connects to the educators and the institutional practices (Finn & Zimmer, 2012). Therefore, understanding the dynamicity, complexity, and multi-faceted factors that influence learner engagement poses additional emphasis on its significance to achieve academic, social, and emotional success among learners (Symonds et al., 2019). In addition to the complexity and the dynamicity of the construct of learner engagement, evidence from research has shown a positive correlation between high levels of learner engagement and the learners' achievement, long-term retention, and social and psychological well-being (Crick & Goldspink, 2014; Deng et al., 2020; Halverson & Graham, 2019). These studies specifically indicate the importance of learner engagement as a construct which is highly valuable in different learning environments.

Models of Learner Engagement

The complex and multidimensional nature of the construct of learner engagement prompted the development of various explanatory models which attempted to identify the major aspects and dimensions of the construct. One of the early models to explain learner engagement was developed by Fredericks et al. (2004) with three dimensions. These dimensions include the behavioral, cognitive, and emotional dimensions (Nazamud-din et al., 2020). The dimension of behavioral engagement represents the learners' deployed practices, positive efforts, and active participation in different learning events (Nazamud-din et al., 2020). Likewise, the cognitive engagement dimension has been viewed in light of the learners' asserted educational goals, their expressed self-regulation, and their effective and positive investment in learning (Mahatmya et al., 2012; Nazamud-din et al., 2020). The emotional dimension refers to the learners' attachment and sense of belonging to their learning environment, their productive attitude, and their keen interest in various learning activities and events (Blumenfeld et al., 2005; Fredericks et al., 2004; Mahatmya et al., 2012; Nazamud-din et al., 2020). Behavioral learner engagement is usually associated with the level of learners' actual and active participation in the learning endeavors which include their participation in academic, social, or even other supplementary educational activities (Nazamud-din et al., 2020).

Four additional dimensions—psychological, academic, behavioral, and cognitive—were added to the idea of learner engagement by the other models (Appleton et al., 2006; Christenson et al., 2008; Halverson & Graham, 2019). For each of these kinds, there are various markers that are available, according to Appleton and colleagues (2006). Similar to this, Skinner and his colleagues' model from 2008 and 2009 has four dimensions. The other two of these dimensions dealt with behavioral and emotional disaffection as well as behavioral and emotional disaffection, respectively. The engagement dimensions in this model are similar to the previous models. Likewise, a multi-dimensional aspect of learner engagement has also been represented in another model by Finn and Zimmer (2012) with four-dimensional constructs including the academic, social, cognitive, and affective dimensions. Among these and other models, more recently, an applied model of learner engagement was proposed by Carrol and her colleagues to provide a practical tool that can be utilized by practitioners to engage learners in different educational settings (Carrol et al., 2021). The model introduces factors that influence learner engagement, classifying them as individual, task-related, and environmental. It also presents "measurable indicators of learner engagement that provide practitioners opportunities to assess engagement levels and adapt learning content accordingly" (Carrol et al., 2021, p. 760).

Czerkawski and Lyman (2016) propose an instructional design framework that fosters learner engagement in the online environment. The framework consists of four related phases. The first phase includes identifying the instructional needs by conducting a needs assessment and learners' analysis. The second phase implies defining instructional goals and objectives. The third phase entails developing the learning environment by conducting formative assessment, developing interaction and collaboration strategies, and selecting media and instructional resources. Finally, the fourth phase includes the summative assessment in which educators conduct learning outcomes assessment and evaluate instructional effectiveness (Czerkawski & Lyman, 2016).

Current learner engagement models, instruments, and measurement tools are inadequate due to the complexity of the construct of learner engagement and the specifications of different contextual factors which could be related to the course, activity, or institutional levels (Halverson & Graham, 2019). Therefore, Halverson and Graham (2019) call for a new model which applies engagement measurement instruments in traditional, blended, and online learning contexts.

Indicators and Facilitators of Learner Engagement

Although many researchers developed models to identify the complexity and multi-dimensional aspect of the construct of learner engagement, there is a need to distinguish between facilitators and indicators of learner engagement in order to reach a comprehensive understanding of the construct (Sinclair et al., 2003; Skinner et al., 2008). According to Skinner and his associates (2008), engagement indicators represent the characteristics that are innate to the construct, whereas facilitators refer to the causal factors which could influence the construct from outside. Skinner and Pitzer (2012) also call for a distinction between indicators, facilitators, and outcomes in order to add clarity to the concept of learner engagement. In a proposed motivational model of learner engagement, Skinner and Pitzer (2012) state that the indicators of learner engagement are actional in nature. Therefore, the behavioral, emotional, and cognitive dimensions can be observed through learners' interactions with their academic environment in the learning activities, whereas academic performance and achievement cannot be considered as indicators of learner engagement as they are learning outcomes that are differentiated from engagement indicators and facilitators (Coates, 2006; Redmond et al., 2018).

There has been considerable misunderstanding regarding concepts of engagement indicators and facilitators. Skinner and Pitzer (2012) propose two types of facilitators that include personal and social facilitators. Personal facilitators represent the learners' self-perceptions or self-systems which include their sense of self-efficacy or belongingness to the learning context (Halverson & Graham, 2019). Social facilitators refer to the learners' interpersonal interactions with the main social elements in the learning process like their instructors, colleagues, and other stakeholders (Skinner & Pitzer, 2012). While considering social elements of online learning, one should not forget social engagement as an important aspect of online learning, especially when there is no other option for collaboration besides peer or group interaction through virtual means (Redmond et al., 2018). There can be various forms of collaborative engagement in online learning. For example, peer collaboration, student-teacher collaboration, institutional collaboration, and professional collaboration among experts in the field of online teaching and learning (Albion, 2014; Pittaway & Moss, 2014; Redmond, 2018).

Although researchers understand the significance of personal and contextual facilitators, they are unable to assess the precise impact of interventions in the absence of clear engagement indicators measurements. Many engagement measurement tools mix up facilitators and indicators, assessing engagement facilitators rather than engagement indicators (Halverson & Graham, 2019). The study of engagement facilitators is essential but not enough without understanding the indicators that allow researchers and educators to have effective measures to test the efficacy of the interventions used to improve learner engagement (Halverson & Graham, 2019). Halverson and Graham (2019) propose a blended learning engagement framework to assist measuring learner engagement. They believe that cognitive and emotional learner engagement are the essential factors to understand learner engagement through the manifestations of the cognitive and emotional indicators, which contribute to achieve the desired learning outcomes. Both cognitive and emotional engagements are comprised of different factors. Cognitive engagement includes both quantity and quality factors. The quantity factors of cognitive engagement include the learners' attention, effort and persistence, and time spent on a task, whereas the quality factors are represented by the metacognitive strategies, concentration, and learners' interest and curiosity. On the other hand, emotional engagement includes positive and negative emotional aspects. The positive aspects of learners' emotional engagement include emotions like pleasure and self-confidence, whereas the negative aspects of learners' emotional/affective engagement include tedium, frustration, and anxiety (Halverson & Graham, 2019). This framework is used by the researchers in blended and online learning environments. Other studies also acknowledge the importance of cognitive and emotional learner engagement. For instance, Reschly and Christenson (2012) indicated that cognitive and affective engagement comprise the internal processes through which academic and behavioral engagement is mediated. Moreover, a study (Henrie et al., 2015) found conceptual confusion between the concepts of cognitive engagement and behavioral engagement. Similarly, Pekrun and Linnenbrink-Garcia's (2012) propose a model that includes an overlap between the cognitive and behavioral aspects of engagement among their five-types model of engagement.

Learner Engagement in the Online Context

Learner engagement is a multidimensional and dynamic construct that is difficult to quantify in traditional learning contexts as well as in blended and online learning environments (Alharbi, 2019; Dahleez et al., 2021). Different mixtures of human and technical interaction, as well as instructional strategies, are inherent to the structure of the online learning environment and have an impact on learner engagement. (Halverson & Graham, 2019). Therefore, several levels of learner engagement, from the course level to the institutional level (Ainley, 2012), should be monitored depending on the interventions (Wang et al., 2014). Online students encounter difficulties with their ability to self-regulate and stay committed to the courses in the online setting. (Kitsantas & Dabbagh, 2004). Although learner engagement is highly influential in the traditional learning settings, the online environment may require additional effort on the part of educators to implement different strategies, which can improve the effectiveness of course delivery and interpersonal relationships between the learners and instructors (Aladsani, 2022; Feekery & Condon, 2021).

Studies on learner engagement demonstrate a positive correlation between the implementation of educational technology and online learners' engagement. Chen and colleagues (2010) found a positive correlation between the use of learning technology, learner engagement, and achievement of learning outcomes. Moreover, a number of studies (such as those by Heiberger and Harper [2008] and Junco et al. [2011]) suggested that the use of social media platforms could boost learner engagement by improving communication and interpersonal and social connections. However, research demonstrates that retention among learners in the online environment is usually lower than in the traditional learning environments (Kahn et al., 2017). Additionally, Kahn and colleagues (2017) hypothesized that online learning settings stimulated reflexivity because students recognized the need of persistent practices and tangible acts in the face of uncertain and difficult circumstances.

There are issues related to learner engagement in online learning. For example, learner-to- learner engagement, learner-to-instructor engagement, and learner-to-content engagement (Martin & Bolliger, 2018). Despite conceptual and measurement problems with an increasing number of studies over the past ten years, the learner engagement debate is still in its infancy (Reschly & Christenson, 2012). In order to give educators a clear distinction between engagement facilitators and indicators and to give them the ability to build useful engagement measuring tools, researchers need to explain the theoretical conceptualization of the construct of learner engagement. In this context, engagement models like learner-to- learner, learner-to-instructor, and learner-to-content interactions are vital to take into consideration in traditional, blended, and online learning contexts (Skinner & Pitzer, 2012). Learner engagement in online learning needs further attention to students' social, cognitive, emotional, and pedagogical presences with different modes of communication and interaction (Kucuk & Richardson, 2019).

Methodology

This study is guided by the realist ontological assumption which considers the objectivity of the study results to construct knowledge from a study (Cohen et al., 2018). The epistemological assumption of this study is guided by a positivist paradigm to explore the objective truth of social reality in terms of learner engagement in an online learning context (Avelsson et al., 2022). A quantitative study method was adopted to explore the factors influencing undergraduate learner engagement in the online environment. An online questionnaire was sent to undergraduate students at one public and two private universities in the UAE as part of the quantitative study. Because of the time limitation, the researchers chose to adopt a cross-sectional study as it allowed for the collection of data from a student population in a short period of time, which was critical in this study (Cohen et al., 2018). Cross-sectional studies also have the advantage of increasing the chance of participation and make it easier to perform a study in an online mode.

Population and Sample

The purpose of this quantitative study was to explore undergraduate students' experiences with online/distance learning, investigate the factors that affect their engagement in the online environment, and determine whether this has any effect on their academic performance. Participants were undergraduate students enrolled in a variety of programs at three higher education institutions in the United Arab Emirates (UAE). Convenience sampling was adopted, and the participants were selected based on their availability and willingness to participate in the study (Scharrer & Ramasubramanian, 2021). As the survey was distributed online via the participants' emails, a study sample was selected from the three universities depending on the availability of the learners' emails and their agreement to participate in the study. The online survey was sent to 1539 undergraduate students. The study sample consisted of 126 participants. Table 1 displays the distribution of the sample depending on the personal and functional variables. The male-to-female distribution is 52:48, respectively. The age distribution of the 126 respondents is 46.0%, 31.7%, 14.3%, and 7.9% for (18-22), (23-29), (30-35), and above 35, respectively. For the education level variable, over 40% of the respondents are fresh students in their first year at the university, whereas about 21% are in their third year of study.

Table 1
Distribution of Participants with Gender, Age, and Year of Study

Variable	Classification	Frequency	Percent %
Gender	Male	65	51.6
	Female	61	48.4
Age	18 – 22	58	46.0
	23 – 29	40	31.7
	30 – 35	18	14.3
	Above 35	10	7.9
Years of Study	First-year	51	40.5
	Second-year	25	19.8
	Third year	26	20.6
	Fourth year	24	19.0

Construction of the Questionnaire

The online survey questionnaire consisted of 24 elements and three sections (see Appendix A). The items of the study were created based on the literature review and the researchers' experiences in the online learning environment (Chiang et al., 2020). Data on the demographics of the graduate students, such as their gender, age, year of study, and major were gathered in the questionnaire's first section. Statements about the students' experiences in the online courses were included in the second section (Blackmon & Major, 2012; Yan et al., 2021). The third section included statements on the students' participation in online courses, the influence of the instructor's feedback, the impact of technology on students' engagement and motivation, and the importance of online activities (Gray & DiLoreto, 2016). The items of the survey in the second section were listed in statements based on a 4-point Likert scale with strongly agree (coded 1), agree (coded 2), disagree (coded 3), and strongly disagree (coded 4). The four key thematic constructions in the second section of the survey were *Learners' experience with online participation, Learners' engagement in online activities,* and *Collaboration and learning opportunities.* Altogether, 17 items were statistically analyzed from the questionnaire data as they were based on a 4-point Likert scale. Items from 18-24 were analyzed for their frequency.

Data Collection Procedure

The current study has received ethical approval from the United Arab Emirates University's Social Sciences Research Ethics Committee. Following their consent, participants received information about the study. The significance of the study, the justification for choosing volunteers, and directions on how to access the online questionnaire were all thoroughly explained by the researchers. The participants were not required to disclose any identifying information, such as names, student IDs, or emails, to maintain confidentiality and anonymity (Singh & Sagar, 2021). In the cover letter, the participants were advised that participation in the study was entirely voluntary. Acceptance to continue and withdrawal choices were also offered at the beginning of the online survey in the cover letter. The data was collected from March to April 2022 in collaboration with each institution's Office of Student Affairs, which disseminated the online questionnaire.

Additionally, the survey was created using Google Forms, and all of the participants—undergraduate students from three colleges in the UAE (one public and two private universities)—were provided the link to the survey. By the end of the first week, 38 responses had been received. Two weeks later, a reminder email was sent to the students, increasing the response to 126 participants.

Validity and Reliability

To ensure validity and reliability of the research instrument, the survey was piloted in two phases. The survey was first conducted with a group of 14 graduate students for clarity, language, length, and ease of instruction. Following their feedback, minor adjustments were made to increase readability and comprehension. These changes included minor adjustments to the words used in the questions. For instance, question 3 asked about the influence of advanced technology without referring to positive or negative influences, which was found vague by the participants in the pilot study. Therefore, it was substituted by two questions (3 and 4) to reflect both the negative and positive influences that could be related to the use of advanced technology. Also, *option d* in question 24 was changed from "*online activities*" to "*pair activities*" based on the participants' suggestions. A second piloting procedure was conducted by sending the survey to undergraduate students at one university. The responses of 17 participants were recorded and used to make minor modifications to increase the validity of the survey questions (Cohen et al., 2018). These modifications included removing the midpoint option "*neutral*" from the Likert scale as 87% of the participants selected this option when it was available. This was meant to encourage the participants to reflect their "true opinion" rather than selecting the easiest available option (Chyung et al., 2017, p.3). The overall reliability for the second pilot survey was (0.70). This indicates an acceptable Cronbach's Alpha value for the piloting study as a Cronbach's Alpha value is acceptable if it is more than (0.60) (Cohen et al., 2018).

Data Analysis and Interpretation

To analyze the collected data, the researchers used applicable statistical tools with IBM SPSS (version 28) software. To ensure the validity and reliability of the data acquired from the study sample, the internal consistency of the study variables, as well as the reliability of the latent constructs, were measured using Cronbach's alpha test (Table 2). The confirmatory factor analysis (CFA) technique was also used to see how well the measured variables explicitly explained their corresponding latent structures.

Table 2

Reliability Coefficients for the Three Composite Variables and the Overall Scale

Reliability Statistics		
Dimension	Cronbach's Alpha	N of Items
Learners' experience with online participation	0.882	7
Learners' engagement in online activities	0.774	8
Collaboration and learning opportunities	0.630	2
Overall	0.767	24

Prior to performing the analytical tests, we employed Cronbach's alpha to assess the reliability of 24 components of the study's questionnaire. The overall reliability level ($\alpha = 0.767$) was found to be excellent with the study sample that showed increase in alpha value from the piloting of the questionnaire ($\alpha = 0.70$) (Table 2).

Factor analysis was conducted to identify the main thematic variables which emerged from the collected data. The 17 items in the questionnaire data were divided into three composite factors that reflected the main study variables: (1) *Learners' experience with online participation*, (2) *Learners' engagement in online activities*, and (3) *Collaboration and learning opportunities*. For each construct, the internal reliability was performed using Cronbach's alpha test. Table 2 shows Cronbach's alpha (internal reliability coefficient) values of 0.882 for *Online Participation*, 0.774 for *Engagement*, and 0.630 for *Collaboration*.

The researchers also conducted Kolmogorov-Smirnov and Shapiro-Wilk tests to test the data for normality. According to the Kolmogorov-Smirnov and Shapiro-Wilk tests of normality, the three variables that were related to undergraduate learners' engagement in the online environment were not normally distributed ($p < 0.05$). Therefore, the remaining tests were performed using non-parametric tests. The three thematic variables (dimensions) were tested using One Sample Non-Parametric Test, and two Independent Samples Non-Parametric tests were conducted on the independent variables (Mann-Whitney Test for *gender*, and Kruskal-Wallis Tests for *age-group* and *study year*) as these tests do not assume normality of the dependent variables, and hence they are free from any effects by the nature of distribution (Cohen et al., 2018). Based on the results from Kruskal-Wallis tests, Pair-wise Comparison test was conducted on one variable (*Learners' engagement in online activities*). Moreover, correlation and regression analysis were conducted to test the correlation among the three thematic variables. The remaining survey items (18-24) were tested for frequency and listed under the theme of *Learners' perceptions of online learning*, as they are categorical items which cannot be statistically tested.

Results

A total of 126 valid responses were received and qualified for data analysis. A snapshot of the demographic profile of the study sample, learners' experience with online participation, learners' engagement in online activities, and collaboration and learning opportunities are presented below. In addition to Cronbach's alpha test presented in Table 2, KMO and Bartlett's test were conducted to decide whether the collected data was plausible to conduct factor analysis. The KMO value indicates KMO = 0.813 which means that the data can render itself to conduct factor analysis. Data were analyzed through a normality test (Table 3), a one-sample Wilcoxon signed rank test (Tables 4–6), the independent samples Mann-Whitney test U-test gender (Table

7), the independent samples Kruskal-Wallis test across age ranges (Table 8) and comparison wise tests across age ranges (Table 9), correlations among the dimensions (Table 10), a generalized linear model for parameter estimates (Table 11), and the results of the participants' perceptions of online learning (Table 12).

The Kolmogorov-Smirnov and Shapiro-Wilk tests of normality for the variables in Table 3 showed that the three variables that were related to undergraduate learners' engagement in the online environment were not normally distributed ($p < 0.05$). Therefore, the comparison tests were performed using non-parametric tests (e.g., one-sample Wilcoxon signed rank test, Mann-Whitney U-test, and Kruskal-Wallis test).

Table 3
Test of Normality of Learners' Experience, Engagement, and Collaboration and Learning Opportunities.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Variables	**Statistic**	**Df**	**Sig.**	**Statistic**	**Df**	**Sig.**
Dim (1) Learners' experience with online participation	0.078	126	0.058	0.971	126	0.008
Dim (2) Learners' engagement in online activities	0.103	126	0.002	0.969	126	0.005
Dim (3) Collaboration and learning opportunities	0.144	126	<0.001	0.916	126	<0.001

The distribution of the three dimensions (*learners' experience with online participation, learners' engagement in online activities, and collaboration and learning opportunities*) showed that the median values vary across the three themes and from the ideal Likert-scale mid-value of 2.5. Moreover, the observed median for the second and the third theme was greater than the hypothesized median. Therefore, the one sample Wilcoxon signed rank tests were performed (Tables 4-6) to examine whether these differences were statistically significant. The following sections discuss the results for each theme area.

Table 4
One-sample Wilcoxon Signed Rank Test for Learners' Experience with Online Participation (test value = 2.5 from the 4-point Likert-scale Items).

Item/Variable	N	Test Stat.	STD. Error	Standardized Test Stat.	Asymp. Sig.(2-sided test)	Obs. Median
1. I find the online courses intellectually relaxing.	126	4669	396.843	1.685	0.092	3
2. I often feel motivated during online discussions.	126	4806	395.889	2.035	0.042	3
3. I often share learning materials with other	126	4536	396.158	1.352	0.176	3

classmates during online classes.						
4. Online classes provide the students with opportunities of meaningful learning experiences.	126	4095	396.406	0.238	0.812	2.5
5. I often feel more encouraged to participate in online classes than in traditional classes.	126	3523.5	394.963	-1.208	0.227	2
6. The use of advanced technology positively influences my participation during online classes.	126	4047	397.031	0.117	0.907	3
7. My previous learning experience influences my engagement in my current classes.	126	2722.5	389.421	-3.282	0.001	2
Dimension (1) Learners' experience with online participation	126	4240.5	410.024	0.585	0.558	2.57

Table 5

One-sample Wilcoxon Signed Rank Test for Learners' Engagement in Online Activities (test value = 2.5 from the 4-point Likert-scale Items).

Item/Variable	N	Test Stat.	STD. Error	Standardized Test Stat.	Asymp. Sig.(2-sided test)	Obs. Median
8. The use of advanced technology positively influences my participation during online classes.	126	7455	397.477	8.691	0.000	3
9. I often participate in online courses where the instructor gives the students the opportunity to participate in decision-making.	126	7047	395.889	7.695	<0.001	3
10. I often contribute to the class activities when the online course outcomes match my expectations.	126	6699	392.092	6.882	<0.001	3

11. I feel engaged in online classes when I have positive relationships with my colleagues.	126	7400.5	397.031	8.564	0.000	3
12. The instructor often provides me with effective (verbal/written) feedback.	126	7117	395.601	7.878	<0.001	3
13. I often pay full attention to the courses which I consider important for my future career	126	7767	397.349	9.479	0.000	4
14. My learning engagement is influenced by the availability of online resources related to my courses.	126	6555	392.563	6.507	<0.001	3
15. I often feel engaged in the classes where I am given the chance of independent learning.	126	6992	394.614	7.581	<0.001	3
Dimension (2) Learners' engagement in online activities	126	7429	390.86	9.409	0.000	3.13

Table 6

One-sample Wilcoxon Signed Rank Test for Collaboration and Learning Opportunities (test value = 2.5 from the 4-point Likert-scale Items).

Item/Variable	N	Test Stat.	STD. Error	Standardized Test Stat.	Asymp. Sig.(2-sided test)	Obs. Median
16. Collaboration with my classmates in group work is less effective in the online environment than in the face-to-face environment.	126	5705	396.158	4.303	<0.001	3
17. I often participate in classes that have opportunities for practical and real-life learning.	126	6954	395.889	7.46	<0.001	3
Dimension (3) Collaboration and learning opportunities	126	4383	285.433	6.509	<0.001	3

Learners' Experience with Online Participation

Table 4 shows the results of one-sample Wilcoxon signed rank test for learners' experience with online participation (test value = 2.5 from the 4-point Likert-scale items) in different higher education institutions in the UAE in the spring semester of the academic year 2021–2022. The results showed that the undergraduate students had mixed views of their experience with online participation. Their view of "*online courses intellectually relaxing*" was not statistically significant (z = 1.685, p = 0.092 > 0.05). Likewise, their views on "*Online classes provide the students with opportunities of meaningful learning experiences,*" "*use of advanced technology,*" and "*sharing learning materials with other classmates during online learning*" were all statistically insignificant at levels above 0.05 of significance. However, the participants' views on "*motivation during online discussions*" was statistically significant (z = 2.035, p = 0.042 < 0.05).

On the other hand, the undergraduate students had negative views in the following items. Their view "*encouragement to participate in online classes than in traditional classes*" was not statistically significant (z = -1.208, p = 0.227 > 0.05). However, their view regarding "*previous learning experience influences engagement in current classes*" was statistically significant (z = -3.282, p = 0.001 < 0.05). The overall composite scale level of learners' experience with online participation was statistically significantly positive (z = 0.585, p = 0.558 > 0.05) (Table 4).

An independent sample Mann-Whitney U-test (Table 7) for undergraduate student learners' experience with online participation showed that there was no statistically significant difference between the male and female students in terms of their experiences in participation in online classes (Female: Mean Rank = 58.63, n = 61; Male: Mean Rank = 68.07, n = 65; z = -1.453 and p = 0.146> 0.05). Similarly, there was no statistically significant difference across age ranges of students in terms of their experience with online participation (Mean Rank = 2.57, n = 126; z = 7.663 and p = 0.054> 0.05) (Table 8).

Learners' Engagement in Online Activities

Table 5 shows the results of the One-sample Wilcoxon signed rank test for learners' engagement in online activities (test value = 2.5 from the 4-point Likert-scale items), in higher education institutions in the UAE in the spring semester of the academic year 2021–2022. The results showed that the undergraduate students had positive views of their engagement in online activities. Their view "*pay full attention to the courses which I consider important for my future career*" was statistically significant (z = 9.479, p = 0.000 < 0.05). Likewise, their views on "*use of advanced technology,*" "*positive relationships with my colleagues,*" "*contribute to the class activities when the online course outcomes match my expectations,*" "*effective (verbal/written) feedback,*" "*the availability of online resources related to my courses,*" "*chances of independent learning,*" and "*the opportunity to participate in decision-making*" were all statistically significant at the 0.05 level of significance. The overall composite scale level of learners' engagement in online activities was statistically significantly positive (z = 9.409, p = 0.000 < 0.05) (Table 5).

An independent sample Mann-Whitney U-test (Table 7) for undergraduate student learners' engagement in online activities showed that there was no statistically significant difference between the male and female students in terms of their engagement in online activities (Female: Mean Rank = 60.13, n = 61; Male: Mean Rank = 66.66, n = 65; z = -1.008 and p = 0.314> 0.05). Similarly, there was no statistically significant difference across age ranges of students in terms of their experience with online participation (Mean Rank = 3.12, n = 126; z = 12.487 and p = 0.006> 0.05) (Table 8).

Collaboration and Learning Opportunities

Table 6 displays the results of the One-sample Wilcoxon signed rank test for collaboration and learning opportunities (test value = 2.5 from the 4-point Likert-scale items), in higher education institutions in the UAE in the spring semester of the academic year 2021–2022. The results showed that the undergraduate students had positive views of their collaboration in online activities. The participants' view on the effectiveness of their collaboration with their classmates in group work in online and face-to-face environments was statistically significant (z = 4.303, p = 0.001 < 0.05). Likewise, their views on "*participate in classes that have opportunities for practical and real-life learning*" was also statistically significant at the 0.05 level of significance. The overall composite scale level of learners' collaboration and learning opportunities was statistically significantly positive (z = 6.509, p = 0.001 < 0.05) (Table 6).

Table 7

Independent Samples Mann-Whitney U-Test (Gender)

Statistic	**Learners' experience with online participation**	**Learners' engagement in online activities**	**Collaboration and learning opportunities**
Total N	126	126	126
Mann-Whitney U	1685.500	1777.000	2224.500
Wilcoxon W	3576.500	3668.000	4115.500
Mean Rank (Female, N=61)	58.63	60.13	67.47
Mean Rank (male, N=65)	68.07	66.66	59.78
Test Statistic	1685.500	1777.000	2224.500
Standard Error	204.454	203.913	199.942
Standardized Test Statistic	-1.453	-1.008	1.210
Asymptotic Sig.(2-sided test)	0.146	0.314	0.226

An independent sample Mann-Whitney U-test (Table 7) for undergraduate student learners' collaboration in learning opportunities showed that there was no statistically significant difference between the male and female students in terms of their engagement in online activities (Female: Mean Rank = 67.47, n = 61; Male: Mean Rank = 59.78, n = 65; z = 1.210 and p = 0.226 > 0.05). Similarly, there was no statistically significant difference across age ranges of students in terms of their experience with collaboration and learning opportunities during online learning (Mean Rank = 3.0, n = 126; z = 2.647 and p = 0.449> 0.05) (Table 8).

Table 8

Independent Samples Kruskal-Wallis Test (across age ranges)

Statistic	Learners' experience with online participation	Learners' engagement in online activities	Collaboration and learning opportunities
Total N	126	126	126
Test Statistic	7.663	12.487	2.647
Median	2.57	3.12	3.0
Degree Of Freedom	3	3	3
Asymptotic Sig.(2-sided test)	0.054	0.006	0.449

As Table 8 indicated significant differences in the result of Kruskal-Wallis for one variable (*Learners' engagement in the online activities*), a pair-wise comparison across age groups test for this variable was conducted to examine which three pairs of age groups had a significant difference (Table 9).

Table 9

Pair-Wise Comparisons of Age Groups in Relation to Learner Engagement in Online Activities

Sample 1 – Sample 2	Test Statistics	Std. Error	Std. Test Statistics	Sig.	Adj. Sig. [a]
18 – 22 -23 – 29	-20.391	7.471	-2.729	0.006	0.038
18 – 22 -30 – 35	-22.687	9.808	-2.313	0.021	0.124
18 – 22 -Above 35	-30.103	12.447	-2.419	0.016	0.093
23 – 29 -30 – 35	-2.296	10.317	-0.223	0.824	1.000
23 – 29 -Above 35	-9.713	12.852	-0.756	0.450	1.000
30 – 35 -Above 35	-7.417	14.337	-0.517	0.605	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is 0.050. Significance values have been adjusted by the Bonferroni correction for multiple tests.

The findings indicate that age group *18-22* was significantly different from the age groups *23-29*/ *30-35* / *above 35* at the significance level 0.05 in relation to the variable *learners' engagement in the online activities*. The difference between age groups *18-22* and *23-29* was significant at (sig. p = 0.006 < 0.05). Moreover, the difference between age groups *18-22* and *30-35* was significant at (sig. p = 0.021 < 0.05) whereas the difference between age groups *18-22* and *above 35* was significant at (sig. p = 0.016 < 0.05). Other age groups did not display significant difference at the same level of significance 0.05 (Table 9).

Table 10
Correlation (2-tailed) between the Different Dimensions (Experience, Engagement, and Collaboration)

			Dim.1 (Experience)	Dim.2 (Engagement)	Dim.3 (Collaboration)
Spearman's rho	Dim.1 (Experience)	Correl. Coeff.	1.000	0.025	-0.405**
		Sig. (2-tailed)	.	0.778	<0.001
		N	126	126	126
	Dim. 2 (Engagement)	Correl. Coeff.	0.025	1.000	0.188*
		Sig. (2-tailed)	0.778	.	0.035
		N	126	126	126
	Dim. 3 (Collaboration)	Correl. Coeff.	-0.405**	0.188*	1.000
		Sig. (2-tailed)	<0.001	0.035	.
		N	126	126	126

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Additionally, the three emerging dimensions, learners' experience with online participation, learners' engagement in online activities, and their collaboration and online opportunities were tested for possible correlations among them (Table 10). The results indicate that there is a significant correlation between the participants' experience with online participation and their collaboration and online opportunities (sig. $p = 0.001 < 0.05$) (Table 10). Similarly, a significant correlation between the learners' engagement and their collaboration was found (sig. $p = 0.035 < 0.05$). On the other hand, there is no significant correlation between the learners' engagement and their experience with online participation.

The undergraduate learners' experience with online participation was found to be significantly impacted only by the learners' collaboration and learning opportunities ($B = -0.402$, $p < 0.001 < 0.05$). The other independent variables which include the learners' study year, age range, gender, and engagement were not found to impact the learners' experience with online participation as indicated in (Table 11).

Table 11
Generalized Linear Model for Independent Variables (Study Year, Age Range, Gender, Engagement, and Collaboration) and the Learners' Experience with Online Participation as Dependent Variable

	Parameter Estimates						
	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model	B	Std. Error	Beta	T	Sig.	Lower Bound	Upper Bound
(Constant)	4.090	0.555		7.364	<0.001	2.990	5.190
Year of Study	-0.029	0.058	-0.044	-0.497	0.620	-0.143	0.086
Age Range	0.141	0.074	0.175	1.910	0.059	-0.005	0.286
Gender	-0.119	0.126	-0.078	-0.947	0.346	-0.368	0.130
Dim2 (Engagement)	-0.117	0.153	-0.068	-0.760	0.449	-0.420	0.187
Dim3 (Collaboration)	-0.402	0.087	-0.387	-4.606	<0.001	-0.575	-0.229

a. Dependent Variable: Dim1 (Learners' experience)

Discussion

The overall composite scale level of learner engagement in the online learning environment was statistically significantly positive ($z = 9.409$, $p = 0.00 < 0.05$). This finding indicates that the undergraduate learners were engaged during the online activities in the learning process through a variety of opportunities, technologies, and means of effective pedagogical resources which enhanced their active engagement in the online environment. This finding is consistent with the expectation in an online engagement framework (Chen et al., 2010; Redmond et al., 2018). The online learning experiences with meaningful engagement of students in higher education might have been enhanced due to the effective organization and access of learning management system implemented in undergraduate and graduate programs (Coates, 2006). The utilization of technology has been identified as an essential factor in promoting learner engagement, investment, and satisfaction among the learners in the online environment (Carroll et al., 2021; Chen et al., 2010; Czerkawski & Lyman, 2016). The findings revealed several factors that were statistically significant and thus had a positive impact on the participants' engagement levels. These findings agree with those of Fabian et al. (2022). These factors include the utilization of advanced technology, effective instructor feedback, availability of online resources, opportunities for practical and independent learning, and learner participation in decision making (Dixson, 2015; Fredricks & McColskey, 2012). These findings also coincide with previous studies (Appleton et al., 2006; Blumenfeld et al., 2005; Mahatmya et al., 2012) which emphasized the importance of these factors to enhance the learners' engagement in different class modes.

Although learner engagement has been proven to be of paramount influence on the academic achievement of learners during the online classes (Carroll et al., 2021; Halverson & Graham, 2019; Khan et al., 2021), the learners' previous learning experiences had a statistically negative significance on their level of engagement in the online environment. This finding is not consistent with the results found by Hiver et al.(2020) which indicated that the learners' previous experiences positively influenced their engagement in their classes. The result from this item further suggests that the participants are less motivated to participate in online classes, according to the research (Coates, 2006). This outcome is consistent with the findings of a study by Kahn et al. (2017), which revealed that learners had trouble participating in online classrooms since there were no prolonged practices or tangible actions taken in uncertain and complex situations. The learners might have low motivation in online learning and engagement might be due to lack of personal attention and individualized care through the learning system (Pugh, 2019).

Similarly, the overall scale level of learner collaboration and online opportunities was statistically significantly positive ($z = 6.509$, $p < 0.001 < 0.05$) which indicates that online collaboration and real-life learning opportunities positively influence learner engagement in the online environment. This finding coincides with the results reported by Kahn et al.(2017) which also found positive correlations between these two variables.

Nonetheless, the overall scale level of the participants' experience with online participation was not found to be statistically significant ($z = 0.585$, $p = 0.558 > 0.05$). This indicates that the participants had conflicting opinions about the influence of their participation in online activities on their engagement during online classes. The different opinions might have originated due to different perceived experiences of social, cognitive, and pedagogical presence in online mode during the COVID-19 pandemic (Dixson, 2015). While the participants felt motivated during online discussions, their responses indicated that they had mixed opinions about online classes providing opportunities for meaningful learning experiences. They also had contradictory views about the impact of sharing learning materials with their classmates. This result is consistent with Wang (2008) and Upadhayaya (2021) in the sense that learners in higher education may have different experiences of sharing and negotiating leading to contradicting views (Omar et al., 2021). In addition, the findings revealed that the participants found the courses with outcomes that match their expectations to be more engaging than other courses. Furthermore, the findings indicate that the participants believe that their engagement level increases when they have positive relationships with their colleagues. These findings also coincide with the results indicated by previous studies (Martin & Bolliger, 2018; Skinner & Pitzer; 2012). These findings could be related to the fact that the learners need to feel more connected with their colleagues during the online classes as they mostly feel isolated behind the screens. Another factor which plays a role here is the fear of embarrassment which could hinder many learners from participation if they do not have positive relationships with their colleagues. The importance of positive relationships among the learners and their colleagues has been emphasized in research as there is a great impact of the social presence of learners in different contexts on their learning and academic achievement in higher education institutions (Skinner & Pitzer, 2012).

The undergraduate learners' perceptions of the factors influencing their engagement in the online environment varied across questions. While some participants indicated the importance of their relationships with their instructors and colleagues, 38.9% of them viewed that their self-confidence constitutes the major factor that determines their participation in online classes. This result could be attributed to the importance of self-confidence in the online environment, as there are few opportunities for communication among online students. This may exacerbate the tension caused by not meeting their partners and colleagues in person. Similarly, the participants indicated the importance of collaborative work, as 42.1% indicated that collaborative work improves their motivation, and 44.4% indicated that it improves their participation in the classroom. Collaboration in the online environment is clearly valued by participants and is considered to have a significant impact on their engagement levels and learning experience (Coates, 2006; Dixson, 2015; Redmond et al., 2018). Another factor that was highlighted by the participants is the instructor's feedback which was viewed as a factor that improves the participants' learning experience by 50.8% of the participants. These results coincide with the findings of previous studies (Martin & Bolliger, 2018; Skinner & Pitzer, 2012) which found a positive correlation between healthy learning environments and positive relationships among the learners and between the learners and their instructors. They also coincide with what was found by earlier studies (Arghode et al., 2018; Schell et al., 2013) that positive and timely feedback provided by the instructors helps to increase the levels of learner engagement.

Positive communication and relationships in the learning environment have been viewed as significant predictors of academic achievement. These achievements could be related to academic gains, self-confidence, participation, creativity, and collaboration among learners (Alawamleh et al., 2020). The undergraduate learners' experience with online participation was found to be significantly impacted by the learners' collaboration and learning opportunities which indicates that the quality of the learners' experience in the online environment can be predicted by the level of their collaboration and the learning opportunities provided for them in online classes (Redmond et al., 2018). The social and collaborative engagement with their peers and teachers were not effective or not engaging to several undergraduate students. This finding is consistent with Read (2020) in which they reported 78% of research participants found online classes not engaging due to lack of collaboration (as cited in Hollister et al., 2022). Collaborative engagement with student-student and student-teacher interaction may foster “a sense of community, which is often correlated with more effective learning outcomes” (Hollister et al., 2022, p. 2).

The findings of the study are also related to learner engagement frameworks created by researchers (Carroll et al., 2021; Fredricks et al, 2004) which indicate the main dimensions of learner engagement. In this study, three of these dimensions—behavioral, emotional, and social—were put to the test. These three factors—participation, collaboration, self-confidence, relationships with peers and teachers, perceptions of the learning process, and the impact of their learning environment on their engagement levels—are all clearly reflected in the study's findings. An appropriate framing of learner engagement in online, offline, and face-to-face learning should be assessed in order to develop congenial and effective teaching and learning in higher education, whether in crises or normal situations (Kahu, 2013), in order to create a positive impact on student’s academic performance (Rajabalee et al., 2020). The findings of the study as discussed above could be different in the pre-COVID context or the post-COVID context, as many students and teachers were forced to take online classes Therefore, the implications of the study should be considered in the context of the COVID-19 pandemic, which forced students and teachers to turn to online teaching and learning as the only means to continue education in the UAE and other countries in 2020 and 2021.

Implications

The significance of this study lies in the fact that it provides insight into the factors that influence learner engagement in the online undergraduate context. Although few studies have investigated learner engagement in higher education in the online learning environment in the region (Omar et al., 2021), this study presented an overview of the factors that influence learner engagement in the online learning from a different perspective including the learners’ participation, collaboration, and learning experiences. The findings derived from this study provide evidence of the importance of learner engagement in improving the undergraduate learners’ experience and investment in the online learning process. The generalized linear model revealed that the undergraduate learners’ demographics had no significant impact on the levels of their engagement and participation in online activities. Nonetheless, the learners’ collaboration, relationships with their colleagues, and utilization of advanced technology in online classes had an impact on their level of engagement and learning experience. Moreover, the findings suggest that effective feedback provided by the instructors plays an important role in improving learner engagement in online undergraduate classes. These findings are consistent with the findings in Coates (2006) and Halverson and Graham (2019). Therefore, it is essential to provide undergraduate learners with meaningful collaborative opportunities during the online activities as collaboration would lead to positive relationships among the learners and their colleagues and provide them with opportunities to increase their learner engagement. Moreover, advanced technologies and effective educational online platforms are to be utilized to improve the meaningful, purposeful, and authentic learning experience of the undergraduate learners. Furthermore, instructors need to provide effective feedback which allows the students to learn without negatively influencing their self-confidence (Coates, 2006). Effective feedback strategies would increase learners’ interest in the learning material and their engagement levels. These strategies include the need to build effective communication channels between the instructors and the learners in a way that builds positive relationships, trust, and satisfaction within the learning environment.

Limitations of the Study

Despite the significance of the study results in providing support for available research about the factors that influence learner engagement in the region, few limitations are present in the study due to different constraints. First, the limited number of the participants might not reflect the perceptions of the entire population of undergraduate learners in different higher education institutions available not only in the country, but also in the region. Second, the researchers needed to adopt convenience sampling due to communicative constraints and the limitations related to reaching out to different groups of participants in different colleges and study majors. This could have influenced the study sample by obtaining responses from specific groups rather than a representative sample of the entire population. Third, the emotional dimension of learner motivation was not investigated in this study as the focus was on the three dimensions related to the cognitive, behavioral, and social dimensions of learner engagement. This was due to the nature of the survey questions which constitutes the fourth limitation of the study. The nature of the questions in the designed survey includes Likert scale items which, though helpful in providing a statistical measure for the factors related to the variables, do not provide an insight into the reasons or motives behind the participants' responses. As a result, a mixed methods approach would have provided more insight into the learners' perceptions and views on the factors influencing their engagement and experience in the online environment. The fifth limitation is related to the categorical items that were included in the survey. These items, though analysed for their frequency, were not included in the factor analysis and statistical tests which were conducted on the rest of the items. Although the data collected from these items is important, it was not tested from a statistical significance viewpoint. The final limitation of this study is related to the context of the study. The study was conducted at a time when all face-to-face classes were closed due to the COVID-19 pandemic, and students and teachers were forced to continue teaching and learning in online mode. Therefore, the students' experiences of engagement in learning might have been significantly impacted by the lack of prior experiences in online learning and faculty members not being well prepared to engage students.

Recommendations and Conclusion

This study investigated the various factors that influence undergraduate learner engagement in the online environment in three higher education institutions in the UAE. A sample of 126 undergraduate students participated in the study by responding to an online survey. Statistical analysis was conducted on the collected data using IBM SPSS-28. Data analysis included non-parametric one-sample Wilcoxon signed rank test, independent samples Mann-Whitney U-test, independent samples Kruskal-Wallis test, and generalized linear model test. The findings revealed three main variables that were applicable to statistical analysis and one variable which was derived from the participants' responses to the categorical survey items. Collaboration, real opportunities for online activities, the use of advanced technologies, effective instructor feedback, and positive relationships between participants and their colleagues and instructors were found to influence the participants' engagement levels. The study also provides further evidence of the dynamicity and complexity of the construct of learner engagement in the online environment.

As the online learning environment is influenced by many variables that may impact learners' academic achievement and engagement levels, it is recommended that instructors in different higher education institutions are provided with the required professional training that assists them to establish effective communication channel between them and the learners. Appropriate training is also required to equip instructors and educators at different levels with the best online teaching strategies that emphasize the utilization of authentic and practical content and effective, timely feedback which facilitates the learning process and maximizes learner attainment. Moreover, educators and other stakeholders should invest in leveraging efficient and cutting-edge educational technology and platforms, which are thought to be essential in improving learner engagement levels and the learning experience as a whole. In order to better understand how students perceive the aspects that affect their engagement and learning experience, future studies could focus on including a wider sample of students in higher education from a variety of levels, majors, and environments. Further research could use a mixed methods approach to gain a deeper understanding of the learners' perceptions, which could then be compared to findings from other studies conducted in different regions and learner levels. More specifically, a future study is recommended with a larger sample size involving both public and private higher education institutions. To overcome the limitation due to convenience sampling, we recommend that stratified random sampling be adopted, including higher education institutions from different regions or Emirates within the UAE and even across the Gulf Cooperation Council (GCC) countries. We also recommend that future studies should include behavioral, cognitive, social, emotional, contextual, and technological dimensions of student engagement in online learning as independent variables and their impact on student achievement as a dependent variable. Finally, we would like to recommend ongoing faculty development and training for online teaching and learning in order to provide students with meaningful and impactful learning experiences through greater and positive engagement in various modes of virtual interaction, learning, sharing, and supporting one another.

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Declarations

Authors declare no conflict of interest in publishing this article.

Authors 1 and 2 had an equal contribution in developing this manuscript. Therefore, both should be regarded as first authors of this article.

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Appendix A
Survey Instrument

Learner engagement has been recognized as a valuable element in the success of the learning process and enhanced performance among learners of various levels and interests. The current survey is designed to collect data about the factors that influence learner engagement among college learners during their study in the online environment. The UAE University's Research Ethics Committee has approved the study. (Ref# ERS_2022_8472).

By submitting your responses, you will be helping the researchers to gain better insight into the factors that influence learner engagement in the online environment and suggest strategies to increase the levels of learner engagement among college learners. Participation is completely voluntary. The survey will take approximately 10 minutes and is conducted fully online. The information obtained from this survey is confidential and will be recorded anonymously.

Your participation is highly appreciated.

Do you agree to take part in this online survey sent to you by Ph.D. students in the College of Education at the UAE University?

□ Yes, I agree to take part in this survey.
□ No, I do not agree to take part in this survey.

Section 1
Demographics

Your Gender Male: ________________ Female: ________________

Your Age: 18 - 22: ____ 23 – 29:_____ 30 – 35: ________ Above 35: ______

Year of Study: First Year: _____ Second Year: ______ Third Year:______ Fourth Year:____

Section 2
Instructions
Please indicate to what extent you agree/disagree with the following statements based on your experience in online university courses.

Strongly Disagree	Disagree	Agree	Strongly Agree

1. I often pay full attention to the courses which I consider important for my future career.
2. I feel engaged in online classes when I have positive relationships with my colleagues.
3. The use of advanced technology positively influences my participation during online classes.
4. The use of advanced technology negatively influences my participation during online classes.
5. Collaboration with my classmates in group work is less effective in the online environment than in the face-to-face environment.
6. I often participate in classes that have opportunities for real-life learning.
7. I often feel engaged in the classes where I am given the chance of independent learning.
8. I often feel less encouraged to participate in online classes than in traditional classes.
9. I often participate in online courses where the instructor gives the students the opportunity to participate in decision-making.

10. I often feel frustrated during online discussions.
11. Online classes do not provide the students with opportunities to participate in meaningful learning experiences.
12. I often contribute to the class activities when the online course matches my expectations.
13. I often hesitate to share learning materials with other classmates during online classes.
14. My learning engagement is influenced by the availability of online resources related to my courses.
15. My previous learning experience does not influence my engagement in my current classes.
16. I find the online courses intellectually exhausting.
17. The instructor often provides me with effective feedback.

Section 3
Instructions
Based on your experience during the online classes, please select the statement which is most accurate in your experience.

18. My participation in the online classroom mostly depends on
   a. My relationship with the instructor of the course.
   b. My relationship with my colleagues in the course.
   c. My self-confidence during the online course.
   d. My interest in the course.
19. The instructor's feedback in the online course often
   a. Encourages me to exert more effort in the course.
   b. Discourages me from participating in the course.
   c. Raises the level of my tension in the course.
   d. Improves my learning experience in the course.
20. Online classes are often motivating when
   a. Students are encouraged to express their opinions freely.
   b. Students share their knowledge and experience.
   c. Students are encouraged to be independent learners.
   d. Students work well collaboratively in groups.
21. My participation in online classes is mostly improved by using
   a. Breakout rooms
   b. Blackboard whiteboard
   c. Interactive online platforms
   d. Group discussions
22. Online collaborative work mostly helps me to
   a. Improve my social skills.
   b. Explore different areas of interest.
   c. Enhance my interaction with my colleagues.
   d. Improve my participation in the classroom.
23. From the online activities used during classes, I mostly prefer
   a. Online videos
   b. Interactive games
   c. Online discussions
   d. Individual work
24. I mostly feel demotivated in the online classroom during
   a. Group collaboration
   b. Online discussions
   c. Individual assignments
   d. Pair class activities

Engagement in Online Learning Among Thai and German students: The role of Classmates, Instructors, and Technology across Country Contexts

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Abstract
Since the outbreak of COVID-19, an increasing number of educators around the world have been challenged to support student engagement in online environments. However, there is a lack of research in online learning that considers the role of the country context. This study explores student engagement in online learning, comparing the experiences of 9 German and 11 Thai students with help of in-depth interviews. Findings reveal differences in affective, behavioral, and cognitive engagement across groups. Only German students referred to a lack of affective engagement due to ineffective communication with peers and lecturers, tools used, and privacy concerns. The learning environment influenced affective and cognitive engagement differently. German students felt exhausted because of increased self-study time and lack of guidance. Thai students spent more time studying via videoconferences due to institutional policies. They highlighted a lack of focus due to distraction by digital technologies as well as family members, which they associated with Thai cultural norms to spend time with family. Behavioral engagement, particularly verbal participation during videoconferences, was negatively affected among Thai students. They worried about the effect voicing behavior could have on classmates' feelings, which they attributed to cultural values of being considerate and the need for social harmony. These and other findings are discussed considering the possible role of national, local, and cybercultures as well as institutional contexts.

Keywords: engagement, online learning, culture, Thai, German

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Engagement has been associated with positive learning outcomes, such as the improvement of relationships through collaborative learning (Zweekhorst & Maas, 2015), meta-cognition (Salaber, 2014), and lifelong learning (Karabulut-Ilgu et al., 2018). With a growing internationalization of education online learning across borders gains increasing importance. Research on worldwide developments in distance education (Zawacki-Richter & Qayyum, 2019) has emphasized the need to consider the context of institutional and national cultures as well as differences in the use of learning technologies across countries when designing online learning. Online learning can be defined as a form of learning supported by networked computing technology and learning technologies (Moore et al., 2011), conducted on or off campus, synchronously, or asynchronously. Exploring the country context as well as learners' backgrounds can support careful planning and adequate pedagogies that aim to increase engagement, an important prerequisite of online learning (Englund et al., 2017).

While student engagement plays an important role in online learning, scholars have found it to be vaguely conceptualized (e.g., Ashwin & McVitty, 2015) and weakly theorized (Kahn, 2014). Engagement has been defined as an investment of students' resources, such as their energy, effort, and time, aiming at improving learning outcomes (Trowler & Trowler, 2011), which can include behavioral (e.g., participation and persistence), affective (emotional reactions to learning, e.g., excitement) and cognitive dimensions (e.g., self-regulation and deep learning strategies) (Moore et al., 2009; Perez et al., 2018). It has been debated whether dimensions of social engagement (Fredricks et al., 2016) and agency (Klemenčič, 2017; Reeve & Tseng) should be added. Redmon et al. (2018) suggested an online engagement framework for higher education and further distinguished between social and collaborative engagement. While the former addressed aspects such as building a community and establishing a sense of trust, the latter focused particularly on collaboration, such as when learning with peers.

Motivation has been regularly defined as an antecedent to engagement, a non-visible intent, which can be separated from its behavioral expression (e.g., Reschly & Christenson, 2012). While engagement has been contrasted with passivity or alienation (Case, 2008), scholars have mostly defined engagement and disengagement as two separate constructs, with disengagement often being associated with frustration (Ikpeze, 2007), opposition/rejection (Smidt et al., 2014) and disappointment (Granberg, 2010).

The use of educational technologies, such as online discussion boards, digital games, web-conferencing software, and knowledge-sharing tools has been positively associated with student engagement (Chen et al., 2010; Rashid & Asghar, 2016; Schindler et al., 2017). However, a recent review study (Bond et al., 2020) showed that the use of knowledge organization & sharing tools with undergraduate students as well as synchronous communication tools were topics researched far less than expected. Next to a lack of studies centering on tools in online learning engagement, review studies reflecting upon the role of culture in online learning stress the need for more scholarly efforts in researching the role of the country context in-depth (Grothaus & Zawacki-Richter, 2020).

The role of culture in online learning engagement

Scholars have stressed the importance to consider learners' backgrounds, preferences, and experiences when designing learning environments to increase engagement (Weidlich & Bastiaens, 2019). Boubsil et al. (2011) asked to consider the influence of culture when designing online learning through such as pedagogical methods, localized cultural character of online programs as well as through content and teaching models. A systematic review study on

Emergency Remote Teaching highlighted a focus of research on local contexts and a lack of cross-national collaboration in research on student engagement. The authors suggested scholars to consider the broader sociocultural framework of engagement when exploring how educational technology affects engagement (Bond, 2020). Bond & Bedenlier (2019) added the component of learning technologies to the student engagement framework by Kahu (2013), who conceptualized individual experiences embedded within a socio-cultural context and influenced by psychosocial as well as structural factors. Their model included a micro, meso, exo, and macro level, with the latter two considering the social/economic background, including family, community, and national curriculum as well as facets of culture, digitalization, and policies.

The community of inquiry, a constructivist collaborative learning framework (Garrison et al., 2010; Garrison et al., 1999), highlights the interplay between lecturer, social and cognitive presence to encourage deep learning in online environments. However, such models of online learning need to consider the role of the country context. Scholars that have discussed the role of culture in online education have mostly relied on models describing national culture. Studies regularly refer to the cultural dimensions identified by Hofstede (1980), with a focus on the dimensions of individualism, collectivism, and power distance. Cultural values of collectivism and high power distance are more prevalent in many Asian societies, such as Thailand, as compared to individualistic and low power distance societies, more common in Western contexts, such as Germany (Hofstede, 2011). Power distance, which has been defined as the extent to which members of a society accept and expect power differences and collectivist value orientations, which emphasize the importance of group goals and the well-being of the group, may influence the role of lecturer and social presence in engagement.

While Hofstedes' model is among the most cited and well-known in the context of cross-cultural research, it can be perceived as limiting as it generalizes by comparing cultural values across different country contexts. Values of power distance, for example, may not be expressed in the same way across regions, such as in Western as compared to Eastern contexts. Constructivist learning theories stress the importance of students actively designing their learning, supported by positive teacher-student interaction, such as when giving constructive feedback (Martin and Bolliger, 2018). However, across different high power distance societies, characterized by a focus on teacher-centered instruction (Hofstede, 2001), such interactions may express differently.

Local cultures can have their unique way of reinforcing particular cultural values. Cultural psychologists have used frameworks, such as social representation theory, to explore how representations form through communication in their respective cultural contexts. Anchoring, for example, defined as a mechanism where new ideas or phenomena are related to the already known phenomenon, can provide a better understanding of cultural dynamics (Moscovic, 2001). Qualitative research can help to explore how cultural values are expressed across country contexts and influence members of a particular society in online learning environments.

Furthermore, various subcultures also exist within one national context. Scholars have highlighted the danger to view culture categorically with all members of a community being alike, sharing beliefs, values, and practices, or as a static structure rather than focusing on a process with an ongoing and multifaceted meaning-making in sociocultural contexts (e.g., Duveen, 2007). For example, values can differ across regions, socio-economic groups, and groups with different access to education and can be further influenced by the emergence of new technologies. Scholars have referred to digital or hybrid cultures describing how cultural values can be differently expressed and experienced in online spaces as compared to face-to-face learning (Guawardena et al., 2008). For example, playful elements in online space have been found to neutralize power relations (Song & Yuen, 2008). Furthermore, educational cultures, institutions, and attitudes of lecturers can influence students' attitudes and engagement.

Engagement in online learning in the cultural context of Germany and Thailand

While research that explores the country context can help to expand models of learning, according to review studies, research on student engagement and technology-supported learning has been mainly conducted in the USA, UK, Taiwan, Australia, and China (Bond et al., 2020). Though East Asia has received some attention, research on the less-developed Southeast Asia that explores the role of the country context in online learning in-depth is needed. Thailand, a country in Southeast Asia, has been identified as one of the most feminine societies in the world with strong values of social harmony, collectivism as well as power distance, typical for the majority of Southeast Asian countries. These values have been reinforced by religious beliefs, with 94 percent of the population being Buddhist, nationalism as well as the monarchy (Komin, 1991). While studies have highlighted that values of collectivism can support collaborative online learning in Southeast Asia (Grothaus & Zawacki-Richter, 2020), student-centered learning and self-directed studies may conflict with value orientations of collectivism and power distance. On the other hand, an increasing use of media in countries such as Thailand can lead to the emergence of cybercultures, where cultural values may express differently in online spaces than face-to-face on campus. According to a report titled "Digital 2020: Global Digital Overview" (Kemp, 2020), Thailand was ranked first worldwide, spending more than 9.11 hours per day online, with 3.11 hours on social media.

A mixed-method study (2021) assessing 389 Thai university students' perceptions of engagement, showed that those who actively contributed to their learning demonstrated the highest engagement levels. However, some students who participated in observational activities, such as viewing videos, were still highly engaged, regulated, and self-driven. Imsa-ard (2020) studied perceptions of online learning of 310 Thai university students. The majority of students disagreed that online learning would enhance the quality of learning and support communication between instructors but believed that it supported learning autonomy. Poondej and Lerdpornkulrat (2020) found high levels of satisfaction and interaction with gamification elements of an e-learning course among 104 Thai undergraduate students, which were suggested to be used to counter a possible lack of motivation during self-directed learning. While these studies show that self-directed learning may be challenging some country contexts and the possible role of technologies, there is a lack of qualitative investigations on how cultural value orientations could influence online learning behavior and perceptions.

A systematic review study (Bond et al., 2020) on student engagement and educational technology identified 7.3% of 243 studies originating from Europe, with only one study conducted in Germany. Another systematic review in the field of arts and humanities identified studies in East Asia and Europe (Bedenlier et al., 2020) but none in Germany. The authors recommended that regions such as continental Europe require further investigation, as learning would be rooted in cultural contexts. While individualistic cultural values in countries like Germany (Hofstede, 2011) may support self-directed learning, cybercultures and institutional contexts further play a role in online learning. The "Index of Readiness for Digital Lifelong Learning" placed Germany in the last rank, pointing at an under-investment in digital infrastructure and skepticism towards digital technologies (CEPS, 2019). A study comparing

Thai and German higher education students' use and acceptance of digital media (Author et al., 2021) revealed a preference for and more frequent use of entertainment media and collaborative tools among Thai learners and higher acceptance of office tools as well as fewer study related tasks performed via social media among German students.

Qualitative studies need to follow quantitative efforts to explore how differences in media across countries possibly influence engagement to support conceptualizing of online learning engagement across different country contexts. Review studies show a majority of studies on engagement and educational technology are of quantitative nature, particularly studies conducted in Asia (Bond et al., 2020). Among the few qualitative studies, Arndt et al. (2020) assessed 52 student surveys and 17 instructor surveys at higher education institutions in Germany that reflected online learning perception and experiences admits the onset of COVID-19 in Germany with findings showing how workload, communication, and prior experience can influence online learning perceptions. Existing qualitative studies focus on one country only and further neglect to explore the possible influence of the environment. Qualitative research can shed light on engagement in complex learning environments (Shewmaker & Nguyen, 2017), considering the interaction of students with their lecturers, technology, and peers in their country contexts.

This study shall fill this gap by exploring engagement in online learning among Thai and German students qualitatively, focusing on the role of instructors, peers, the learning environment, and technologies. While the study explores differences across the two groups, it is important to highlight that it does not aim to generalize findings or establish cause and effect but rather aims to suggest how certain cultural values, if present, could potentially influence online learning. It shall also consider the role of different types of culture, such as national, local, and cybercultures. The study addresses the following questions:

1. How do Thai and German students perceive online learning and engage, considering behavioral, cognitive, and affective engagement?
2. What role do instructors, peers, tools, and the learning environment play in student engagement across the two groups?
3. What are differences and similarities in engagement in online learning across groups and how could these be possibly related to the country and cultural context, considering the role of national, local, and cybercultures?

Method

Research Design and Participants

The qualitative approach of this study was chosen as it allowed for exploring engagement and possible differences across the two student groups in-depth, considering the role of the online learning environment and that of the country context. Braun and Clarke (2006) described thematic analysis as a method useful for exploring diverse perspectives, similarities, and differences, as well as for gaining unexpected insights. A thematic analysis was chosen as a method of qualitative data analysis to uncover, analyze, and report patterns in textual data emerging from the interviews with help of a clearly defined step-by-step process (Braun and Clarke 2006). The principal researcher conducted in-depth interviews with nine German Bachelor students (one male, eight females) and 11 Thai Bachelor students (two males, nine females), aged 18–23, from July to August 2020, as classes had just started with online instruction due to the outbreak of COVID-19. Thai students came from two international colleges and one local college with majors in social sciences, natural sciences, media studies, business studies, and medical science. German students came from four different universities, studying educational science, tourism, philosophy, business studies, and natural sciences. Two Thai international colleges and three German universities used their own internal Learning Management Systems. Since in Thailand international colleagues make up an important part of the academic landscape but are, at the same time, mainly attended by a higher socio-economic income group due to higher study fees, both international and local colleagues were chosen. This way the researcher could pay attention to potentially different types of media being used across institutes as well as possible cultural differences. As international colleagues are not as characteristic of the academic landscape in Germany, local universities were chosen. A number of different universities as well as different majors allowed the researcher to explore a variety of tools and instruction methods applied. Thematic saturation was reached after 20 interviews were conducted, with no new concepts emerging in the data.

Data Collection

The researcher announced the project in German and Thai universities and asked lecturers to share the study announcement. Additionally, snowball sampling was applied as students who took part in the interviews identified other potential study participants. While referrals can be a quick and reliable way to identify participants, the limitation of this sampling approach was that it led to a sample with female students being overrepresented. Participants were provided with information about the aim of the study and its procedure. They were informed that they could interrupt the study at any time as well as that neither their name nor any information that could identify them would be disclosed. The research project was approved by the Ethics Committee of the International College.

An interview question guideline was developed with a set of general questions addressing students' attitudes towards online learning, their experiences, feelings as well as challenges associated with online learning. Further questions were organized into categories covering engagement and the role of relationships between students and lecturers, students and technology, and peer relations. These questions considered different types of engagement. For example, to explore behavioral engagement, questions addressed communication with peers and lectures as well as performance. Questions further covered characteristics of online learning, such as synchronous and asynchronous as well as collaborative forms of learning. Before interviews were conducted, 10 Thai students (different from those interviewed) volunteered to participate in pilot interviews to reflect on how questions were understood as to then adapt them accordingly. Forty-five to sixty-minutes long semi-structured interviews were conducted in German and English with help of videoconferencing.

Data Analysis

The thematic analysis research design (Braun & Clarke, 2006) allowed to capture meaning within textual data sets with help of a stepwise and systematic framework of data analysis. The author transcribed interviews and uploaded data sets to the qualitative data analysis software MAXQDA. Transcripts were read with the main research questions in mind, focusing on differences (and similarities) in engagement during online learning across the two groups of students as well as the role of the lecturer-student relationship, peer exchange, and the cultural context. Passages in the text were coded inductively by openly looking at meaning within the data sets, as well as deductively, relating data to existing concepts, such as those of previously researched cultural value orientations. MAXQDA helped to identify and organize codes and related text passages as well as to aggregate codes several times to be able to build and name overarching themes and subthemes. Finally, text passages that belonged to each theme were downloaded via the system and summarized to then write up the results section of the paper. Selected quotes were later translated into English. As the author had spent more than 10 years in Thailand as a university lecturer at the point of data collection, to prevent biases, the author paid attention to staying self-critical during the entire research process, being conscious of and taking notes of her internal and external dialogue.

Findings

Engagement and the Role of Classmates and Peers

Social presence and support on engagement—The role of the year of study and type of media

Students across groups described how online learning felt less exciting due to the lack of exchange and physical presence of other students. A German student (21, female) elaborated: "What is extremely missing, in uni you sit down at some desk and meet people, also new people you get introduced to. You live in your own little world with only few people in there. Studies become much less exciting."

The year of study affected the need for exchange with other students differently across the two samples. Only German students centered their responsibility in organizing their entry to university. German institutions required more student initiative to organize their first year of study. Students missed opportunities to exchange with students and lecturers to support the process. Thai students did not highlight such challenges. Both groups shared how, in their last year of study, they could not spend time with others and were thus not able to properly finish a chapter of their life.

Further, the type of media used to connect with classmates influenced engagement across samples differently. Only Thai students shared how connecting via messenger applications and social media helped them to deal with feelings of isolation. German students highlighted the need for privacy. They mostly communicated with friends they were already connected with via social media. German students had much less time organized synchronously and more frequently left their camera turned off and felt consequently more disconnected. Breakout room discussions helped to increase social presence, which increased affective engagement across groups. A Thai student (23, female) shared: "We worked but we also need to talk, you know, like 'how are you, how was your holiday' and stuff. Online it is important that we have that extra time to connect."

Group work—Initiating contact and involvement with the task on affective engagement

Only German students highlighted challenges when collaborating with classmates on assignments. They mostly communicated via email, particularly with classmates they did not know well, and felt frustrated, tired, and disengaged as work did not progress quickly enough or as they had to finish tasks by themselves. On campus, it was easier for them to connect with students they did not know well. Thai students, on the other hand, used various tools, particularly messenger applications, as well as collaborative writing tools, and did not mention any such communication challenges.

Students across groups referred to feelings of "trust," "comfort," and "connectedness" when exchanging in smaller groups in breakout rooms during videoconferences, which, they said, improved their collaboration and increased overall engagement. While Thai students related engagement more often to social exchange when collaborating, German students highlighted the effectiveness of collaboration and deep learning experiences as engaging.

Concerns about what classmates feel and think and engagement in voicing behavior

Only Thai students frequently expressed concerns about how they were perceived by their classmates as well as how their actions, such as when speaking up in class, may affect classmates' feelings. Several Thai students refrained from speaking up in the main videoconference room as they tried to prevent taking other students' chances to voice their ideas. In breakout rooms they were less concerned about interrupting each other, as verbal contributions were not graded, and they would thus not risk taking other students' participation points. One Thai student (20, female) emphasized how she spoke up more frequently online. On campus, she felt judged when standing out, which she experienced less so when studying online as she did not feel the presence of her classmates as much. Being the center of attention was described as selfish. Some Thai students referred to Thai cultural values to be polite and considerate to explain their behavior:

> 'Kreng jai' (เกรงใจ) in Thai means when you meet or talk to people, there is this urge to be polite. It's not just lecturers, it's for everyone. Online people do not speak up a lot. Maybe they want it too but if I talk a lot, other students that are willing to share their opinions, they might stop doing so because of me (21, female).

Thai students further shared how it was easier on campus to speak up as others provided words of encouragement or one could assure with others if an answer was correct. One could see who was willing and ready to speak, observing each other's body language. A Thai student (20, female) shared how she preferred to know whether her classmates were listening to her as she spoke, which was more difficult online. Other Thai students stressed how they spoke up more regularly on campus as it was easier to concentrate, observing others who also paid attention. German students did not mention the importance to consider others' feelings and to read body language to be better able to respond to those feelings.

Engagement and the role of the lecturer

The role of seeing and exchanging with lecturers synchronously in affective engagement

Many German students described online learning as less engaging as they did not see lecturers or exchange with them often enough. Much of their learning was organized as asynchronous self-study or videoconferences with less interactive work. Thai students on the other hand were required to take part in weekly synchronous videoconferences and breakout room sessions. A German student (20, female) shared: "The lecturer spoke his 90 minutes and showed us his script on the screen. In the end he just said: 'Does anyone have any questions?' On campus, we were more encouraged to engage." On the other hand, while several German lecturers offered synchronous sessions to guide self-study, many students did not attend those. A German student (19, female) shared how on campus she would skip classes less often. She felt, as she had already made the effort to commute to campus, she should also attend classes. Further, German students experienced asynchronous communication with lecturers via email or forums as slow and frustrating and hesitated to contact their lecturers as they did not want to interrupt their private time, especially if they taught classes with multiple hundreds of students. Such were not offered in Thailand. A German student (20, female) described self-studying as "nerve-wracking and tiring." One would have to "always research and work out everything by oneself."

Some Thai students stressed how regular videoconferences were necessary, particularly in Thailand, referring to a more teacher-centered learning approach and culture. A Thai student (19, male) shared that it took him a few days to adapt to the videoconference environment. After that, it would feel to him as if he knew his lecturers as much as he did on campus. He, however, shared how, if lecturers did not engage students to speak up, it felt more disconnected and as if “one was watching a video.” Thai lecturers also encouraged the use of messenger groups, which they sometimes joined. This was not the case among the German students, who stressed the importance of privacy and data protection in Germany.

The role of lecturer presence and authority in behavioral engagement—Voicing behavior, camera use, and self-study

Voicing behavior, as a form of behavioral engagement, overall decreased in online settings as compared to face-to-face learning. Students mentioned that speaking up during videoconferences in the main forum felt “less required” and that they felt “less pressured.” Only Thai students, however, referred to the reduced power of the lecturer as an authority figure, which could be expressed more so in face-to-face settings:

> On campus, in the classroom, you have to be there fully, your whole self is present. You know the lecturer might look at you, like in your eyes, and come to you and then you might have to answer, or you might have to listen because it's the environment where you see everybody is listening. At home, you're alone in front of the screen. (Thai, 22, female)

Students across groups preferred their lecturers to encourage or assign them to share ideas during video conferences. Thai students highlighted how lecturers asking them to use a virtual indicator, such as the symbol of a hand, increased participation. This way they did not have to worry about taking someone’s turn. Students across groups would approach lecturers less often after class if in online settings, as they often logged out as classes were finished. If they stayed to answer questions, other students would stay and listen, which made it less private.

Students also reacted differently to the presence and authority of the lecturer in online breakout rooms. Thai students emphasized how it was often silent in rooms students were assigned to for discussions until the lecturer joined, then they would start to speak. In contrast, German students described the opposite, emphasizing how they felt more relaxed and motivated to talk to each other if the lecturer was not in the breakout room. Only Thai students highlighted the importance to read the body language of the lecturer to identify when they could or should speak up.

Students also responded differently to the authority of the lecturer when being asked to open their cameras. A German student (19, female) shared: “If the lecturers asked us openly at the beginning of class to open the camera and really stressed how they would appreciate this, then there are always one or two people who actually really do this.” However, while Thais more readily opened their cameras, some Thai students felt surprised that many classmates did not do so, despite lecturers encouraging them. A Thai student (21, male) reported how students would use a picture to pretend their camera was turned on or tilted their camera so that their face was not visible. A few Thai students referred to a change in power dynamics as compared to on campus learning and associated such with the anonymity of the online space:

> As a Social Science student, I think about power structure and sense of surveillance. I heard friends saying how everyone was so visible and you can pick up who is paying attention and who is not. Maybe the entire class is being recorded and they are going to go back and look if anyone is misbehaving. Technology has evolved. I don't think anyone takes this seriously here in Thailand, except maybe social science students.

Considering the role of cognitive engagement, only German students referred to learning as a reward. A Thai student (20, female) emphasized how online learning could have potential, if students were able to motivate themselves, which she doubted was possible. She stressed how students may likely not address the lecturer if they did not understand what they had studied by themselves at home, referring to the mentality of students in Thailand:

> I can already sense that some students would not study by themselves and then can't participate in discussions. It's a general thing here. We gather and are like "oh did you read the handout" and they say no and it's a funny thing. They are proud of that. It's more like a joke, like they would say: "Of course I didn't read it why would I read it. I have my own life."

Engagement and the role of learning technologies

Tools to support self-study and engagement—Time intensive but at one's own timing

Thai students more readily used different tools and digital media. A Thai student (23, female) shared: "The normal way we take notes here is with our iPad. We use it like a paper. We put all class files on the iPad and then write on it." In contrast, a German student (21, female) referred to her math class. She used to insert her exercise sheet into a lecturers' wooden mailbox on campus. Now she needed to conduct math exercises in an online program: "I feel this is much more exhausting and takes double as long. Now I am doing all of this with my computer instead of a simple piece of paper." Only German students mentioned that the closing of the library slowed them down and affected their performance. Thai students were used to receiving digital files from their lecturers or to research information online.

Students across groups felt exhausted if they had to handle many different unfamiliar applications that took more time and led to confusion. Discussion forums, wikis, and lecture recordings were mostly appreciated, allowing students to view content at their own speed and to learn from written contributions of classmates. Staying on track positively affected affective engagement. However, particularly German students, who felt more compelled to take detailed notes, felt disengaged as video lectures increased their study time, as they could now write down all lecture details.

Videoconference meetings on performance—Following class content, resisting distractions and participation

The majority of students appreciated video conferences. Hearing, seeing, and talking to classmates synchronously and guided by the lecturer was positively associated with participation and performance. However, particularly Thai students, who attended weekly required video conferences, reported difficulties to focus over extended periods of time and to resist distractions, using their phones during lectures for non-related class content. A Thai student (20, female) described: "Online it's different. If someone says a really long sentence, I will stop in the middle of the sentence, just stop paying attention." Another Thai student (21, male) shared: "It is difficult to concentrate. Then you just end up doing something else. Someday I'll just zone out in the middle of the lecture and lose track.” Some students shared how the same time period online as compared to face-to-face on campus was experienced as longer. Distractions made students lose track, which in some cases decreased performance and affective engagement.

Several students felt more encouraged to respond via online chat during video conferences than to speak up, which was particularly the case among German students in the case of large lecturers with multiple hundreds of students. Such large classrooms were not organized in Thai university settings. A German student (24, female) elaborated: “As you type, you are somehow braver. Like sitting with 150 students in a lecture hall, I ask less because I think maybe someone will look at me thinking that I am stupid.”

Use of the camera on engagement—Feeling connected, observed, and exhausted

Students experienced the use of the camera as inconvenient, referring to: “Lack of privacy”; “needing to dress up”; “not looking good in the morning”; “having to be organized”; “feeling observed”; “observing oneself”; “less flexibility to do other tasks” and “less anonymity.” A German student (20, male) described the challenge of being in the center of attention: “It felt like holding a speech to 200 people and everyone stares at you. This is worse if the cameras of others are turned off.” While many Thai students used their phone more often during online classes, a German student (19, female) described how in a large classroom on-campus she would eat or use her phone as she could hide but online with the camera on, she refrained from doing so. Only Thai students regularly referred to the experience of “monitoring” themselves, which led to exhaustion and lower levels of concentration. A Thai student stressed: “I am fine seeing other peoples’ faces but I don’t want to see my face. I see it every day anyways.” Not knowing who was looking at them, Thai students described as stressful.

Despite negative experiences related to camera use overall, the camera engaged students more than that it didn’t. Students described how it felt “less lonely,” “more real,” “exciting,” “connected,” and “almost like in an actual classroom.” They could better follow speakers and consequently stayed engaged. Only Thai students pointed out how their lecturers’ body language helped them to understand how they performed. A Thai student (20, female) shared: “If I do not see the lecturer I do not know if he is satisfied with my answer or if he is maybe confused about what I say or if he wants to move on to the next topic. Also, if the lecturer looks at me, I feel supported. Another Thai student (21, female) shared:

> The lecturers don't know what we don't know, and we don't know how to tell them what we don't know because like the nonverbal cues. In class they can look at our face and go like “oh ok, so like 90% of students in class don’t know what I'm talking about.” If we stay quiet, it can be because we already understand and we want them to move on or because we are confused.

The role of the learning environment in engagement—Distractions, flexibility, and structure in self-directed learning.

Overall, German students described learning experiences more vividly than Thai students as they referred to advantages and disadvantages of online learning. Lectures would “shoot at them with tasks” and studying online was experienced as “the absolute horror” or as “super nice,” “exciting,” and “fun.” Some Thais emphasized how online learning, as compared to on campus studies, would be "clearly inferior." Only one Thai student expressed excitement about the flexibility of online learning.

Challenges—Structuring tasks, managing time, and dealing with interruptions

Students across groups described how they felt "tired," "exhausted," and "drained" when organizing their studies by themselves. Thai students had generally less time allocated for self-study, and regular synchronous video lectures were required. They emphasized how in Thailand clear lecturer guidance was necessary students and that homework would otherwise often not be completed. Germans referred to feelings of being overwhelmed with an increased workload, less support, and expectations of independent studies:

> I got this script with 200 pages, videos, articles but no starting point. There is much information to process. At some point you did not feel like studying anymore. It's this idea of independent learning here in Germany but online we do need support. (20, female)

Several German students shared how they needed more structure, deadlines, and guidance. A German student (21, female) struggled to allow herself to take breaks:

> I would have sat a whole day in uni too but there you talk to friends and have a longer lunch break. When I sit by myself than I do only these things. I don't talk to myself in between. At some point I decided that this does not work like this. I can't study 10 hours per day without a break or even for 8 hours.

Thai students more often referred to being distracted at home using their phones and computer to view and interact with non-class related content. They watched YouTube videos, played games, and checked their social media accounts. As work piled up, they felt less productive and kept procrastinating, which frustrated and exhausted Thai students and decreased cognitive engagement. A Thai student (22, female) stressed: "I kept everything until the last moment and by the end of the term I had like literally no grind whatsoever, no motivation. I was just doing it for the grades. I think I didn't learn much. It was bad."

Only Thai students regularly referred to the influence of the immediate and extended family, who distracted them, spending much time in the same room or expected them to perform certain duties, which slowed them down. A Thai student explained: "When I study, there are many people around me. Sometimes my mom calls me. Like sometimes I have to cook something for my sister. At home, like I can't only study. I also have to some things for the family." Another Thai laughed as she described:

> When I study at home, I have my family. I have my mother and my aunt, who want to stay with me in my room so I can't concentrate on the teacher. I tell them to leave but they don't care. They always come to my room because they want to be near me.

Advantages—Flexibility in managing schedules and the need for structure

Several German students but only one Thai student shared excitement about the flexibility to structure one's time and tasks as well as to save time commuting when studying online. They felt excited about being able to manage their own schedules as they could study at their own pace and were responsible for distributing their workload over the course of the semester. A German student (20, male) shared how his friends "loved online learning so much" that they considered changing their program and potentially the university to study a major that would be offered fully online.

A German student (21, female) emphasized how much she enjoyed self-study, particularly one class for which her lecturer had provided them a clear structure and engaged them with help of a learning path with a completion bar. Another German student (19, female) shared how she, already as she studied on campus, audio-taped class content as she could not take notes quickly enough. Now she would not need to go to campus to get these, which saved her time and felt like “a significant improvement.”

Many students appreciated prerecorded video lectures. However, a German student (23, female) stressed that this way they had to spend double as much time studying, as they now watched lectures and attended live classes. Another German student (19, female) elaborated: “Now with these posted videos during the online trimester you can just take so much more notes. You try to write down every little detail in these videos. That just made if feel like so much more work.” Furthermore, lectures were now more condensed as they did not include any informal talk and breaks.

Discussion

This study explores engagement of Thai and German university students studying online, considering the role of relationships between students as well as students and lectures and of technologies. Behavioral, cognitive, and affective engagement, as part of the engagement construct (Moore et al., 2009; Perez et al., 2018), were addressed. The study aims to shed light on the possible role of national, institutional, and cybercultures in engagement in online learning by exploring how values, attitudes, and behaviors related to online learning differed across the two samples. However, while exploring differences across groups, this study does not attempt to predict that these differences in online learning are to be led back to cultural contexts.

Findings revealed how challenges in collaborative work when organizing group projects outside of videoconferences negatively affected social and affective engagement of German students, who felt tired and less excited about their studies. They reported increased frustration, having to finish work by themselves whilst feeling inhibited to initiate contact with unfamiliar classmates via messenger applications. Thai students did not report such challenges. While scholars have highlighted social engagement as a key characteristic of online learning and as part of the engagement construct (Fredricks et al., 2016), this studied showed how social engagement differed across the two samples.

Cultural values of collectivism, as well as the familiarity with communication tools, may have encouraged Thai students to use various tools and to initiate contact to organize self-directed group work. Review studies on online learning in the context of Southeast Asia (Grothaus & Zawacki-Richter, 2020) have highlighted the role of teacher-centered education with stronger values of power distance in countries such as Thailand. While scholars have frequently described Asian learners as rather passive (e.g., Kwok, 2004), scholars have also highlighted that such fixed ideas about how students learn can prevent lecturers and researchers from exploring student-centered learning in these cultural contexts (Pham & Renshaw, 2013). Findings of this study showed how Thai students were proactive in organizing group work without the support of the lecturer. This may be explained by taking a closer look at the possible role of culture. Studies discussing culture in online learning frequently refer to Hofstedes’ cultural dimensions (2011). However, the potential role of other cultural dimensions deserves attention. German students’ hesitation to contact classmates outside of campus could be possibly explained with Trompenaars & Hampden-Turners' (1989) concept of specific cultures (Germany), which, as compared to diffuse cultures (Thailand), value separation of private and work life more strongly. German students regularly stressed the importance not to interrupt classmates' private spheres. Further, institutional cultures may play a role in students' attitudes towards technologies, as lecturers in Germany were not allowed to encourage the use of external applications for learning. Lastly emerging cyber cultures, with German students being more hesitant to use general web tools for learning than Thai students, seemed to reduce the influence of cultural individualistic values on the motivation and ability to conduct self-study among German students.

Review studies (Grothaus & Zawacki-Richter, 2020) show how scholarly work discussing the role of culture in online learning has focused particularly on Hofstedes' dimensions of collectivism and power distance and less on the dimension of femininity. Feminine cultures have been identified particularly in the region of Southeast Asia, with Thailand being among the most feminine cultures in the world (Hofstede, 2011). While feminine cultural values, which have been associated with Thai students' motivation to connect and to maintain social harmony, seemed to positively affect collaborative work outside of live classes, verbal exchange during videoconferences as a form of behavioral engagement decreased. Thai students emphasized challenges of a lack of body language and informal talk with classmates, which they deemed necessary to confirm answers before speaking up. Lower levels of competition as a characteristic of feminine cultures and the aim to maintain harmony, may have influenced students' concerns about affecting classmates' feelings when risking interrupting them or to take their attendance points.

A number of recent studies (Chaiyasat & Intakaew, 2022; Chung, 2021; 2022; Hongboontri, et al. 2021) have explored the role of silence among Thai students as well as the influence of culture. Chung (2021) found that while Thai students often remained silent, they did not see themselves as passive but as students who attentively participated. Silence was described as an effective way to save face by avoiding judgment and to maintain harmony, values that were associated with Thai culture. Furthermore, silence was seen as a strategy to organize their thoughts to deeply comprehend, which can be associated with cognitive engagement. Such findings need to be reflected in the online cultural context. As this study showed, Thai students stayed silent, and thus showed less behavioral engagement, as they felt challenged to read each other's body language, and lacked opportunities for informal talk with classmates, which they deemed necessary to confirm answers before speaking up. Reading each other's body language would help them to maintain harmony and save face.

Hall & Hall (1990) highlighted the importance of body language in low context cultures, such as Thailand, to maintain relationships. According to Hall & Hall, members of high-context cultures pay attention not only to the words spoken but particularly to interpersonal relationships, nonverbal expressions, as well as physical and social settings. The context must be understood before members start to communicate. Moreover, cognitive engagement was challenged in cases when students could not concentrate and follow along and got more distracted, which they said was particularly the case when studying online. However, Chung (2021) suggested encouraging students to write out their thoughts as an alternative way to participate in class. In the online context, chat functions during video conferences supported students to participate without needing to speak up.

German students, on the other hand, only referred to concerns about affecting classmates in cases where they did not want to invade private spheres. Further, the size of the classroom also played a role in voicing behavior among German students, which showed an influence of institutional contexts. While several students said participation dropped as students felt less accountable online, some stressed how in lectures with multiple hundreds of students, they participated more if conducted online than on campus, as they felt less afraid due to increased anonymity. Such large lectures were more common in German university settings. Educational staff working across borders should consider that the type of instruction can affect engagement differently.

Next to the influence of classmates on engagement in online learning, findings revealed how the lecturer played an important role. The community of inquiry model (Garrison et al., 2010) suggests lecturer presence positively affects social and cognitive presence, which encourages deep learning when studying online. Thai students stressed the importance of lecturer guidance and universities in Thailand organized significantly more time for synchronous videoconference meetings. While Germany has been identified as a low power distance and individualistic culture, focusing on student-centered instruction and independent learning (Hofstede, 2011), this study showed how too little guidance and structure negatively affected engagement of German students. This shows how national cultural values supporting independent learning on campus may not as easily translate to online learning contexts and how students thus require more scaffolding.

Furthermore, Thai students referred to the importance of the authority and presence of the lecturer in breakout rooms. Participation, as a form of behavioral engagement, often decreased as the lecturer was absent, which was not mentioned by German students. Thai students also felt they needed to see and interpret lecturers' body language to identify when they could or should speak up, which was more difficult for them in an online environment. While such differences may be explained considering the role of power distance across the two countries, scholars have also highlighted how online spaces can allow for more informal environments which can change power dynamics (Song & Yuen, 2008). This may have been the case as Thai students were surprised that many students did not comply with the lecturers' request to open their cameras. They shared how it was easier not to follow what the teacher said in online environments as it was more anonymous.

Moreover, culture needs to be also reflected as a dynamic construct that is influenced by societal changes. Recent student movements showed how student opposed the influence of the military government and monarchy and criticized power distance and rules such as those related to student uniforms (Lertchoosakul, 2021). These changes may further support reluctance to follow orders. This may have implications for lecturers in Thailand who apply a more teacher-centered learning approach and expect students to follow. Supporting intrinsic motivation instead of extrinsic approaches that rely on obeying the authority and teacher-centered learning, may positively support cognitive engagement.

Next to the influence of students and lecturers, technology and the learning environment played a role in student engagement. German students' affective engagement was influenced by an increase in self-study time and experienced lack of lecturer guidance. However, only German students associated strong affective engagement with the freedom to regulate their time and studies. Thai students highlighted how Thai cultural values for teacher-centered learning would not support self-study. Cognitive engagement increased as students used taped video lectures, which improved comprehension as they could pause and rewind. However, German students, who described themselves as eager, also reported exhaustion due to an increase in study time, as video lectures were condensed and as they could note down potentially everything.

Thai students' affective engagement decreased as they felt tired from so much screen time, self-monitoring when opening the camera, and digital distractions. As only Thai students stressed the influence of self-monitoring, it may be interesting to explore if the value of "maintaining face" and social presence in online situations could affect students differently across cultures. On the other hand, in a few cases Thai lecturers required or strongly encouraged students to keep the camera turned on, which may have influenced their response. Furthermore, Trompenaars & Hampden-Turner (1998) have identified Thailand as a polychronic culture with members handling many things at the same time, as compared to monochronic cultures, such as Germany. Findings showed how multi-tasking decreased their ability to focus and follow the lecture. Thai students more often highlighted how they used multiple applications at the same time, chatting with friends and using social media while listening to the online lecture. Thai students' cognitive engagement was further negatively affected as family members often gathered in the same room or expected students to support in the household. The majority of Thai students, who had lived in dorms near campus before, had moved back to their parents' house during online instructions. Scholars studying collectivist societies (Markus & Kitayama, 1991) have previously highlighted cultural characteristics of family members living together as well as the role of family expectations. The influence of family members on online learning needs to be considered when designing online learning in countries where students more frequently live with their families and maintaining private spheres is less important.

Conclusion

This study identified differences between Thai and German university students in affective, cognitive, and behavioral engagement when studying online. Cultural dimensions such as those of collectivism, femininity, and power distance (Hofstede, 2011) or high and low context cultures (Hall & Hall, 1990) as well as institutional and cybercultures may likely explain some of these differences. Follow-up studies could explore certain findings further in-depth, such as the role of family members in online learning engagement or the concern about affecting classmates' feelings in collectivist and feminine societies. Furthermore, future research could consider the possible role of the field of study, which was not centered in this study but may have influenced factors, such technologies and instructional methods used for online learning.

Findings can support practitioners across country contexts. Lecturers and institutions who decide to organize self-directed learning, may need to rethink how to do so in different cultural environments. For example, lecturers could support the use of various tools and guide with initiating contact to support students from individualistic country contexts and members of specific cultures as well as consider the role of distractions among students with polychronic orientations. Further, the institutional context and methods applied, such as instruction in large lecture halls, which were more frequently organized in Germany universities, should be considered. For example, German students felt more encouraged to participate online, such as when sharing questions in the chat during lectures conducted with more students. Lastly, there are limitations to this study that should be addressed. As data was collected during the outbreak of COVID-19, when social distancing policies were introduced and students experienced several changes in their lives, these may have influenced their behavior and attitudes towards online learning. Furthermore, while this study suggested possible cultural explanations to explain differences in engagement across samples, qualitative research cannot confirm such relationships. This study aimed to consider the complexity of culture, including national, local, institutional, and cyber-cultures. However, one needs to acknowledge the limitation that comes with assigning cultural characteristics to groups, such as those defined by national borders.

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Special Educator Course Format Preferences

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Abstract
Online special education courses and programs are widely available and provide pathways for both initial certification and in-service professional learning. Despite the wider availability of online special educator courses and programs due to the COVID pandemic, very limited research about special education candidates and educator preferences for online courses is available. This study included 965 special education teachers and paraprofessionals who completed an online survey of their preferences about various special education course formats and lengths. Results indicated that special educator course format and length preferences varied and that fully online courses are not uniformly the top choice. Findings also suggested that shorter online courses (e.g., 7-weeks) are best suited to knowledge-based topics, while skills-based courses benefit from longer course duration (e.g., 15-weeks). Implications for special education program delivery are discussed.

Keywords: Online courses, special education, remote learning, course format

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Before the global COVID-19 pandemic, colleges and universities began offering fully online courses and degrees. Initially, most online courses were entirely asynchronous. More recently, additional online formats and combined on-campus and online options have been added. Alongside the emergence of online college courses, researchers have begun to investigate various aspects of online instruction. Although the literature about online instruction is still very young, some initial findings are available. Much of the available research has been conducted with online courses in healthcare, social work, and education. Importantly, these are fields facing significant labor shortages and some online degree programs were developed for the purpose of addressing these shortages (Tiedt et al., 2021). Research to date has addressed aspects of students' online experiences, effective online instructional practices, curriculum needs, and accreditation. The findings reveal that interest and support for online instruction is increasing alongside the need for more comprehensive online curriculum development that meets accreditation standards.

A significant benefit of online college programming is that such courses can be accessed from any global location where there is an internet connection. Among the occupations with recently expanded online course availability is teaching (Dunn & Rice, 2019). The U.S. is experiencing a major shortage of teachers, including special education teachers, and online college programs to prepare future special educators are one possible pathway to address this shortage (Gaines, 2022). Although there are certain advantages to online teacher preparation, very little is known about prospective teacher preferences for online learning. Gardner et al. (2021) found that adult-learner preferences for online course formats in many different disciplines varied across age, family situation, employment, and motivation. These findings suggest that it is important for colleges and universities to consider when, where, and how courses are offered to attract and retain successful students. Considering the dire shortage of special education teachers, information about the course format preferences from individuals already working in special education could help provide information about what course features are most likely to appeal to future special educators.

Course format preferences result from prior learning experiences and can contribute to a student's learning success. In the case of adult students such as prospective teachers, course format preferences could influence the decision to enroll in a course, the level of effort and satisfaction with course assignments, and overall course outcomes. Online course and program options have radically changed the options available for those who seek to become teachers and there is emerging agreement about course format definitions (Johnson et al., 2022). The expansion of choices could contribute to more customized learning for future teachers, but only if students know about, and can select their preferred course format (Gardner et al., 2021). For professions with current critical shortages, such as special education, information about what course formats are preferred is especially important in order to support degree completion and workforce development.

Special Educators' Online Learning Experiences

Only five research studies were located that included a specific focus on special education online courses and preparation. A 2014 study by Vernon-Dotson and colleagues summarized research about different types of course delivery for special educator candidates. Their analysis indicated that online course outcomes were about the same as those for on-campus courses. In 2018 Juarez and Purper published a quantitative analysis of available studies regarding various types of instruction for future special educators. Although they noted that very few studies that explicitly analyzed the outcomes of online instruction for special educator candidates were available, they did find that the use of topic-specific online modules as part of special educator courses can be an effective way to prepare future special education teachers to use evidence-based practices in their later teaching. This finding is like Luo et al., (2017), who found that authentic learning activities that are tied to professional tasks are more enjoyable for instructors and students.

Two recent studies examined the use of Universal Design for Learning (UDL) with special educator candidates. UDL is a practice widely used by special educators in public schools to ensure access for students with disabilities. A survey of graduate students in special education courses revealed that the instructor's use of UDL strategies helped them to be more connected and engaged with the course (Lohman et al., 2018). A more in-depth, quasi-experimental study examined how well special educator candidates applied learning about UDL in sample lessons they created. In this study, special education student teachers completed three online modules about UDL and then created lesson plans to deliver in their field placements (Lee & Griffin, 2021). The lesson plans were then scored using a rubric, with the scores compared to pre-UDL course lessons the participants had developed. All participants showed improvement in the use of UDL and overall lesson quality. In addition, a concluding survey revealed that the candidates found the modules helpful and that they planned to use what they learned in their future teaching.

Other Online Learning Research

The earliest research about online instruction often compared students’ experiences in on campus and online courses. As recently as 2011, a large study of students and faculty in an Australian university found that both groups were less satisfied with the online instruction than on-campus classes (Guest et al., 2018). Baran and colleagues (2011) suggested that dissatisfaction with online courses might be due to the fact that this method of instruction requires changes in student and teacher roles. In particular, online instruction at the college level needs to take into consideration two important factors: (a) students are adult learners, and (b) online instruction includes different types of interactions than in on-campus classrooms. Although online classes offer significant flexibility for learners, the learning still requires engagement and interaction with the content, instructor, and other students. If the students have limited time for such learning, it can affect the outcomes.

No studies with special educators were found that focused on student engagement and interactions, or about how students demonstrated their learning. Research with students in other disciplines has suggested important information about these components of online learning. For example, Foronda (2014) noted that student engagement and a sense of community are essential for effective online nursing instruction. In a study of online instruction for continuing medical education (CME) many physicians found their own lack of time and variable participation rates to be barriers to effective online learning (Guan et al., 2008). Recommended online instruction practices include using a variety of software tools, frequent instructor presence, and assignment options can help keep students engaged. Student engagement is a major theme in many studies of online instruction and one of the factors that influences student engagement is instructor presence (Foronda, 2014). Importantly, there are multiple dimensions to instructor presence online and these include being present to students through teaching, cognitive modeling, and social interactions (Dunn & Rice, 2019).

Additional research about online learning outcomes for medical students showed that the selective use of online modules was associated with higher student satisfaction and better course performance. Specifically, Sawarynski and Baxa (2019) found that how and when an online module bank was used influenced students' actual use of the modules as well as their satisfaction with the course, perhaps due to the modules influencing how the students demonstrated their learning. This finding is similar to Ellaway et al. (2014), who noted that contextual and environmental factors had a large effect in medical students' use and satisfaction with multimedia learning modules. Their study also indicated that module alignment with required exams as well as instructor attitudes toward the modules were very important in student usage. These studies together suggest that organizing learning activities into "modules" which focus on specific topics appeals to current and future physicians. In addition, the Sawarynski and Baxa findings suggested that providing learners with choices about learning content improves engagement.

A recent study (Sharma et al., 2020) evaluated the frequency and duration of students' logins to the learning management system (LMS) used with a hybrid communications course. Findings showed that both frequency and duration of the students' online sessions were correlated with the final course grade, with frequency more highly correlated than duration. Given that students are likely to vary in relation to how long they need to be logged in for the purpose of completing and understanding online assignments, it makes sense that more frequent logins were the best predictor of student grades because more repeated contact with the content is more likely to reinforce prior exposures. Another factor associated with the quality of students' online learning experiences is the amount of preparation to teach online the instructor had prior to the course. In a study of online social work courses, Alston et al. (2017) found that discipline-specific professional learning enhanced student satisfaction and learning outcomes.

In other research with students in health-related programs, researchers examined the effects of course length on learning outcomes. A longitudinal study by Stephens (2012) compared students' grades from 4-week and 8-week versions of an online physiology course over a 5-year time period. The results showed that the grades were roughly equivalent for both sections. Similarly, Harwood et al. (2018) compared final assignment grades for students in 7-week and 15-week online courses and showed the scores were not significantly different. Additionally, the students' course evaluations were highly similar across both formats.

Preparation, Curriculum, and Accreditation

A number of the research studies cited above provide information about how teaching online is not the same as teaching on campus. This reality suggests that preparation for online teaching is important (Adnan, 2017). Several studies have examined the role and importance of preparation to teach online, both at the college level and in K through 12 school settings. Ching et al., (2018) noted that a course in online teaching is an important start, but likely not sufficient to fully prepare instructors. It is likely that teaching online will create discomfort for some faculty but taking time to learn to do it well is worthwhile (Archibald & Barnes, 2017). Importantly, college and university faculty need to consider the extent to which they intend to make their courses and programs available in fully online formats (Ching et al., 2018) because doing so requires different preparation than on-campus delivery.

Teacher education has both state and professional accreditation standards, and these must be considered when planning online instruction (Davis et al., 2019). Notably, Smith et al. (2016) conducted a survey of higher education faculty teaching in special educator teaching programs. The findings revealed that a majority taught their students to teach online in K through 12 settings in the future. Despite this program component, many faculty members did not realize that standards for online instruction exist (e.g., iNACOL). Yet, many of the skills included in the courses included those in the iNACOL standards for quality online instruction. Nonetheless, many of these standards were not covered in the courses reported by participants. In general, there is very limited research about applicable standards for online instruction. For faculty who teach in professional preparation programs such as healthcare, social work, and education, two levels of standards must be kept in mind: (a) online instruction standards, and (b) professional standards required for certification or licensure. The professional standards must be met so that graduates can earn practice credentials. In order for online programs to be effective in preparing graduates for such standards, it seems likely that they must also apply online instruction standards.

Online degree programs are one way that colleges and universities have attempted to prepare more special educators. Due to the severe shortage of special education teachers, identifying the course formats that those already in the field prefer, could offer important information about the course and program features most likely to attract more individuals into the field of special education. These programs offer the benefit to students of being able to stay in their current locations while completing the degree. Nonetheless, no research to date has examined either current or future special educators' preferences regarding online learning. This survey study examined special educators' preferences for different course formats, lengths, and topics through the following research questions.

1. What is the *frequency of course format* (on campus, combined on campus and online, synchronous online, asynchronous online, combined synchronous and asynchronous online) for *currently enrolled* and *most recently completed* special education courses and are there differences in course format in relation to current enrollment?
2. What *course format* (on campus, combined on campus and online, synchronous online, asynchronous online, combined synchronous and asynchronous online) do special education teachers and paraprofessionals prefer and are there differences in format preferences between special education teachers and paraprofessionals?
3. What *course length* (7-weeks, 15-weeks) do special education teachers and paraprofessionals prefer, and are there *differences* in course length preferences between special education *teachers and paraprofessionals*?
4. Are there *differences* in 7-week and 15-week course *grade expectations* between special education teachers and paraprofessionals?
5. What *course topics* do special education teachers and paraprofessionals ***recommend for*** *7-week and 15-week* online course formats and what are the *benefits, limitations*, and perceived *cost* of each length?

Method

Participants

A publicly available data base of special education teachers and paraprofessionals in a Northeastern state in the U.S. was used to collect email addresses. The sample included both special education teachers and paraprofessionals because both provided individualized and small-group instruction for students with Individualized Education Programs (IEPs) under special education teacher supervision. The database search resulted in a total of 10,532 emails for the combined group of special educators. All study procedures were reviewed and approved by a university institutional review board.

A secure email message was sent to all of the available email addresses with an invitation to participate in the survey; the message included the approved IRB participant consent form which indicated that choosing to complete the survey provided consent. Qualtrics data indicated that 650 of the emails were not deliverable. Due to school district data security and firewall protections, an unknown number of additional intended recipients might not have received the invitation. A total of 985 surveys were submitted with 961 having complete data. Ten of the participants reported a current job assignment in general education, seven reported not currently teaching, and 56 indicated their current role as “other.” Survey data from participants who reported they currently worked in general education, were not working, or whose work setting was “other” were excluded from the analyses in order to focus on the responses of current special educators.

Instrument

A 16-item survey was developed for this study (Table 1). Survey items included demographic data such as teaching assignment and certification(s), and years in education. The primary focus of the survey items was participant preference for different special education course formats based on the five following specific course options:

1. On campus
2. A combination of on campus and online
3. Synchronous online
4. Asynchronous online
5. A combination of synchronous and asynchronous online

The final section of the survey included items comparing 7-week and 15-week online course formats. First participants indicated whether they would prefer a 7-week or 15-week online course. Next, they indicated which special education course topics were best suited to 7-week or 15-week online formats. Finally, they indicated the benefits and limitations of 7-week online courses. Two of the items (5 and 6) were contingent on whether the participant was currently enrolled in a college or university course. The final item was an open-ended question regarding any other reflections or information the respondent wanted to provide.

Procedure

The items and emails were entered into the Qualtrics software program and distributed to the special educators directly from the Qualtrics platform. The survey was available for a total of

Table 1
Survey Items

Number	Question
1.	What educator credential(s) do you currently have? a. Special Education Teacher b. General Education Teacher c. Paraprofessional (Ed. Tech I, II, or III) d. Special Education Teacher Candidate e. None f. Other
2.	What is your current teaching assignment? a. Special Education b. General Education c. Paraprofessional (Ed. Tech I, II, or III) in Special Education d. Paraprofessional (Ed. Tech I, II, or III) in General Education e. Student Teaching f. Not currently teaching g. Other
3.	How long have you held your current position? a. Not currently teaching b. 1-5 years c. 6-10 years d. 11-15 years e. 16-20 years f. 20 or more years
4.	For how many total years have you worked in education? a. None (still a student) b. 1-5 years c. 6-10 years d. 11-15 years e. 16-20 years f. 20 or more years
5.	Are you currently enrolled in one or more college or university courses in special education? a. Yes b. No (skip item 6)
6.	In what format is/are your current college or university course(s) conducted? a. On-campus only b. Combination of both on-campus and online sessions c. Online synchronous only d. Online asynchronous only e. Combination of both synchronous and asynchronous online sessions (skip items 7-8)
7.	If you are not currently enrolled in one or more college or university courses in special education, in what year did you complete your most recent college or university course? a. 2016-2021 b. 2011-2015 c. 2005-2010 d. More than 15 years ago
8.	In what format was/were your most recent college or university course(s) conducted? a. On-campus only b. Combination of both on-campus and online sessions c. Online synchronous only d. Online asynchronous only e. Combination of both synchronous and asynchronous online sessions

Number	Question
9.	If you were to enroll in a new college or university special education course in the near future, please rank order your preference of course formats. a. On-campus only b. Combination of both on-campus and online sessions c. Online synchronous only d. Online asynchronous only e. Combination of both synchronous and asynchronous online sessions
	In recent years, some colleges and universities have begun offering online courses that last for a duration of 7 weeks. These courses are sometimes referred to as "accelerated" courses and they include all of the same content as a 10-week quarter or 15-week semester. Students can complete multiple 7-week courses at the same time or complete two sequentially in one semester-length term. The following questions refer to comparisons between 7-week accelerated online courses and traditional quarter or semester-length online courses.
10.	If given the choice between enrolling in a 7-week online course and a 15-week online course in special education, which would you prefer? a. 7-week online b. 15-week online c. Depends on the course topic
11.	What course topics do think are best suited to the 7-week online format? a. History of Special Education b. Teaching methods c. Reading instruction d. Math instruction e. Behavior support f. Law and ethics g. Other
12.	What course topics do think are best suited to the 15-week online format? a. History of Special Education b. Teaching methods c. Reading instruction d. Math instruction e. Behavior support f. Law and ethics g. Other
13.	If you enrolled in a 7-week online special education course, do you expect you would earn the same, lower, or higher grade than the same course offered in a 15-week online format? a. The same b. Lower c. Higher
14.	What do you think are the benefits of 7-week online special education courses? a. Easier b. Finish more quickly c. More focused learning d. Earn certification more quickly e. Cost f. Other
15.	What do you think are the limitations of 7-week online special education courses? a. Harder b. Too much information in a short time c. Too much work in a short time d. Cost e. Other

3 weeks, with reminders sent at the start of weeks 2 and 3. The survey was closed at the end of week 3. Once the survey was closed the data were downloaded into SPSS version 28 software. An initial data review was conducted to confirm data accuracy and to remove incomplete cases as well as those from individuals not currently teaching special education (e.g., general educators, administrators, and others). There were so many responses to the open-ended last question that those data were analyzed separately and not reported here. Due to the contingent items and optional final question, the maximum number of items a participant was expected to complete was 14. A participant's responses were part of the analysis if they included a current teaching assignment in special education, certification(s) held, and answers to any of the remaining questions.

Data Analysis

This study utilized descriptive and comparative analyses to investigate which course formats, including online options, current special education teachers and paraprofessionals preferred for special education courses. This method is particularly useful for studies which seek to describe sample features as part of an effort to understand phenomenology (Beaudry & Miller, 2016). Demographic data summarizing the participants' current teaching assignment, certifications, years in their current role, and total years in education were compiled. Data indicating whether participants were currently enrolled in a college or university course and the format of the course were summarized. For participants not currently enrolled in a course, information about the date and format of their most recent course were noted. In order to identify which course formats were most preferred across roles, the case counts for preferred course formats were broken down by special education teacher, paraprofessional, and special education teacher candidate. Finally, t-tests were used to determine whether there were statistically significant differences between special education teachers and paraprofessionals regarding course formats, length, and expected grades.

Results

Participant Roles and Experience

A total of 965 teachers and paraprofessionals provided complete survey responses. Table 2 displays a breakdown of all teacher participants according to their current work assignments and certificate(s) held. There were 374 who reported working as special education teachers, with 364 of these being certified in special education. This suggests that 10 of those currently working as special education teachers were not certified in this area. Ten participants reported working as general education teachers, although 21 indicated general education certification. There were 540 total paraprofessionals, with 91 of these working in general education and the other 419 in special education. Four participants indicated that they were special education teacher candidates and a total of 22 reported that they had a "certificate" as a special education teacher candidate. Such a certificate does not exist in the state, and it might be that these participants were referring to a conditional certificate which is available. Seven of the participants reported they were not currently teaching nor in any other education role, and 12 participants indicated they were certified as teachers, but not teaching; these individuals might have held administrative roles. A total of 56 respondents selected "other" as their current teaching assignment, with six of these indicating current certification. Due to the focus of the research on course preferences of special educators, only the responses from teachers, paraprofessionals, and student teachers who reported currently working in special education are included in the following results.

Table 2

Number of Participants (percentages) by Current Teaching Assignment and Teaching Certificate Types*

Role	Assignment (N=961)	Certificate (N=965)
Special Education Teacher	374 (38%)*	364 (37%)
General Education Teacher	10 (1%)	21 (2%)
Paraprofessional Teaching in Special Education	419 (43%)	540 (55%)
Paraprofessional Teaching in General Education	91 (9%)	
Special Education Teacher Candidate	4 (0.4%)	22 (2%)
Not Currently Teaching/None	7 (0.7%)	12 (1%)
Other	56 (6%)	6 (0.6%)

*Percentages may not equal 100 due to rounding

Most participants were relatively new to their current roles, and most special education teachers (N=206; 55%) reported being in that role for one to five years (Table 3). The number of paraprofessionals with one to five years in their current roles was even higher at 293 (71%). Two of the student teachers reported being in their roles for one to five years. Despite the newness in their current jobs, participants were a moderately experienced group of educators overall, especially the special education teachers, with 101 (27%) having worked in education for over 20 years. Indeed, only a minority of the teachers (N=55; 15%) were new to the profession. Among paraprofessionals, the years in education were opposite, with 175 (42%) having one to five years of experience and 75 (18%) with more than 20 years of experience (Table 4). Two of the student teachers (50%) indicated one to five years in education while the other two (50%) indicated six to ten years.

Table 3

Number of Years (percentages) in Current Assignment for Special Education Teachers, Paraprofessionals, and Teacher Candidates*

	Years (%) in Current Assignment				
Role	**1-5**	**6-10**	**11-15**	**16-20**	**20+**
Special Education Teacher	206 (55)	74 (20)	35 (9)	20 (5)	38 (10)
Paraprofessional	293 (71)	55 (13)	21 (5)	15 (4)	25 (6)
Special Education Teacher Candidate	2 (100)	0	0	0	0
Total (N=784)	501 (64)	129 (16)	56 (7)	35 (4)	63 (8)

*Percentages may not equal 100 due to rounding

Table 4
Total Number (percentages) of Years in Education for Special Education Teachers, Paraprofessionals, and Teacher Candidates*

	Total Years (%) in Education				
Role	**1-5**	**6-10**	**11-15**	**16-20**	**20+**
Special Education Teacher	55 (15)	84 (23)	66 (18)	67 (18)	101 (27)
Paraprofessional	175 (42)	85 (21)	49 (12)	28 (7)	75 (18)
Special Education Teacher Candidate	2 (50)	2 (50)	0	0	0
Total (N=789)	232 (29)	171 (22)	115 (15)	95 (12)	176 (22)

*Percentages may not equal 100 due to rounding

Most Recent Course Format

Participants were asked to indicate whether they were currently enrolled in a college or university course related to special education. A total of 641 participants indicated they were not currently enrolled. These respondents were then asked to indicate when they last completed any college or university courses related to special education. Among teachers and paraprofessionals, 338 (53%) of this combined group reported that the most recent courses were taken between 2016 and 2021 (Table 5). This group was then asked to indicate the course delivery method for their more recent course (Table 6). The most frequent format was on campus, although many more paraprofessionals (N=139; 40%) reported completing an on-campus course than did teachers (N=65; 18%). The second most frequent format was combined on-campus and online (N=150; 21%) with online asynchronous courses the third most frequent (N=147; 21%). Both online synchronous (N=80; 11%) and combined online asynchronous and synchronous (138; 19%) courses had notable numbers as well.

There were 265 participants who reported that they were currently enrolled in a college or university course related to special education (Table 7). These participants reported that the online asynchronous format was the most frequent (N=91; 34%) with combined synchronous and asynchronous the second most frequent (N=85; 32%). While entirely on-campus courses were reported to be the least frequent (N=6; 2%), combined on campus and online courses (i.e., hybrid) were reported for 43 participants (16%), a number similar to online synchronous courses (N=40; 15%). As compared to participants who were not currently enrolled in a course, these numbers reflect a shift away from exclusively on-campus learning to a variety of online course formats, including combined on-campus with online. Two-tailed independent samples t-tests that compared course format preferences between those currently enrolled in a course and those who were not showed statistically-significant differences in rankings for all course formats (Table 8).

Table 5
Numbers (percentages) for the Years When the Last College or University Course Was Taken by Special Education Teachers, Paraprofessionals, and Teacher Candidates*

Role	**2016-2021**	**2011-2015**	**2005-2010**	**15 Years or More**
Special Education Teacher	198 (65)	50 (16)	25 (8)	32 (11)
Paraprofessional	140 (45)	53 (17)	40 (13)	81 (26)
Special Education Teacher Candidate	0	0	2 (100)	0
Total (N=641)	338 (53)	103 (16)	67 (10)	133 (21)

*Percentages may not equal 100 due to rounding

Table 6

Numbers (percentages) of the Course Format for Special Education Teachers', Paraprofessionals', and Teacher Candidates' Most Recent Prior College or University Course*

Role	On Campus	On Campus and Online	Online Synchronous	Online Asynchronous	Online Synchronous and Asynchronous
Special Education Teacher (N=365)	65 (18)	72 (20)	39 (11)	88 (24)	101 (28)
Paraprofessional (N=350)	139 (40)	76 (22)	41 (12)	59 (17)	35 (10)
Special Education Teacher Candidate (N=4)	0	2 (50)	0	0	2 (50)
Total (N=717)	204 (28)	150 (21)	80 (11)	147 (21)	138 (19)

*Percentages may not equal 100 due to rounding

Table 7

Numbers (percentages) of Special Education Teachers, Paraprofessionals, and Teacher Candidates Currently Enrolled in a College or University Class by Course Format*

Role	On Campus	On Campus and Online	Online Synchronous	Online Asynchronous	Online Synchronous and Asynchronous
Special Education Teacher (N=142)	4 (3)	23 (16)	16 (11)	51 (36)	48 (34)
Paraprofessional (N=118)	2 (2)	18 (15)	24 (20)	38 (32)	36 (31)
Special Education Teacher Candidate (N=5)	0	2 (40)	0	2 (40)	1 (20)
Total (N=265)	6 (2)	43 (16)	40 (15)	91 (34)	85 (32)

*Percentages may not equal 100 due to rounding

Course Format Preferences

The next section of the survey asked participants to rank order their preferences for future special education courses. Table 9 shows the numbers of participants by role who selected the five different course formats as their first choice for any future special education course. Across the roles, online asynchronous courses were the favorite (N=193; 33%) with combined on-campus/online courses (N=115; 20%) about equal to online synchronous/asynchronous courses (N=116; 20%) as the second favorite. Interestingly, on-campus courses were the next favorite (N=105; 18%). Among the formats, online synchronous was the least-picked favorite (N=55; 9%). Overall, all course formats were selected as a first choice by a meaningful number of participants.

Table 8
Independent Samples t-Test Results Comparing Course Format Preferences Between Special Educators Enrolled in a Current College Course and Those Who Were Not

Course Format	*t*	df	*p**	Effect Size**
On-campus only	6.08	267	<.001	.49
On-campus and online	6.04	232	<.001	.53
Online synchronous	-3.23	227	<.001	-.28
Online asynchronous	5.57	229	<.001	-.49
Online synchronous and asynchronous	-4.00	241	<.001	-.34

*two-tailed, equal variances not assumed; **Cohen's d

Table 9
Numbers (percentages) of the First Choice for the Format of a New Course Taken by Special Education Teachers, Paraprofessionals, and Teacher Candidates*

Role	On Campus	On Campus and Online	Online Synchronous	Online Asynchronous	Online Synchronous and Asynchronous
Special Education Teacher (N=207)	48 (23)	52 (25)	23 (11)	101 (49)	74 (36)
Paraprofessional (N=285)	59 (21)	62 (22)	32 (11)	91 (32)	41 (14)
Special Education Teacher Candidate (N=3)	0	1 (33)	0	1 (33)	1 (33)
Total (N=586)	107 (18)	115 (20)	55 (9)	193 (33)	116 (20)

*Percentages may not equal 100 due to rounding

The course format preferences for the special education teachers and paraprofessionals were compared to determine whether there were statistically significant differences in their preferences. Two-tailed independent samples *t*-tests were run using the mean rankings for each course format (Table 10). The results showed that teachers and paraprofessionals ranked on-campus, online synchronous, and online asynchronous courses about the same, with non-significant results for these formats. Statistically significant differences emerged between the teachers' and paraprofessionals' rankings of two course formats: (a) combined on-campus and online courses ($t = 2.11$, $p = .035$, Cohen's d = .17), and (b) combined synchronous and asynchronous courses ($t = 3.68$, $p < .001$, Cohen's d = .17). Paraprofessionals preferred combined on-campus and online courses more than the teachers, and the teachers preferred combined synchronous and asynchronous online courses more than the paraprofessionals. Despite these differences, the Cohen's effect sizes between the groups were very small.

Online Course Length Preferences

The remaining survey items focused exclusively on online course length. Participants indicated whether they would prefer to take a 7-week or 15-week online course or whether the course length preference depended on the course topic (Table 11). Responses were very similar across roles, and about half (N=354; 49%) indicated that their preferred course length depended on the topic. The second preference was the 7-week course (N=287; 40%) followed by the 15-week course (N=85; 12%). An independent samples *t*-test that compared teachers' and paraprofessionals' online course length preferences was not statistically significant (t = -.64; p = .521). Student teachers were not included due to their very small numbers.

Table 10

Independent Samples t-Test Results Comparing Course Format Preferences Between Special Education Teachers and Paraprofessionals

Course Format	*t*	df	*p**	Effect Size**
On-campus only	1.84	581	.066	.153
On-campus and online	2.11	581	.035	.175
Online synchronous	-.22	581	.826	-.018
Online asynchronous	-. 40	581	.688	-.033
Online synchronous and asynchronous	-3.68	581	<.001	-.304

*two-tailed, equal variances assumed; **Cohen's d

Table 11

Numbers (percentages) of Preferred Online Course Length by Special Education Teachers, Paraprofessionals, and Teacher Candidates*

Role	7-Week	15-Week	Depends on Topic
Special Education Teacher (N=357)	143 (40)	46 (13)	168 (47)
Paraprofessional (N=366)	143 (39)	38 (10)	185 (51)
Special Education Teacher Candidate (N= 3)	1 (33)	1 (33)	1 (33)
Total (N=726)	287 (40)	85 (12)	354 (49)

*Percentages may not equal 100 due to rounding

Course Length Grade Expectations

Participants were also asked whether they expected the same, lower, or higher grade in a 7-week course (Table 12). The majority (N=584; 82%) indicated they expected the same grade. Lower grades were expected by 102 participants (14%) and higher grades expected by 24 participants (3%). An independent samples t-test compared the mean grade ratings for teachers and paraprofessionals. Results showed that there was a statistically significant difference between the expected grade ratings (t = -2.11; p = .035; Cohen's d = -.159), with paraprofessionals expecting slightly higher grades than teachers (Table 13). Still, the effect size was very small and the overall means for both groups indicated that most expected the same grade.

Table 12
Numbers (percentages) of Expected Grade in a 7-Week Online Course by Special Education Teachers, Paraprofessionals, and Teacher Candidates*

Role	Same Grade	Lower Grade	Higher Grade
Special Education Teacher (N=349)	299 (86)	40 (12)	10 (3)
Paraprofessional (N=358)	283 (79)	61 (17)	14 (4)
Special Education Teacher Candidate (N= 3)	2 (66)	1 (33)	0
Total (N=711)	584 (82)	102 (14)	24 (3)

Table 13
Independent Samples t-Test Results Comparing Course Grade Expectations Between Special Education Teachers and Paraprofessionals for 7-Week Online Courses

Course Format	*t*	df	*p**	Effect Size**
7-week course grade	-2.11	696	.035	.159

*two-tailed, equal variances not assumed; **Cohen's d

Recommended Course Topics in Relation to Course Length

Participants also indicated their recommended topics for 7-week and 15-week online courses (Table 14) using a list of common special education course topics as well as a choice of "other." Participants could select multiple options for each online course length and the choices were fairly consistent between the teachers and paraprofessionals. Participants indicated that *History of Special Education* and *Law and Ethics* were best-suited to a 7-week online course format. Courses in *Teaching Methods*, *Reading Instruction*, and *Math Instruction* were rated as most appropriate for a 15-week online course format. One course topic, *Behavior Support*, was more evenly split, and resulted in 395 recommendations for 15-weeks and 368 for 7-weeks.

Table 14
Recommended Topics for 7- and 15-Week Online Course Format by Special Education Teachers, Paraprofessionals, and Teacher Candidates

Role	History of Special Education		Teaching Methods		Reading Instruction		Math Instruction		Behavior Support		Law and Ethics		Other	
Weeks	***7***	*15*	*7*	***15***	*7*	***15***	*7*	***15***	*7*	***15***	***7***	*15*	*7*	*15*
Special Education Teacher	261	58	151	206	109	233	106	231	161	204	204	128	24	25
Paraprofessional	216	95	184	207	131	185	113	202	206	190	165	156	6	13
Special Education Teacher Candidate	3	0	0	3	2	1	2	1	1	1	2	1	0	0
Total	**480**	153	335	**416**	242	**419**	221	**434**	368	**395**	**371**	285	30	38

Benefits, Limitations, and Costs of 7-Week Online Courses

The final section of the survey included items in which participants provided information about the benefits and limitations of a 7-week online course format. As with the recommended online course length items, participants could select multiple benefits and limitations. Table 15 summarizes the responses regarding benefits. Participants indicated that *finishing more quickly* and *earning certification more quickly* were the top benefits of 7-week classes. *More focused learning* was a third benefit. *Cost* was rated as a fourth benefit, with more paraprofessionals than teachers rating it beneficial. Notably, very few participants (N=18) indicated that 7-week courses would be *easier*. Participants' ratings of 7-week online course limitations revealed that both *too much information* and *too much work* were the top limitations (Table 16). The third most frequent limitation was that the 7-week online courses would *harder*. Fewer participants endorsed *cost* as a limitation (N=29) as compared with its endorsement as a benefit. The option "other" was also selected, suggesting that participants identified additional features of online 7-week courses as having benefits and limitations.

Table 15

Benefits of 7-Week Online Course Format by Special Education Teachers, Paraprofessionals, and Teacher Candidates

Role	Easier	Finish More Quickly	More Focused Learning	Earn Certification More Quickly	Cost	Other
Special Education Teacher	9	272	156	193	96	14
Paraprofessional	9	269	169	223	120	7
Special Education Teacher Candidate	0	3	0	2	0	0
Total	18	**544**	325	**418**	216	21

Table 16

Limitations of 7-Week Online Course Format by Special Education Teachers, Paraprofessionals, and Teacher Candidates

Role	Harder	Too Much Information in a Short Time	Too Much Work in a Short Time	Cost	Other
Special Education Teacher	85	231	228	11	32
Paraprofessional	116	228	230	18	23
Special Education Teacher Candidate	0	2	3	0	0
Total	201	**461**	**461**	29	55

Discussion

Survey results suggest that special educators prefer online instruction over on-campus, with some differences between certified teachers and paraprofessionals. Notably, most participants were either currently enrolled in a college course or had taken one in the last five years. Nonetheless, there were differences in the course format preferences between those currently enrolled in a course and those who were not. Given that online instruction has become more prevalent in recent years, the differences in format preferences could be due to changes in how courses were provided when the most recent course was taken. Although prior research documenting the number of special educator programs that offer online courses or degrees was not found, available research indicated the benefits of online modules (Juarez & Purper, 2018) and UDL (Lee & Griffin, 2021; Lohmann et al., 2018) for future special educators. In addition, Vernon-Dotson et al. (2014) noted that online special education course outcomes are about the same as on campus courses. Online course formats are likely to keep changing as new technologies emerge, and these changes could affect students' preferences for course formats. To address the shortage of special educators, university programs could benefit from identifying and offering courses in formats that are preferred by special educators.

The variability in preferences for different online course formats suggested no clear preference. Indeed, it is perhaps more interesting that the least preferred format was online synchronous and campus courses were more preferred than online synchronous courses. Online asynchronous was the most preferred but other formats, including combined online and on campus, were also preferred by a significant number of participants. Statistically significant differences between special education teachers and paraprofessionals were demonstrated for two course formats: combined on-campus and online and combined synchronous and asynchronous online courses. Two prior research studies regarding course format preferences (Baran et al., 2011; Gardner et al., 2021) showed that in 2011, students preferred the on-campus version but by 2021, students preferred other formats. The Gardner et al. (2021) finding lines up with the current results and suggests that student experience and circumstances influence course preferences. Regarding the two course formats where special education teachers and paraprofessionals differed, the differences observed could be the result of how recently the most recent prior course was taken, its topic, or its format.

Notably, the results suggested that if a course requires a scheduled time commitment (i.e., on-campus, online synchronous) special education teachers preferred synchronous online sessions and the paraprofessionals preferred on-campus sessions. This is interesting in light of the fact that the special education teachers were the group having taken more recent courses. It's possible that their preference for online synchronous sessions over on-campus was the result of the recent trend toward more online course offerings. That said, special education teachers already hold the credential necessary for a career in special education and paraprofessionals do not. If recruiting current special education paraprofessionals to complete coursework to become special education teachers is employed as a way to address teacher shortages, then offering more combined on-campus and online courses might result in more enrolled students. If multiple course formats appeal to learners of different backgrounds, having format choices could help to attract more diverse special educators into the classroom, a need highlighted by a recent webinar series sponsored by CEC (Council for Exceptional Children, 2022).

Although survey responses suggested approval and support for various online course formats, findings about course length were mixed. Almost half of the participants indicated that the best length for an online course depends on the course topic and no significant differences between the teachers and paraprofessionals related to course length were noted. This important information suggests that the combination of course length and topic could be the determinant when a special education college student selects online courses. Online courses have the benefit of near universal access but if a potential student thinks that the course length is not appropriate for the content, enrollment might not happen. It is notable that a clear majority of participants did not expect a different grade from a 7-week online course as compared with a 15-week course. However, there was a difference between the teachers and paraprofessionals regarding grade expectations, with the paraprofessionals expecting higher grades than the special education teachers. Again, this might be a recency effect since the teachers had taken courses more recently than the paraprofessionals and so they might have already learned that online course grades were not generally different from on-campus courses.

Of the six special education course topics provided in the survey, two were clear favorites for 7-weeks and a different three were selected for 15-weeks. The 7-week preferred courses (*History of Special Education*, *Law and Ethics*) both focus on knowledge more than skills. By comparison, the 15-week preferred courses (*Teaching Methods*, *Reading Methods, Math Methods*) focus more on skills, albeit built on knowledge. It might be that the participants' choices indicate an understanding that course content should drive decisions about course length. This survey result corresponds to prior research which showed that students found it very difficult to complete all assignments in shorter courses (e.g., 7 or 8 weeks; Guan et al., 2008; Tiedt et al., 2021). For online courses that include learning related to certification and licensure standards, it seems important to consider the course length to ensure that students can complete all work and meet the standards (Davis et al., 2019).

There are very few prior studies of the benefits and limitations of 7-week courses. Although some studies found that student learning outcomes were about the same for 7- and 8-week courses as compared with 15-week courses (Harwood et al., 2108; Stephens, 2012; Vernon-Dotson et al., 2014) other research indicates that shorter courses are more challenging for students because they struggle to complete the work on time (Guan et al., 2008; Tiedt et al., 2021). Participants in this survey indicated that shorter courses would reduce the time to reach professional goals. However, they also indicated that they are likely to include too much work in too short a time. Notably, very few participants (N=18) indicated that 7-week courses are easier. By contrast, many more (N=201) indicated that 7-week courses are harder. Together with the finding that course duration is best determined by course topic, and prior research indicating that some shorter courses can be very challenging, college and university faculty members may want to be highly selective in determining which courses are available in 7-week formats and which remain at 15-weeks.

There was an interesting finding in relation to the cost of 7-week courses. A significant number of participants (N=216) indicated that cost was a benefit of these courses while a much smaller number (N=29) indicated that cost was a limitation. It is possible that participants thought that shorter duration courses would cost less than longer courses. Given that most shorter courses include the same content, assignments, and credits as their 15-week versions, it seems unlikely that 7- or 8-week courses would be offered for a lower price. No findings specifically related to online course costs were included in the reviewed research. This survey's findings about cost suggest that colleges and universities might need to communicate that 7-week courses that carry the same numbers of credits as 15-week courses will cover the same content and cost the same amount.

Limitations and Future Research

This study's findings cannot be generalized to all special educators because there might be sampling bias and other unaccounted factors in the results. Participants included a large convenience sample, yet their experiences with online instruction could be influenced by regional options. Also, due to an effort to keep the survey brief, information about participant's racial and ethnic backgrounds was not collected. In part due to COVID-19, online instruction is expected to continue growing for learners of all ages, including those who teach students with disabilities. Significantly more research is needed to provide guidance about the most effective online instruction methods for specific disciplines, topics, and student groups. For example, more studies that compare learning outcomes between shorter and longer duration courses of specific topics are needed. This study's results suggested that special educators see a benefit in matching course duration based on course topic. It might be that knowledge-based courses are better matched to shorter course lengths and skills-based courses should utilize longer course lengths, but this needs to be empirically tested for content in all education disciplines.

Additional important topics for future research include examining the overall readiness of teacher candidates prepared in fully online programs as compared with partially online and fully on campus programs. If there are notable differences in preparation, this could affect accreditation status as well as the teachers' classroom effectiveness. Although randomly controlled trials might not be possible for such research, quasi-experimental comparisons of cohorts could offer important information. In addition, more research about specific online special education teaching practices is needed. Questions to consider include whether evidence-based on campus instructional practices can transfer seamlessly to online environments or if changes are needed. And, are there online-specific instructional practices that should be identified and used in all special education courses because of their efficacy? For example, additional studies that examine course workloads related to amount and types of expected reading and assignments might help to provide additional information about whether online courses utilize similar or different pedagogy from on-campus approaches. Specifically, do online courses utilize traditional textbooks or are other materials such as websites or instructor-made videos included?

More investigation of the nature and frequency of student interactions is also needed. How do online courses incorporate student to student and student to instructor interaction and how do such interactions fit into the course expectations, assignments, and grades? A recent study suggests that student role-plays could be an effective tool for improving student engagement (Berry & Kowal, 2022). Such role-plays could be useful in teacher preparation programs because it is important that teachers be ready to collaborate with their fellow educators; information about online course interactions could shed light on how teachers are learning to collaborate in online settings. Finally, studies that examine students' ratings of their knowledge and skills before and after completing an online course could help college and university faculty determine the depth of student learning and how the students perceive their own intellectual development over time. Certainly, more research about online instruction is forthcoming and the more that special education faculty engage in such research, the better prepared all future special educators can be.

Conclusion

Overall, the findings in this current study are largely consistent with prior research about special education course formats and online course duration. Participants reflected diverse preferences for online courses, some of which appeared linked with how recently they had taken a course in special education. At the same time, most all of the different course format options were selected by a significant number of special educators as their top choice, suggesting that no one online instruction format is seen as best across these special educators. Perhaps the most important finding was that course duration should be based on the course topic. This result suggests that current special educators understand that not all online courses are the same and certain types of learning require more time than others. As with prior research, findings indicated that shorter online courses offer both benefits and limitations. Until more research provides clear guidelines for shorter course content, providing a variety of course format options will offer special educators access to their preferred formats.

Declarations

This study's method and procedures were reviewed and approved by the Social and Behavioral Sciences Institutional Review Board at the University of Southern Maine, USA.

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(Meta) Cognitive Presence for Graduate Student Teacher Training

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Abstract

This qualitative study examines cognitive presence in a graduate-level online pedagogy course that introduced students to the Community of Inquiry (CoI) framework. Students wrote weekly reflections that described their own learning and speculated on how they could apply what they learned to create positive online learning environments for future students. This article focuses on a reflection students wrote about cognitive presence in which they analyzed their own engagement with the four phases of practical inquiry during the week they read articles that theorized cognitive presence. The results illustrate the value of metacognition about cognitive presence as a teacher training tool. The CoI framework gave students a vocabulary to describe their own learning and prompted them to reflect on when that learning was or was not visible to the instructor. This knowledge positively impacted their plans for designing learning environments to help their future online students move through the four phases of practical inquiry.

Keywords: Community of inquiry, cognitive presence, graduate student teacher training, online pedagogy, first-year writing

Stewart, M. K. (2023). (Meta) Cognitive presence for graduate student teacher training. *Online learning*, *27*(4), 232-251. DOI: 10.24059/olj.v27i3.3416

The Community of Inquiry (CoI) framework (Garrison et al., 2000; Garrison, 2017) is commonly employed as a heuristic for instructional design (Shea & Bidjerano, 2009). Instructors use the three components of the CoI framework—teaching presence, social presence, and cognitive presence—to develop instructional materials and activities that leverage teaching presence to promote social presence in a way that facilitates cognitive presence. This study builds upon that work by using the CoI framework as a teacher training tool in a graduate-level online pedagogy course. More specifically, this study qualitatively analyzes an assignment asking graduate students to reflect on the extent to which they engaged in the four phases of cognitive presence (triggering event, exploration, integration, resolution) and then apply their own experiences as students to their plans for teaching online in the future. Ultimately, the study advocates for metacognition about cognitive presence as a teacher training tool.

Review of Relevant Literature

The Community of Inquiry (CoI) framework was constructed based on the findings of a content analysis of asynchronous discussion forums (ADFs). Randy D. Garrison and his co-authors, Terry Anderson, Walter Archer, and Liam Rourke, coded ADF transcripts in search of evidence that collaborative learning was viable in asynchronous online environments. They found evidence of students interacting with one another and concluded that knowledge co-construction was possible online, further concluding that three components were necessary to make that learning likely: teaching, social, and cognitive presence. Teaching presence is the instructional design that organizes an online course, social presence is the interpersonal interactions that make knowledge co-construction possible, and cognitive presence is the collaborative learning that ideally results from courses that are designed as communities of inquiry (Garrison, 2017).

Cognitive Presence

Garrison et al. (2001) explain that their research began with an assumption that education should be "both collaborative and reflective"; consequently, they sought to develop "the means to assess the nature and quality of critical, reflective discourse that occurs within a text-based educational environment" (p. 7). Their goal was to design a tool for measuring learning, and their first step was to look for evidence of "critical, reflective discourse" in an online course. Because most student-student interaction occurred within ADFs, they coded ADF transcripts, questioning whether those transcripts contained evidence of students not just interacting with one another, but interacting in a way that demonstrated knowledge co-construction.

Their findings led them to define "cognitive presence" as a component of the CoI framework. They grounded this construct in literature on critical thinking and operationalized it via Dewey's model of Practical Inquiry (1993), which includes four phases: the *triggering event* initiates the process, leading learners to engage in *exploration*. When their understanding of a concept begins to shift based on the results of that exploration, they experience *integration*. The process concludes when learners demonstrate their newly constructed knowledge via *resolution*. Garrison et al. also recognized that the process of critical thinking is not linear. While the four phases of practical inquiry are useful for measuring and discussing cognitive presence in online courses, they "must not be seen as immutable" (p. 9). Instead, students move between phases and may encounter new triggering events throughout the process.

In the two decades since Garrison and his colleagues' initial publications, many scholars have engaged with the Community of Inquiry framework (Swan & Ice, 2010; Garrison, 2017). Most of the research on cognitive presence either employs the CoI Survey or replicates Garrison and colleagues' methods of reporting the frequency counts that result from applying content analysis to code ADFs for the four phases of practical inquiry (Moore & Miller, 2022). In Sadaf and colleagues' recent "Advances in Cognitive Presence" special issue of *Online Learning Journal* (2022), the editors argue that, across the scholarship on cognitive presence, one consistent conclusion arises: "higher levels of cognitive presence can be achieved in the environments where cognitive presence phases based on the Practical Inquiry Model are intentionally incorporated into a learning task or the course design" (p. 3). This conclusion implies two goals of cognitive presence scholarship. The first is to measure the extent to which higher levels of cognitive presence (i.e., learning) occur, and the second is to understand and facilitate intentional instructional design strategies. Accordingly, this literature review first discusses scholarship on cognitive presence that aims to *measure learning*, and then discusses scholarship that *evaluates instructional design*.

Cognitive Presence as a Measurement of Learning

The primary goal of most cognitive presence research is to measure student learning, and this is often achieved through coding ADFs for the four phases of practical inquiry. In the initial article, Garrison and colleagues (2001) analyzed ADFs from a graduate-level course in Workplace Learning. They found ample evidence of exploration (42% of coded responses) but fewer instances of the other three phases (4-13% of coded responses). Subsequent research consistently confirms that exploration is often visible in ADFs, while the other three phases are less frequent; resolution is especially infrequently demonstrated in ADFs (Akyol & Garrison, 2011; Galikyan & Admiraal, 2019; Moore & Miller, 2022; Wilkinson, 2022). The general conclusion from this research is that the design of many ADFs do not require or invite resolution. This might be a teaching presence issue resolved by more intentional instructional design. Or it might be a constraint of the ADF, which may not permit time for the reflection required to facilitate higher levels of cognitive presence. The latter implies that ADFs can be a productive space for observing exploration—the sharing and comparing ideas—but they may not be the best space to observe the full process of practical inquiry.

Accordingly, some scholars look for resolution in final course projects instead of weekly activities like ADFs (Kim, 2016). In the specific case of teacher education, researchers also recognize that students may not have "had the chance to test a solution to an issue in their real-life teaching" (Galikyan & Admiraal, 2019, p. 5). Scholarship on learning transfer provides support for this point, indicating that the application of learning (i.e., resolution) may not occur until after a course is complete (Brent, 2011; Wardle, 2007).

Other scholars supplement their content analysis of ADFs with other methods, such as interviews and surveys to measure perceived versus actual learning (Akyol & Garrison, 2011), network analysis to measure the impact of learner interaction on academic performance (Galikyan & Admiraal, 2019), epistemic network analysis to study the relationship between social and cognitive presence (Rolim et al., 2019), and linguistic analysis to study "the psychological processes indicative of different phrases" of cognitive presence (Joksimovic et al., 2014, p. 4). These more complicated methods for measuring the nature and quality of learning in ADFs offer useful insights into the many factors that impact the learning that is (or is not) observable in ADFs. This scholarship also reinforces Garrison and colleagues' (2001) original argument that cognitive presence is a *process*. Measuring learning via ADF transcripts, even when triangulated with other data, provides merely a snapshot of a moment in that process, and ADFs are always “a significantly less-than-complete record of the learning that has taken place” (Garrison et al., 2001, p. 13).

Like other CoI research, this study involved coding student writing for the four phases of cognitive presence with the goal of measuring the extent to which the students experience or engage with triggering events, exploration, integration, and resolution. There are two key differences between this study and previous scholarship. First, instead of examining ADFs, I code weekly reflections designed to help students metacognitively examine their learning in the course, including their assessment of whether they experienced the four phases of practical inquiry during an asynchronous discussion activity. Second, while studying cognitive presence in teacher training courses is not unusual, most previous research focuses on student learning in content areas separate from CoI. In my study, the course aims to teach future teachers about the community of inquiry framework so that they can apply the framework as a heuristic for instructional design. As such, this study not only uses cognitive presence to measure learning, but also measures students’ learning *about* cognitive presence, as articulated in research question #1: “What does examining their own cognitive presence teach graduate students about learning?”

Intentional Instructional Design to Facilitate Cognitive Presence

The second research question goes beyond measuring whether and what students learned to also consider how they might apply that learning as future teachers: “To what extent can metacognition of cognitive presence serve as a teacher training tool?” This research question aligns with the second goal of cognitive presence research: evaluating instructional design.

Shea and Bidjerano (2009) are frequently cited researchers of this approach. They review several models for pedagogical training and conclude that CoI is optimal because it “focuses on the intentional development of an online learning community with an emphasis on the processes of instructional conversations that are likely to lead to epistemic engagement” (p. 544). To translate the CoI framework into an instructional design strategy, Shea and Bidjerano examined the relationships between the three presences as represented in CoI Survey data. Their findings show that teaching and social presence predict cognitive presence, and social presence is the mediating factor. Applied as a heuristic for instructional design, this means that instructors should begin with teaching presence, creating course environments that explicitly foster the types of social presence that will enable cognitive presence. When we focus more narrowly on cognitive presence, the instructional design heuristic is tied to the four phases of practical inquiry: teachers intentionally construct activities to facilitate triggering events, invite students to engage in exploration, guide students towards integration, and create opportunities for resolution.

Cognitive presence research in this area questions the extent to which specific activity designs are likely to facilitate cognitive presence. As with the scholarship on cognitive presence as a measurement of learning, most of this scholarship focuses on ADFs. Găsević et al., (2015) study scaffolding and ADF role assignment in graduate-level Engineering courses, Olesova et al., (2016) study scripted ADF roles in undergraduate Nutrition courses, Chen et al., (2019) study peer-facilitated ADFs in graduate-level Education courses, Kilis and Yildrim (2019) study scenario-based ADFs in undergraduate Information Technology courses, and Snyder and Dringus (2014) study metacognitive patterns and peer-facilitated ADFs in a graduate-level course on Communities of Practice. Less commonly, some scholars investigate activity design beyond the ADF. Kim and Lin (2019), for example, study supportive versus reflective scaffolding in a mixed undergraduate and graduate-level course on instructional design; instead of ADFs, they examine students' performance on quizzes and writing projects. McCarroll and Hartwick (2022) also move away from ADFs, studying the extent to which instructors' lesson plans aligned with the four phases of practical inquiry. Across this literature, scholars consistently offer evidence for the critical role of teaching presence in facilitating cognitive presence. When activities are deliberately designed to lead students through the four phases of practical inquiry, including the types of questions/tasks and the level of peer or instructor facilitation, learners are more likely to experience cognitive presence.

The emphasis on deliberate and intentional instructional design provides a compelling argument for training teachers to employ the CoI framework as a heuristic for instructional design. Researchers like Rosser-Majors et al. (2022) have responded with studies that examine the effectiveness of "self-paced interactive training modules highlighting specific methods designed to enhance TP, SP, and CP in the online classroom" (p. 13). They found that "instructors' exposure to, and application of IP [instructor presence] practices in the classroom, positively and significantly affect course pass rates and drops, which in turn affect student success and retention" (p. 14). My project does similar work, but through a smaller-scale qualitative study, like Ozogul and colleagues' (2022) case study of an online course that was deliberately designed to foster cognitive presence. They conducted a linguistic analysis of students' posts to ADFs, then interviewed students about what kept them cognitively engaged in the course. They ultimately recommend that instructors "encourage self-expression and frequent opportunities to reflect on [students'] perceptions of the course" (p. 50), and that researchers solicit "detailed qualitative feedback from students" instead of relying on survey data (p. 50).

In my study, I not only deliberately designed a course with the goal of fostering cognitive presence, but I also aimed to teach students about CoI as an instructional design heuristic. My students read about the CoI framework throughout the course and used what they learned to design their own instructional materials. I also asked students to reflect on the ways in which my design of the course enacted the theory of CoI, and to reflect on the extent to which the theory of CoI helped them make sense of their personal experiences as learners. Near the end of the course, students analyzed the extent to which they did or did not engage with the four phases of cognitive presence, and then reflected on how this knowledge might inform their future approaches to instructional design. This study analyzes those students' reflections about cognitive presence to examine metacognition about cognitive presence as a tool for teacher training.

Research Questions

1. What does examining their own cognitive presence teach graduate students about learning?

2. To what extent can metacognition of cognitive presence serve as a teacher training tool?

Methods

This IRB-approved teacher-researcher study qualitatively examined reflective writing that 19 graduate students produced during two sections of an online writing pedagogy course that I taught in Spring 2020 and Summer 2020.

Research Context

The course, Hybrid and Online Writing Pedagogy, was offered to students pursuing doctoral degrees in Composition and Applied Linguistics at a four-year public institution in the Mid-Atlantic region of the United States. The readings and major projects for both sections were largely the same, but course designs varied.

- The Spring 2020 course began as a hybrid class, with alternating face-to-face, asynchronous, and synchronous online meetings. In response to the COVID-19 pandemic, the course was converted to alternate between synchronous online and asynchronous sessions. The students composed reflections during the asynchronous weeks of the 14-week course.

- The Summer 2020 course was initially scheduled to be face-to-face but, on account of the pandemic, was designed as an emergency remote course. Each week of the 4-week course included asynchronous discussion forums, a group project, an optional synchronous video chat, and an individual reflection.

The dataset for this study includes students' final reflections, submitted in week 13 of the spring semester and in week 4 of the summer course.

Both groups of students were asked to submit a 400-500 word reflection that responded to this prompt:

> Analyze your experience this week in light of the four phases and related indicators of cognitive presence. Did you engage in all four phases? How do you know? Can you point me to a particular moment in the online forums where I could see evidence of this learning? What elements of the learning can I *not* see?

Prior to completing the reflection, students participated in an ADF that asked them to locate a sample teaching philosophy, create a forum post that analyzed the philosophy, and then respond to two peers. The goal was to collectively generate an understanding of the genre conventions for teaching philosophies. The Spring students additionally completed a second asynchronous activity by posting a draft of their teaching philosophies and engaged in peer review. The Summer students did not draft and peer review philosophies.

Participants. After each course was complete and final grades were submitted, I emailed the students and invited them to participate in the research study. A total of 21 students consented, 7 of the 8 Spring 2020 students and 14 of the 15 Summer 2020 students. Participation entailed granting me permission to download and analyze their weekly reflections. Two of the Spring students did not submit their final reflections, so this article analyzes 19 reflections, 5 from spring and 14 from summer.

Students who consented to participate in the study were also invited to complete a demographic survey. They selected pseudonyms and were instructed to skip any questions they did not wish to answer. Students also had the opportunity to indicate that they did not want any demographic information disclosed; I will refer to the three students who selected this option as

Participant 1, Participant 2, and Participant 3. Table 1 summarizes the self-reported demographic data and includes Participant 1, Participant 2, and Participant 3 in the "not reported" percentages.

Table 1
Participant Demographics

Section	**69% summer 2020** **31% spring 2020**
Year in PhD Program	5% first year 70% second year 10% third year 15% Not Reported
Gender Identity	75% female 10% male 15% Not Reported
Racial Identity	40% Caucasian 10% Asian 10% Arabic 5% Latina 35% not reported
Ethnic Identity	30% American 30% Middle Eastern 15% International-Confidential 10% Southeast Asian 15% Not Reported
Number of Languages Spoken	25% three or more languages 55% two languages 5% one language 15% Not Reported
Age During Course	40% age 27-32 15% age 33-37 30% age 38-48 15% Not Reported
Prior Experience with Online Learning or Teaching	25% limited experience 35% some experience 25% substantive experience 15% Not Reported

Note: These data were reported through open-ended questions on the survey which I organized into the broad categories in Table 1 to protect participant confidentiality.

Most participants identified as female (75%) and spoke more than one language (80%). Participants also represented a variety of ethnicities (30% American, 30% Middle Eastern, 15% International-Confidential, and 10% Southeast Asian) and age ranges (40% between 27-32 years of age, 15% between 33-37, and 30% between 38-48). Finally, participants differed in their previous experience with online learning: 25% reported limited experience, 35% reported some experience, and 25% reported substantial experience.

Data Analysis. To qualitatively analyze the student reflections, I engaged in a multi-step coding process. First, I descriptively coded the weekly reflections in Dedoose, a qualitative data analysis software. This led me to realize that the final reflections offered an unusual insight into cognitive presence as a tool for teacher training. I then revisited the CoI literature, beginning with three articles that had previously shaped my thinking about cognitive presence: Garrison et al., (2001), Shea and Bidjerano (2009), and Akyol and Garrison (2011). I also searched for recent articles about cognitive presence in *Online Learning Journal*, *Internet and Higher Education*, and *Computers & Education*.

After reading the literature, I engaged in deductive coding of the 19 reflections, seeking instances of student discussion about the four phases of practical inquiry (triggering event, exploration, integration, and resolution). My intention was to document not only how students defined the phases, but also how their understanding of the phases was impacting their future plans as instructional designers. This process resulted in five coding categories: triggering event, exploration, integration, resolution, and CP for teacher training. I exported the excerpts and drafted narrative explanations of how students described each category. The integration of excerpts into a narrative led me to identify several sub-categories for each code and, due to a high amount of code co-occurrence, to collapse exploration and integration into a single code category. I used the results to create a code book which guided a third round of coding in Dedoose. I conducted a fourth and final coding pass during the revise and resubmit process for this article, which resulted in a few minor modifications to the code book and the final frequency counts listed in Table 1. The frequencies describe how many participants mentioned each concept at least once in their reflection.

Table 1

Final Code Book with Frequency Counts

Triggering Events (n=19)	**Discussion forum prompt (n=17)** **Interacting with peers (n=7)**
Exploration/Integration (n=17)	Locating a Teaching Philosophy (n=11) Drafting Posts (n=10) Reading & Responding to Peers Posts (n=15) Exploration/Integration Overlap (n=7)

Resolution (n=18)	Activity-Level Resolution
	    Achieved in forum (n=7)
	    Somewhat achieved, but not visible, in forum (n=5)
	    Achieved when drafting/revising teaching philosophy (n=5)
	Course-Level Resolution (n=6)
	Beyond-Class Resolution (n=4)

Cognitive Presence for Teacher Training (n=16)	CoI as Heuristic for Instructional Design (n=12) Not All Learning is Observable (n=12)

Limitations. Like all small-scale qualitative research, this study is limited to its context. Some of that context is like other CoI studies, that is, students were pursuing graduate degrees, the class sizes were small, and the class content focused on pedagogy/teacher training. Unlike most CoI research, however, these students had pre-existing, face-to-face relationships because they were part of a face-to-face graduate program. This dataset also represents a predominantly international and multilingual student population.

This study is additionally limited by the nature of the data and the methods for data analysis. The reflections are ostensibly accurate representations of students' experiences in the course, but it is entirely possible that students were influenced by social desirability. While reflections were not evaluated for quality, completing them contributed to the students' course grade and, as such, their awareness of my role as an authority figure may have influenced their responses. When analyzing this data, I engaged in qualitative coding as a solo researcher, which means I am unable to report inter-rater reliability.

Finally, this study is unusual because it took place during the COVID-19 pandemic. While I intended to design the courses in the hybrid format to give students experience with online learning in their online pedagogy course, the spring section was disrupted mid-semester by the pivot to emergency remote instruction, and the summer section was redesigned into a fully online format because of the pandemic. Students' reflections on their own experiences as online learners in the middle of a pandemic may have heightened their awareness of how tools like the CoI framework can inform their future work as online instructional designers. Replications of this pedagogical strategy are necessary to determine if similar levels of metacognition are achieved in less extreme educational environments.

Results & Discussion

This section characterizes students' experiences with the four phases of practical inquiry, first measuring what they learned about cognitive presence (RQ1) and then evaluating how this learning impacted their plans for instructional design (RQ2).

RQ1: What does examining their own cognitive presence teach graduate students about learning?

To answer this question, I coded students' written reflections according to the four phases of practical inquiry. I used the results to define and discuss the four phases, demonstrating how the students' self-examination impacted their understanding of how learning happens. By putting these findings in conversation with existing literature, I also expand and complicate definitions of the terms in CoI scholarship.

Triggering Events

All of the students (n=19) discussed or described triggering events in their reflections, with the majority (n=17) explaining that the asynchronous discussion forum (ADF) prompt served as a triggering event. As Stephanie wrote, "the triggering event is the assignment in which we were asked to analyze a teaching philosophy." Or, as Enna put it, "the trigger[ing] event for the class this week was the discussion board post asking us to find a teaching philosophy statement." Some students additionally acknowledged the instructor role in designing that prompt; Gabriella noted, "you, as the instructor, decided on these tasks" while Nina commented, "the first assignment definitely was a triggering event due to the way it was designed by the instructor." For Lana, the instructor's role was actually a hinderance to learning, as she states, "at the beginning I thought that I was engaged in the four phases but when I thought of it for the second time, I am not sure if I did engage in all of this. This is because the trigger[ing] event, which is the task, was not my choice but it was created by Dr. Stewart." Lana recognized that the task was required for a class, which she believed limited her potential to fully engage in practical inquiry.

Lana's insights help explain why the prompt was not the only triggering event the students described. Several students (n=7) additionally argued that they encountered additional triggering events during the week as a result of interacting with peers. As Ava wrote, "in writing my discussion and then the replies to it, I found that a new issue had come up—a more specific triggering event." Or, as Participant 2 wrote, "seeing the philosophies that others in the class had analyzed caused me to restart the cognitive presence cycle." Some of the Spring students also noted that the second activity, in which they submitted their teaching philosophies for peer review, prompted triggering events. Any noted, "I knew that my draft would be reviewed by Lana, and I will engage in the whole phases of cognitive presence again." For Cassia, the act of reviewing others' work was the trigger: "reviewing my partner's teaching philosophy provided me with another 'triggering event.'"

The process of identifying triggering events for their own learning helped these future online instructors understand the complexity of triggering events. They can occur as specific moments that initiate learning (an ADF, a weekly reflection, a response to a peer), or as overlapping and nonlinear events that are defined by both in-class and out-of-class contexts. This finding corroborates CoI scholars' arguments that learning is a process that cannot be fully captured in a single discussion forum (Garrison et al., 2001) and complicates our understanding of triggering events—they might be "wicked problems" (Marback, 2009) that require complex collaboration to solve, but can also be required classroom tasks that spark unexpected questions within and beyond the classroom. The implication for instructors and CoI researchers is to determine what kinds of short- and long-term triggering events a particular activity or assignment or course is aiming to induce.

Exploration and Integration

Two students (Sarah and Jacky) did not explicitly discuss exploration or integration in their reflections, but the other 17 students did. When they wrote about exploration and integration, they described the process of locating a teaching philosophy (n=11), drafting their own posts (n=10), and reading/responding to peers' posts (n=15). Several students also often described overlaps between the two phases (n=7), which is why I present them together in this section. This decision also mirrors other qualitative research on cognitive presence, which finds overlaps between exploration and integration (McCarroll & Hartwick, 2022). My

Many of the students (n=11) described locating and analyzing a teaching philosophy as the catalyst for exploration. Jack wrote, "the exploration phase started when I looked for a statement to analyze its rhetorical moves and content." Ava similarly explained that "exploration in this activity involved figuring out what makes an effective and successful teaching philosophy." While most students characterized this analysis as exploration, a few described it as integration. Stephanie explained, "I rejected a number of teaching philosophies before I found one that felt similar enough to my background and expertise to be a good fit for analysis. The analysis helped move me from exploration to integration because I was looking at discourse level features of the text and connecting them with my existing background knowledge of my field." Students in this study tended to characterize locating and analyzing a philosophy as closer to exploration than integration, but they also perceived overlap between the two phases.

Several students similarly described the process of drafting their forum posts as part of the exploration and/or integration process (n=10), with more students characterizing this as integration than as exploration. Like Stephanie, Participant 2 described integration as analyzing the philosophy, which culminated in writing the forum post: "I engaged in the third phase, integration, as I assessed the philosophy and constructed an analysis discussion post." Or, as Carl more succinctly stated, "the integration involved writing my response." For others, drafting the response simultaneously involved exploration and integration. Enna noted that "exploration and integration phases started when I wrote my own analysis…and posted it."

In addition to locating/analyzing philosophies and drafting forum posts, the majority of students described reading and responding to peers' work (n=15) as exploration and/or integration. When they described this process as exploration, they tended to focus more on reading than on responding to peers, which seemed to be due to reading their peers' work before posting their own. As Ava explained, "even before posting my discussion, I shifted to the social part of exploration and read through what others had written to begin to see what they believed made a philosophy effective." Lana had the same experience: "I was not sure how or what to write in the discussion. I took a look at Nina's post and I was able to understand what to write. I believe these are all examples of the exploring phase."

After their own responses were posted, they tended to describe reading and responding as an act of integration. Gabriella explained, "I see peer responses to peer responses as a form of integration because of their intended purpose to reflect on and intuitively synthesize the all perspectives." Or, as Stephanie wrote, "as colleagues posted their responses and interpretations of my post in comparison with their own, I was able to integrate new understandings of what makes a teaching statement effective." This finding aligns with McCarroll and Hartwick's (2022) recommendation to facilitate integration during asynchronous activities that require students to respond to peers.

While most students gravitated towards integration when describing their experience of responding peers' posts, Enna described a process that involved both exploration and integration:

> When I went back into the discussion forums…I found that I had analyzed the same teaching philosophy as Elsae. I had one of those moments where I felt a sense of panic—reading Elsae's analysis—that I was wrong in my own. But part of exploration was then re-reading the teaching philosophy, my analysis, and Elsae's analysis again in a sort of three-way conversation. The act of synthesizing those three voices helped me puzzle out what I valued…I wasn't necessarily wrong; I was figuring out what I value and how I would present my own statement to certain audiences. Integration also happened when I considered what Elsae valued in the statement that I actually missed myself. Then, when I read Jacky's feedback about the philosophy and read others, I was able to solidify in my mind why I tend to value teaching philosophy statements that are student-centered over teacher-centered.

For Enna and several of her peers (n=7), exploration and integration happened simultaneously. If pushed to differentiate between the two, they characterized exploration as the search for and discovery of new ideas, and integration as a shift in understanding, but tended to describe these behaviors as two sides of the same coin. Elsae explains it well:

> The model is dynamic. Moving through the process at any phase puts the trajectory…in multiple phases at any given moment. For example, right now I am working on deciding which pieces of evidence to include to demonstrate a component of analysis. This could be considered part of exploration and integration. Once I make the decision, resolution has taken place, but if I choose to edit some evidence I initially included, I am back into other components of the cognitive presence.

These students describe both exploration and integration as processes that involve overlapping individual and social actions. Exploration occurs when they locate and read and write responses about what they have read, and it also occurs when they read and respond to their classmates' posts. Integration occurs when they put their experiences in conversation with the texts they read, as well as when their thinking is challenged and changed by their classmates. The iterative and overlapping nature of these cognitive processes make them difficult to pin down in a specific, observable moment, hence the challenges described by previous CoI scholars in measuring cognitive presence (Moore & Miller, 2022). This discovery was important for these future online instructors because it provided a concrete example of the ways that heuristics like CoI do not capture the non-linear nature of learning. Instructional designers use the four phases of practical inquiry (and the three presences of CoI) to conceive of activities and organize courses (Rosser-Majors et al., 2022), but these models are much tidier than the actual student experience (Ozogul et al., 2022).

Resolution

As with their discussions of triggering events and exploration/integration, the students in this study described resolution as a complex, multi-faceted phenomenon. Their descriptions of personal experiences with resolution can also be categorized into activity-level resolution (weekly discussion forums, future class activities), course-level resolution (final projects), and beyond-classroom resolution (future courses, future teaching).

Most students talked about activity-level resolution as it related to discussion forums. Seven students argued that they experienced resolution in the forum, describing the ways their forum posts or replies to peers' posts expressed what they had learned from reading and analyzing teaching philosophies. Any explained, "I mentioned what I learned from the teaching philosophy samples and analyses and how I would integrate them into my own philosophy." For Cassia, the resolution was more present in replies to peers: "in suggesting…feedback for revision, I also had to make use [of] my own understanding of rhetorical moves." Some students seemed confident in their conclusions about resolution, but others hedged. For example, Lana wrote, "I am not sure about the resolution phase but I believe that posting the analysis and the peer review I did are good examples of showing what this experience taught me and which I shared with the class." Others struggled to differentiate between integration and resolution. Participant 2 wrote, "resolution occurred when I responded to posts about the other teaching philosophies (or maybe the responses are still considered part of the integration phase?)" These students' difficulty in concretely identifying whether they experienced resolution in the discussion forums echoes the CoI research that reveals limited evidence of resolution in ADFs (Akyol & Garrison, 2011; Galikyan & Admiraal, 2019).

A few students in this study directly reflected on that difficulty of observing resolution in asynchronous discussion forums (n=6). Carl writes:

> I wouldn't have considered my response pure resolution…. I find my post is a way for me to discover what I think. I usually submit what feels like a complete post, but I also read other posts, on all the readings to check my beliefs and understandings with my classmates. After that, I usually revisit the texts to identify quotes or ideas they analyzed that I didn't remember or focus on. At that point, I organize my weekly notes with a synthesized understanding of what's been said. I'll usually copy and paste parts of

> responses I like and might add a few of my thoughts if something comes to mind. This document serves more as my resolution of inquiry because at that point it's time to move onto the next focus, and also at that point, I feel more confident in my understanding. I'm ready to explore the next idea.

For Carl, the nature of the ADF, which is "a way for me to discover what I think," makes it unlikely for him to reach resolution through drafting and submitting a post. Instead, his resolution, which he characterizes as the moment that he is "confident in [his] understanding" and "ready to explore the next idea," occurs after he has read his classmates' posts, revisited the readings, and written in his personal notes sheet.

Carl does not believe that resolution will be visible in his ADF posts, but he describes achieving a sense of resolution—at least enough to move on to the next idea. The important caveat is that this resolution exists in his notes sheets and individual thinking, not in the artifacts submitted for instructor to review. As Carl put it, "I don't reveal my notes to the class." Phoebe added that, just as instructors cannot see notes, they are often unaware of the conversations students have outside of class; she felt that "most of my learning happened outside of the course LMS in one-on-one conversations" with peers. Nina made a similar point, arguing, "this last stage is also hard to track, since my own resolution could be based off not only what I have learned from the sequence of tasks but from my other experiences of learning in other courses, readings, and so on."

In addition to the discussion forum, the Spring students in this study had a second activity: posting a draft of their teaching philosophy for peer review. The majority of those Spring students (4/5) explained that they would achieve resolution during that second activity. Nina wrote, "the task of writing our own philosophies was set up as a resolution, because based on the previous activity, our prior knowledge, our collaborate replies to each other about philosophies, I was able to implement some of the previously experienced aspects of the genre." Cassia similarly explained that writing her own philosophy involved resolution because she "had to apply [her] consolidated understanding of appropriate rhetorical and genre awareness." Or, as Any put it, "when I revised my teaching philosophy to be reviewed, I tried to integrate what I learned previously in the analysis…. By doing this, I perhaps engaged in the phase of immediate resolution." Summer students were not required to submit a teaching philosophy for peer review, but one student still commented that she expected to experience resolution through the drafting and revising of her teaching philosophy: "resolution came from the insights I developed and will take back to revising my own teaching statement." I suspect more summer students would have made this argument if they had been required to write a philosophy for the class.

Any's comment that she was experiencing "immediate resolution" is also important—she understands the weekly activities as one cycle of cognitive presence, which she expects will be restarted as the class progresses. Other students described something similar, suggesting a distinction between activity-level and course-level resolution. The students in this study described course-level resolution as something that occurs in the final project (n=6) and tended to describe this as an alternative to activity-level resolution. Gabriella wrote, "I am not sure if I will get to the resolution phase in relation to the specific activities this week…. I suppose resolution in our case is our application of these ideas to our final projects/papers." Enna similarly noted, "I do not think you will see resolution, for me at least, in the posts. But I do think you will see it in the final paper." In contrast, one participant saw course-level resolution as something that occurs in addition to (and perhaps because of) activity-level resolution.

Participant 1 characterized the ADFs as a "'testing' version…[that] will allow you to identify the level of knowledge acquired from the initial activities of the course scaffolded through to its end in the new context of the final project." This finding corroborates McCarroll and Hartwick's (2022) recommendation that teachers scaffold resolution throughout a class: "when the resolution phase carries over into subsequent, graded activities, the teachers should articulate and make explicit connections for the students the value of practice in lower stakes assignments…in relation to performance on higher stakes assignments" (p. 93-94).

Other students understood the course as something that would scaffold towards learning outside of class, which I am calling beyond-class resolution (n=4). Gabriella speculated that resolution might occur in a future course: "Next semester, I will be taking Dr. [Name]'s Teaching Writing course and I do wonder how my exploration and integration in this class at the moment may inform the teaching philosophy and/or the course syllabus we design in that course." Phoebe looked further into the future, reflecting, "I know I will find resolution in terms of the paper as a deliverable, but I feel like it will take until I have started teaching online using what I learned in this course to understand who I am as an online teacher."

Reflecting on resolution is a critical part of learning about cognitive presence because it prompts instructors to question the role and purpose of assessment. The students in this study understood learning as an ongoing process and suggested that a teacher's job is not to certify that learning is finished but to confirm that the ongoing process of learning has been stimulated. The goal is to create activities and assignments that stimulate additional triggering events, explorations, and integrations which are temporarily resolved and then re-triggered in the future. In the case of ADFs, this involves recognizing that prompts may or may not lead to activity-level resolution (discussion forums, future class activities), course-level resolution (final projects), or beyond-class-resolution (future courses, future teaching). As Any concluded, "reflecting on these processes is pretty complicated. I was not even sure about the phases of my own cognitive presence. But then perhaps critical inquiry is all about interrogating and complicating experiences to keep pushing boundaries and not to stay in the same state, especially in education when the purpose is to change one's ways of thinking." Future research might explore this further by putting the concept of resolution in conversation with scholarship in the learning sciences that differentiates between "near transfer" and "far transfer" (Brent, 2011, p. 397).

More broadly, the findings related to Research Question 1 contribute to existing conversations about cognitive presence by providing a qualitative account of the complicated and overlapping nature of the four phases of practical inquiry. In this way, the study responds to calls for research that moves beyond survey data and content analysis to contextualize students' experiences of cognitive presence in communities of inquiry (Ozogul et al., 2022; Sadaf et al., 2022).

RQ2: To what extent can metacognition of cognitive presence serve as a teacher training tool?

In addition to understanding what students learned about the four phases of cognitive presence, this study aimed to understand how engaging in metacognition about cognitive presence can serve as a teacher training tool. The data indicate that asking students to analyze their own engagement with cognitive presence as a culminating activity in a course that explicitly teaches students about the Community of Inquiry framework is an effective way to train student-teachers to use CoI as a heuristic for instructional design (n=12). The data additionally illustrate that the activity taught participants that not all learning is visible (n=12).

CoI as Heuristic for Instructional Design

In their final reflection of the course, most students reported that studying the CoI Framework in an online pedagogy course was an effective teacher training strategy (n=12). Carl wrote, “I am sold on CoI…. I’m going to keep analyzing my courses within that framework.” Elsae noted, “I am interested in doing more with improving my teacher presence and cultivating relationships with students.” Or, as Jacky put it, “I managed to emerge at the end of this condensed course as an informed teacher: someone on the right path. I still have so much to learn and do, but I have a solid foundation and feel more informed about the theoretical frameworks that inform my design and my pedagogical practices.” For these students, learning about CoI in an online pedagogy course gave them a vocabulary to analyze and enact their own instructional design as future online educators.

Several students additionally noted that the course was effective because of multiple layers of modeling. Students studied about online learning in an online environment and studied about CoI in a course designed to function as a CoI. As Participant 3 explained, “the course was a good learning experience for me because it helped me see what taking a course online may feel like for my students.” The fact that the course was designed to function as a community of inquiry “in both design and application, as well as in how you interacted with us” (Jacky), deepened the students’ experience. As Participant 3 put it, “the assignments you gave helped me think of how the theories and the ways you model the concept in our course relate to one another and my teaching.”

Jessica was particularly aware of the role of modeling in the final reflective assignment. She explains:

> I noticed the last post I am more in the exploration process as I start to think of how I can incorporate Community of Inquiry and student-centered course design. So, it is clear you can see the learning evolve in the discussion posts. Dr. Stewart, is this part of the cognitive presence thing? You are asking us to investigate our learning trajectory and use the practical inquiry model to help us understand how a[e]ffective the course was? I see what you are doing here! I am kidding, but it is exciting to see my learning experience through the practical inquiry mode. The light bulb just turned on with this weekly reflection.

Enna, who had a similar experience when working to describe the resolution that I could not see in the forums, said, “I think the resolution that you will not see…are the notes I have taken about my course shell and materials…that I still want to change and revise to enact aspects of CoI that I would not have realized without the teaching philosophy statement. Come to think of it, I think your assignment also facilitated some significant learning transfer there as well. Cool.” What made cognitive presence an effective teaching training tool was that they not only read and talked about the concept, but they also experienced an online course designed to facilitate cognitive presence, and they applied what they had learned and experienced to a self-assessment of their own experiences with the four phases of practical inquiry.

This finding corroborates Alwafi (2022), who asked MA-level online students to engage with feedback-based learning analytics, which made them aware of their "level and quality of interaction and their role in building knowledge in an online learning community" (p. 80). The students who became metacognitively aware of their learning experienced higher levels of cognitive presence than their peers who did not interact with learning analytics. While my study does not include a control group, it does similarly suggest that metacognitive awareness of CoI enhanced participants' understanding of the framework and their plans for using CoI as an instructional design heuristic in the future.

Not All Learning is Observable

In addition to learning about the CoI framework and coming to see this framework as a valuable heuristic for instructional design, the students in this study articulated another key take-away from the course: not all learning is observable (n=12). This conclusion was prompted by my question in the reflective writing prompt, "Can you point me to a particular moment in the online forums where I could see evidence of this learning? What elements of the learning can I *not* see?" In response, the students described instances of non-observable learning related to all four of the phases of practical inquiry.

- **Triggering Event**. Stephanie wrote, "although you created the triggering event in the form of the assignment, you couldn't know how students would take up that task. Would they select the first teaching philosophy they found? Would they spend time conducting a cursory analysis of multiple philosophies before they found one that was a good fit?"
- **Exploration**. After describing her process for locating teaching philosophies, Lana concluded, "these are all examples of the exploring phase which Dr. Stewart as a teacher cannot see"; Any similarly wrote, "I think I engaged in exploration, and I think this was not observable" and Participant 1 stated, "the exploration phase is not detectable in the online forums themselves."
- **Integration**. Gabriella reflected that "integration, or the meaning-making construction that follows our exploration, is not easily visible and often inferred," while Carl noted, "I think it's challenging to actually see evidence of the discourse that is involved with integration."
- **Resolution**. As described in the findings related to RQ1, many students felt that resolution was un-observable, either because resolution existed in private notes that were not shared (e.g., Carl), or because resolution is not likely until after the course is complete (e.g., Phoebe), or because resolution was impacted by external factors (e.g., Nina).

Some students also reflected on the difficulty of observing learning in general. Cassia commented that "the element of learning that cannot be seen here is probably the kind of personal understanding or tacit knowledge that is difficult to articulate or demonstrate." Stephanie similarly noted that, "unfortunately, a great deal of the learning process is obscured to teachers." She argued that part of why the learning process is obscured is because teachers don't know how students will interpret their activity prompts, and notes that sometimes good learning occurs when students veer away from instructor expectations. She further speculates that "off-topic remarks" might actually be "more indicative of exploration/integration/resolution because…[they show] students making an attempt to accommodate and adapt to new information in existing schemas." Jacky provides an example of this when she comments, "what I am trying to say is that I might not have gotten out of that reading what you had intended for us to get, but I did engage with it in a critical way. It did trigger my critical tendencies and prove to be a great learning experience for me."

These findings contribute to existing scholarship by showcasing the value of metacognition about cognitive presence as a teacher training tool. Analyzing their own experience with cognitive presence can help student-teachers design activities that intentionally guide students towards the four phases of practical inquiry. Such analysis also helps teachers recognize that they will not have full knowledge of how their students engage with the course, including whether they fully experience community-based inquiry. The goal of instructional design is to create environments where transferable learning is possible, but course facilitators must also be prepared to pivot in response to their students' interpretations of that course design and be comfortable with not knowing exactly what the students take away from the course.

Conclusion

This study examined students' self-reports on their engagement with the four phases of practical inquiry. The results illustrate a complicated conception of cognitive presence. Triggering events can take the form of a discussion forum prompt, but they can also occur when students' curiosity is piqued as they read their classmates' posts, read for other classes, and see overlaps between course content and their lives. Exploration and integration are simultaneously individual and social actions difficult to parse, and that difficulty highlights the non-linear and iterative nature of learning. Resolution can take the form of activity-level, course-level, and beyond-class resolution; it is also difficult to observe because learning is a process that builds upon itself as students resolve one idea only to proceed to the next. These findings reinforce CoI arguments that critical thinking is a non-linear process that requires students to move between the phases of practical inquiry (Garrison et al., 2001).

This study also demonstrates the value of focusing on the theory of CoI in an online pedagogy course and of guiding students to use the four phases of practical inquiry to analyze their own experience with cognitive presence in the course. Previous scholarship argues that participating in an online course when learning about online pedagogy is beneficial (Cook, 2007). This study additionally illustrates that participating in an online course designed to function as a community of inquiry while learning about the CoI framework as an instructional design heuristic creates ample opportunities for metacognition and learning transfer.

Declarations
The authors declare no conflicts of interest for this study.
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Examining the Development of K-12 Students' Cognitive Presence over Time: The Case of Online Mathematics Tutoring

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Abstract
In this article, we focus on the cognitive presence element of the Community of Inquiry (CoI) framework. Cognitive presence consists of four categories: Triggering Event, Exploration, Integration, and Resolution. These categories have been described as phases following an idealized logical sequence, although the phases should not be seen as immutable. Few studies have empirically examined how the four categories develop over time during the inquiry process. This article uses learning analytics methods to study transitions between the categories in K-12 online mathematics tutoring. It was statistically most probable that the tutoring sessions started with Triggering Event (95%) and then transitioned to Exploration (51%). The transitions from Exploration to Integration (18%) and Integration to Resolution (21%) achieved statistical significance but were less likely. In fact, it was more likely that the tutoring sessions transitioned from Integration to Exploration (39%) and Resolution to Exploration (36%). In conclusion, the findings suggest that the idealized logical sequence is evident in the data but that other transitions occur as well; especially Exploration recurs throughout the sessions. It seems challenging for students to reach the Integration and Resolution categories. As the CoI framework is commonly adopted in practice, it is important that tutors and educators understand that the categories of cognitive presence will often not play out in idealized ways, underlining their role in supporting how the inquiry process unfolds. In order to gain an improved understanding of the inquiry process, future research is suggested to investigate how the presences and categories of the CoI framework develop over time in different educational settings.

Keywords: Cognitive presence, community of inquiry, time, online mathematics tutoring

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The Community of Inquiry (CoI) theoretical framework (Garrison et al., 1999) is one of the most well-researched models for online and blended learning (Bozkurt & Zawacki-Richter, 2021; Castellanos-Reyes, 2020; Park & Shea, 2020). It assumes that learning is an active process where students construct and confirm meaning guided by practical inquiry. The basic structure of the CoI framework consists of three elements: the social, cognitive, and teaching presences. *Social* presence reflects the human experience of learning; *cognitive* presence outlines a constructivist learning process, and *teaching* presence is the organization and guidance required to promote learning (Garrison et al., 1999). The elements are divided into different categories representing their distinctive aspects. The elements and categories are regarded as both independent as they represent specific characteristics of a learning experience and overlapping as the intersection of the constructs enable interaction and progression of the inquiry (Arbaugh et al., 2008).

Various studies have explored relationships among the CoI's presences. Through structural equation modeling, Shea and Bidjerano (2009) found that 70% of the variance in students' levels of cognitive presence can be modeled based on their perceptions of their instructors' skills and their abilities to establish a sense of social presence. Kozan and Richardson (2014) explored the relationships between and among teaching, social, and cognitive presences. Their result confirmed positive relationships between the elements. The authors also found that cognitive presence may impact the teaching presence–social presence relationship. Garrison et al. (2010) detected causal relationships among the presences. That is, teaching and social presences influenced cognitive presence, and teaching presence was found to influence social presence. Gutiérrez-Santiuste and Gallego-Arrufat (2017) examined the co-occurrence of elements and categories in chat, forum, and email in an information and communication technology course. They found that social presence interacts with the other elements.

While the CoI framework describes elements and categories that characterize inquiry processes, there is a limited understanding of how the different elements and categories develop *over time*. This is important since this can give us a more detailed understanding of the inquiry process and how to improve teaching methods. One exception is Akyol and Garrison (2008), who explored the dynamics of an online graduate course. Transcript analysis using the CoI framework coding scheme was used to investigate how the elements and categories of the CoI framework change over time. The nine-week course discussions were divided into the first, middle, and last three weeks in order to form measure points that were tested using ANOVA, with repeated measures for the categories. Their findings indicated significant changes in social and teaching presence categories over time. For social presence, affective expression, indicated by self-projection and expressing emotions, was reduced, while group cohesion, indicated by group identity and collaboration, increased significantly over time. For teaching presence, the category of direct instruction increased significantly during the course. However, for the cognitive presence categories, there were no statistically significant changes over time.

In this paper, we seek to raise awareness of the evolution of cognitive presence over time through educational interaction. The categories of cognitive presence—triggering event, exploration, integration, and. resolution—correspond to the different phases of thinking and learning in a Community of Inquiry. Cognitive presence also has a unique feature in relation to the other elements as Garrison et al. (2001) argue that the categories are, in fact, four phases and note that they are an "idealized logical sequence" (p. 9) of the inquiry process. At the same time, new triggering events can be introduced in a conversation, causing the process to start over.

Moreover, intuitive leaps shortcutting the logical inquiry phase may occur (Garrison & Archer, 2000). This paper demonstrates a quantitative evaluation of the idealized logical sequence of a cognitive presence.

Cognitive presence is central to the mathematical problem-solving process (Mills, 2016). Online mathematics tutoring has been found to be an effective and flexible way to support student learning in classrooms (Bloom, 1984; Wood et al., 1976) and online settings (Chappell et al., 2015; Tsuei, 2017). While most previous research has adopted a tutor perspective, for example, by focusing on the examination of the tutoring process and how to encourage collaborative learning in groups (e.g., McPherson & Nunes, 2009; Salmon, 2000), this study adopts a student perspective and pays special attention to how students develop *cognitive* presence over time in tutoring sessions. The aim of this paper is to investigate how students' cognitive presence develops over time in K–12 online mathematics tutoring. In addressing this aim, transcripts of online mathematics tutoring have been coded and analyzed by using learning analytics methods. More specifically, we address the following questions:

1. To what degree do the categories of cognitive presence follow an idealized logical sequence?
2. How do the categories of cognitive presence develop over time in online tutoring sessions?

Literature Review

In this section, we discuss research on cognitive presence, online tutoring and learning analytics, and how these relate to each other.

Cognitive Presence

Cognitive presence is an operationalization of Dewey's (1933) practical inquiry, defined as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse" (Garrison et al., 2001, p. 11). It is suggested to follow four phases of the practical inquiry model: a triggering event, exploration, integration, and resolution (Garrison et al., 2001). A triggering event is the identification, conceptualization, and formulation of a problem or issue or when a conversation changes direction. The triggering event is logically the reason why a student initiates a tutoring conversation or draws attention to new problems or issues that arise during the tutoring session. Exploration includes reviewing the student's previous knowledge, brainstorming, and exchanging information. It might also include self-questioning and doubt on one's ability. Integration is about combining thoughts and making them operational. A typical example in online mathematics tutoring is the use of calculations (Stenbom et al., 2016). Resolution is about solving a problem or issue, which includes developing and analyzing potential solutions.

Online Tutoring

Tutoring is defined as "the means whereby an adult or 'expert' helps somebody who is less adult or less expert" (Wood et al., 1976, p. 89). Student learning is supported by interacting with a more skilled tutor (McPherson & Nunes, 2009). Bloom (1984) studied individual tutoring and compared it to a conventional control class. He found that tutored students were above 98% of the students in the control class when comparing final achievement measures. More recent research has found that online tutoring is also effective. In a study on 119 struggling students, it was found that online synchronous tutoring contributed to improvement in student assessment scores and mainly positive student perceptions (Chappell et al., 2015).

Turula (2018) showed that the levels of cognitive presence were strong in online tutorials and students reached higher levels of critical thinking than in face-to-face meetings (which supported social presence better). It was argued that social presence paved the way for cognitive presence. In a systematic review, it was found that most student contributions were categorized as exploration and integration, while triggering event and resolution occurred less frequently (Sadaf et al., 2021). However, the results are conflicting. In a study of a peer-facilitated discussion environment, cognitive presence was detected in most messages, although most student contributions were categorized as Triggering Event and Exploration (Chen et al., 2019). However, when tutors were involved, the frequency of integration and resolution increased significantly, emphasizing the importance of the tutor. On the contrary, Mills (2016) found that many students reached resolution early but were often not cognitively present in follow-up posts when students were asked to defend their solutions. Others investigated how student online discussions with high levels of cognitive presence can be designed (Gašević et al., 2015). They found that using participation guidelines combined with grading decreased the number of posts characterized as triggering event and exploration and increased the number of posts characterized as integration and resolution. Galikyan and Admiraal (2019) also studied online discussions. They found that engagement in integration and resolution predicted academic performance. Although triggering event and exploration are essential in online tutoring, these findings indicate the importance of supporting students in also achieving integration and resolution.

Learning Analytics

In this study, we use learning analytics (LA) methods to analyze how the four categories of cognitive presence develop over time. LA has been argued to offer valuable methods to increase our understanding of cognitive presence and the CoI framework, especially for students' knowledge construction (Kovanović et al., 2015), and to investigate temporal aspects of the learning process in computer-supported collaborative learning settings (Lämsä et al., 2021). Through the use of LA methods, scholars have been able to identify students' profiles in a study of online discussions. These profiles were characterized as 1) task-focused users, 2) content-focused no-users, 3) no-users, 4) highly intensive users, 5) content-focused intensive users, and 6) socially-focused intensive users (Kovanovic et al., 2015). Task-focused users were as successful as more intensive students belonging to profiles four to six, indicating that cognitive presence can be developed in different ways and is not necessarily connected to how frequently students contribute to online discussions. In another study, Kovanović et al. (2018) observed much smaller differences in cognitive presence when comparing passive users, task-focused users, and highly active users in a MOOC. It was hypothesized that this was likely the result of using a self-reported survey instrument, which has a self-selection bias. Thus, the use of content analysis (used in the present study) seems to be a methodological strength.

Taking a different approach, Yılmaz (2020) investigated the effect of providing LA-based feedback on the perceptions of cognitive, teaching, and social presence. He found a statistically significant effect on the three types of presences, underlining the importance of providing feedback to encourage the development of CoI and that such feedback can be automated. It can be noted that most previous research on LA and cognitive presence has used automated methods (Kovanović et al., 2015; Kovanović et al. 2018; Yılmaz, 2020). Recently, researchers have also used LA methods to examine the cognitive presence dimension (among others) of the quality and depth of student participation in online discussion forums (Farrow et al., 2021). The obvious benefit is to analyze large data sets. Our research complements this approach by using LA methods to analyze manual transcript analysis, with the benefit of providing a more detailed and rigorous analysis.

In this study, we use two LA methods: sequence and process mining. Sequence mining is frequently combined with process mining. It is an analytical technique that has been implemented frequently in LA research to capture the sequential ordered patterns of students' activities. Sequence mining has been used to analyze learning activities visually and statistically. The method has been used to detect types of learning tactics and their sequences. For instance, Matcha et al. (2019) used sequence mining to discover subgroups within learning actions and later correlate such subgroups to performance. Another recent example is the work of López-Pernas et al. (2021), who used sequence mining to discover the process by which students learned programming, how they succeeded in solving assignments, and when they struggled with their learning.

Process mining is a method that allows researchers to make sense of temporal data by discovering the process and mapping it visually and statistically. In doing so, process mining offers a summarizing, visually intuitive map of how students, e.g., use a learning tactic, move between tactics, and the time-frequency of such action. Since a learning process is a temporal process that unfolds over time (Reimann, 2009), the method has been used by many researchers to understand the learning process. For instance, Matcha et al. (2019) analyzed how students used different strategies and how efficient strategies were related to better performance and feedback. Sedrakyan et al. (2016) used process mining to understand students' complex problem-solving processes and offer relative feedback. Another recent example is the work of Peeters et al. (2020), who examined how students used self-regulated learning tactics in an online discussion about academic writing and how the different tactics were used by high and low achievers.

Method

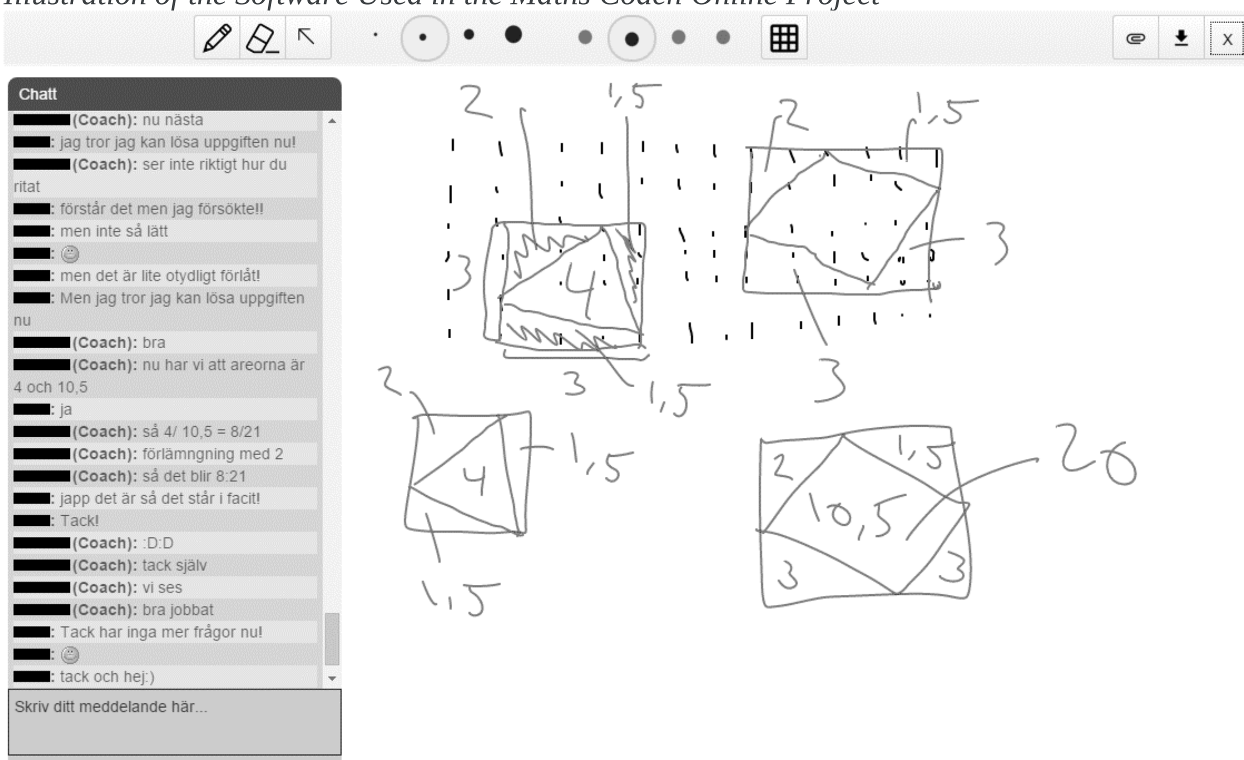
To address the research questions, a case study research design was selected. Using the CoI transcript coding procedure, math tutoring conversations were coded into the categories of cognitive presence: triggering event, exploration, integration, and resolution. In order to analyze how the categories develop over time, sequence and frequency mining were used.

Case Study Setting

The research design is a case study. Case studies allow an in-depth and detailed analysis of a phenomenon within a bounded context (Merriam, 1988). The Maths Coach Online project can be considered an ideal case to evaluate the idealized logical sequence of cognitive presence, as problem-solving is in focus and conversations consist of triggering events, exploration, integration, and resolution in the same chat (Stenbom et al., 2016). Therefore, the empirical data for this research was collected from the Maths Coach Online project, which was started in 2009. It offers K-12 students help with their homework in mathematics from online tutors. The tutors are teacher-students of mathematics and work evenings Monday to Thursday. The project includes three Swedish universities and one UK university. The tutors attend a 2 ECTS credit course to prepare them for online tutoring in mathematics. They use software specifically developed for the Maths Coach Online project that includes a queuing system, text-based chat, and digital whiteboard (see Figure 1). The use of chat makes it possible for the tutor to work with several students simultaneously (Chappell et al., 2015; Madden & Slavin, 2017). A benefit for students is that they can take time to work independently on a problem and continue the conversation later. The Anonymous project meets several research-based recommendations for online mathematics instruction, such as tutor professional development, office hours, frequent communication, and tailored advising (Coleman et al., 2017), though it should be regarded as a complement to conventional K-12 education.

Figure 1

Illustration of the Software Used in the Maths Coach Online Project



Data Collection

All tutoring conversations of the Maths Coach Online project are stored in a database. For this article, all conversations from one year of service (7,640 conversations) were made available for research. In the conversations, K-12 student were seeking guidance with their math homework covering all parts of the Swedish math curriculum (i.e., understanding and use of numbers, algebra, geometry, relationships, and statistics). The number of conversations selected was 60, with 3,109 messages sent in total, as it was thought to be a reasonable number for manual coding. We selected students who represented different age groups because it might affect the characteristics of the conversations. The students were between 12 and 19 years old. Half of the conversations were selected randomly (10 per educational stage of the students, up to age 12, ages 13 to 16, and ages 16 to 19). The additional 30 conversations were randomly selected from the entire dataset. Prior to using the Maths Coach Online service, students and guardians gave their informed consent that the tutoring sessions can be analyzed for research purposes. The tutoring sessions were anonymized prior to analysis.

Data Coding

The data coding was conducted using the validated CoI transcript coding procedure. With CoI, transcripts are a commonly used data source for analyzing discourse from educational activities (e.g., discussion forums, meetings, or chats). In fact, the CoI was originally developed by Garrison et al. (1999) to guide computer-conferencing transcript analysis. With this method, a coding scheme and a unit of analysis are defined, and transcripts are investigated for the elements and categories of CoI (Garrison et al., 2006). The method has been widely employed in different contexts (Weltzer-Ward, 2011; Kovanović et al., 2015; Kineshanko, 2016; Lee et al., 2022) but has also been criticized for not fully covering all aspects of critical thinking (Breivik, 2016). This study uses a cognitive presence coding scheme adapted to online mathematics tutoring (see Table 1). The slight adjustment from Garrison et al. (2001) was made to ensure that? some indicators reflect the one-to-one environment (instead of an environment with several students) and to demonstrate the focus on problem-solving. Additionally, math tutoring examples were provided. A key question when coding data is to select the unit of analysis (Garrison et al., 2006). Examples include thematic units, sentences, paragraphs, and messages (De Wever et al., 2006). During initial coding, it was observed that each chat message typically serves a specific purpose to move the conversation forward. Thus, each chat message was used as a unit of analysis.

Table 1

Coding of Cognitive Presence in Online Mathematics Tutoring (Stenbom et al., 2016).

Element	Category	Indicators (examples only)	Example
Cognitive presence	Triggering Event	Stating a problem	"Here's the problem …"
		Changing direction	"I have another issue."
	Exploration	Brainstorming	"Perhaps I could use …"
		Broad search for insight	"Am I thinking right here?"
		Information exchange	"What is a square root?"
	Integration	Connecting ideas	"I can combine … and …"
		Computations	"7/2 – x = 1/4 "
	Resolution	Achieve solution	"The answer is 3!"
		Analysis of solution	"I made a mistake with …"
		Implementation	"Then the apple is cheaper..."

The coding of the data was performed by one of the authors and a master's student. First, some conversations were examined in order to discuss how to interpret the coding scheme. Then, half of the conversations were coded independently by each person. A message could include more than one category. In these cases, the included categories were ordered in a sequence, as they occurred. Finally, ten conversations were coded by both persons in order to calculate inter-rater reliability. For transcript coding using the CoI framework, percent agreement is a recognized reliability measurement (Cohen, 1960; De Wever et al., 2006; Garrison et al., 2006). The percent agreement was .79 and Cohen's kappa for agreement beyond chance was .69 which indicates substantial agreement. In total, 1 042 messages were coded as cognitive presence. Table 2 presents the distribution among categories.

Table 2

Codes for Cognitive Presence

Category	**Number of codes**
Triggering event	150
Exploration	569
Integration	198
Resolution	125

Data Analysis

To investigate how the four categories of cognitive presence develop over time, the authors performed sequence mining. The sequence mining process entails using time-ordered sequences which are grouped within a time period or session. The sequences in our study were coded messages arranged according to their corresponding timestamp, while the conversations (full thread of messages) were grouped as sessions. To apply a process-oriented analysis to the data, we used the sequence and process mining methods that have been established in educational research in analysis of the temporal unfolding of time-stamped data (see section 2.3 for examples). Sequence mining uncovers the temporal unfolding of events (coded CoI categories in our case) and process mining shows the transition patterns e.g., how students transition from Exploration to Integration and at which frequency or proportion. Therefore, both methods are necessary to understand the different temporal patterns and offer a holistic view of the process. The timely ordered four categories of data were used to construct a state sequence object using the Traminer package (Gabadinho et al., 2011). To visually show the trajectory of messages, the sequences were plotted using an index plot, where every conversation is represented as a single trajectory formed of stacked bars. The stacked bars are the sequences of messages colored according to their coded category. A distribution plot was also plotted as the distribution of sequences at each time point.

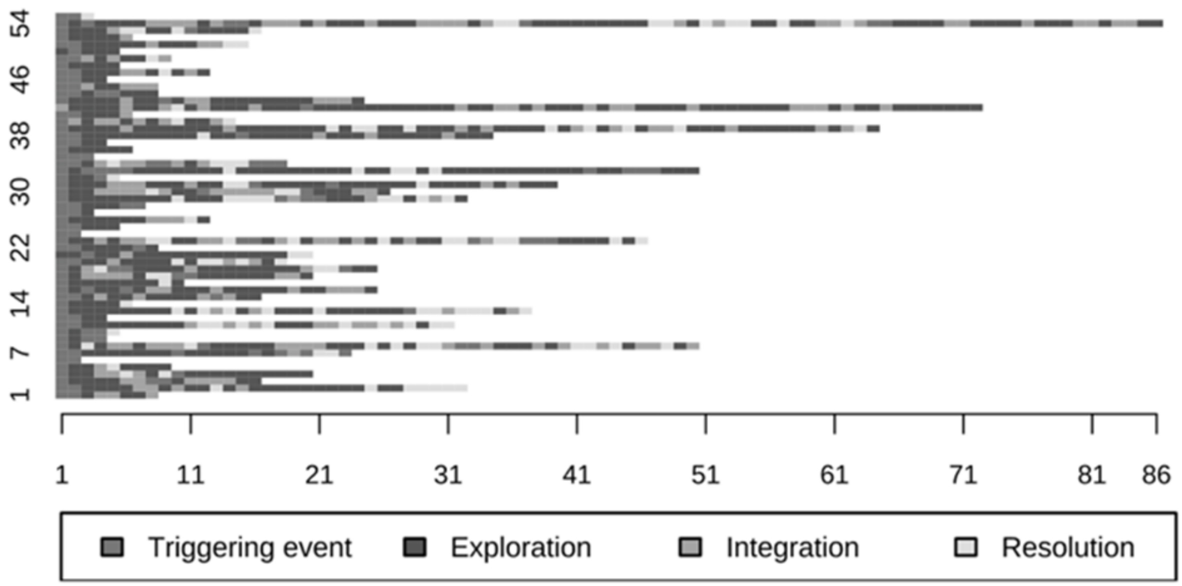
To understand how the categories develop over time, two types of process mining were performed: 1) Frequency-based process mining using the Bupar R! Package (Janssenswillen et al., 2019) and 2) First Order Markov Model, which shows the transitional probabilities between categories (Gatta et al., 2017). Firstly, relative case frequency-based process maps were constructed to show how students write messages coded as different categories and how they transition between them. The sequence maps were built by using each coded message as "event," the timestamp of the event as the timing, the user's ID as the case ID. The process map was the relative case frequency, i.e., the fraction of students writing a message coded as, e.g., Exploration, and the edges are the fraction of students transitioning to other categories, e.g., Integration. Secondly, stochastic process analysis was performed with the R library PMineR (Gatta et al., 2017). In contrast to the frequency-based algorithm, PMineR offers process visualization based on First Order Markov Models (FOMMs) with transition probabilities. In simple words, the process computes the probability of transition between events with statistical significance and only the statistically significant edges are plotted. The process plotted with FOMM is based on the fraction of coded messages, e.g., the fraction of messages coded as Exploration that would transition to Integration.

Results

Figure 2 shows an index plot where the categories are represented as greyscale bars for each tutoring session. It is evident that most sessions start with Triggering events followed by Exploration. Then, Exploration, followed by Integration, are the most common categories throughout the session. There are six sessions with 45 messages or more, all of which focus on Exploration and Integration during the final part of the session rather than Resolution.

Figure 2

Index Plot of the Sequence of the Categories in Each Conversation



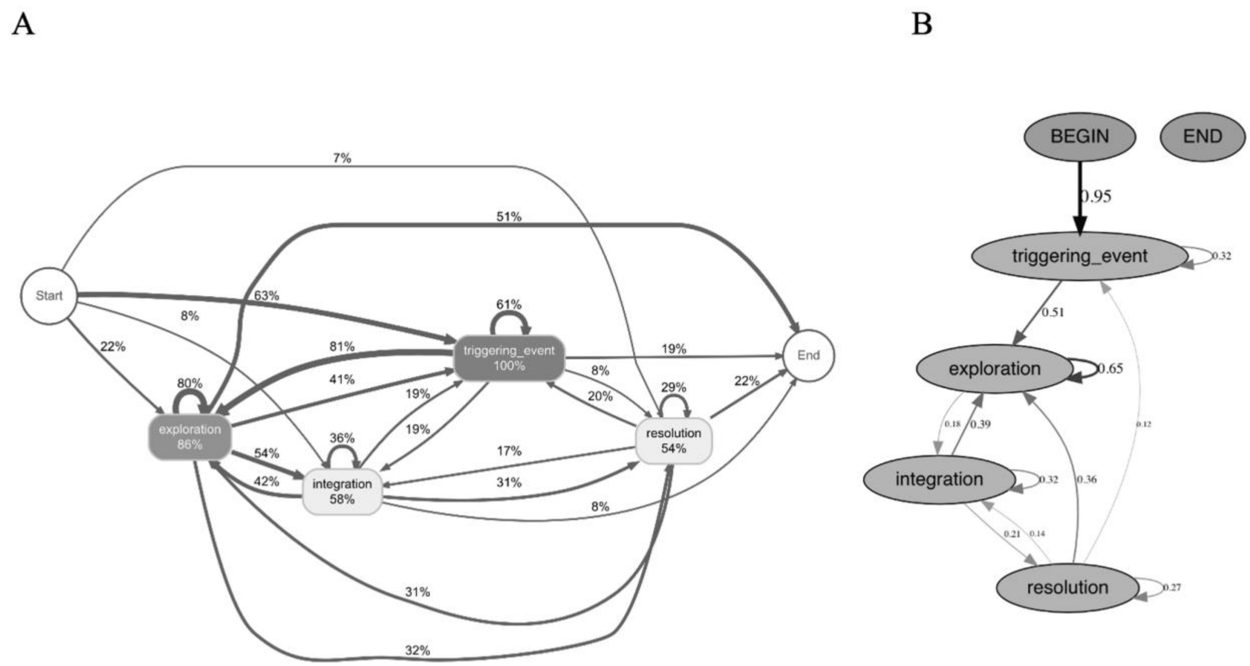
Note. The Y-axis represents the number of conversations; X-axis represents the order of interactions.

Two types of process mining were implemented: a relative case-based algorithm that shows the students' transition between the categories (see Figure 3A) and a stochastic process map (see Figure 3B) based on the fraction of messages. As evident in Figure 3A, a majority of students (63%) start with a Triggering event, although always express Triggering even at some point (100%). This is followed by the transition from Triggering event to Exploration (81%), which is used at least once in most conversations (86%). Around half of the students transition from Exploration to Integration (54%) to end the conversation (51%) or move back to a Triggering Event (41%). Integration is displayed in 58% of the students' conversations. The most common students' transition from Integration is back to Exploration (42%) and to Resolution (31%). Resolution is the least frequent category displayed in 54% of the students' conversations. The most common student's transition from Resolution is back to Exploration (31%). It is also notable that many students' conversations include Exploration followed by another message of Exploration (80%) and a Triggering Event with another message of Triggering event (61%).

The stochastic process map is based on transitional probabilities computed based on the FOMM. Here the transitions describe the events (compared to students in the previous map). Figure 3B shows the most probable *first transition* from a category to another category. The probability that a tutoring session starts with a Triggering Event is 95%. The most probable first transition from Triggering Event is to Exploration (51%). Then, the most likely transition is from Exploration to Exploration again (65%), and less likely to Integration (18%). The next most likely transition is from Integration back to Exploration (39%) or to Resolution (21%). There was no statistically significant transition to the end of the conversation, meaning that the tutoring sessions can end with different categories, although rarely with a Triggering Event.

Figure 3

Frequency-Based Algorithm (A) and Stochastic Process Map (B)



In Table 3, all possible transitions between the categories of Cognitive presence, the statistical probability according to the FOMM algorithm and an example from the conversation logs for each transition is presented. Notably, transitions could occur between all the categories, and within the categories. That said, as noted above, the transitions that achieved the strongest statistical significance were Exploration to another message of Exploration (65%), Triggering Event to Exploration (51%), Integration to Exploration (39%), Resolution to Exploration (36%), Triggering Event to another message of Triggering Event (32%) and Integration to another message of Integration (32%), and Resolution to another message of Resolution (27%).

Table 3
Transitions, Probabilities, and Examples

From	To	Probability (FOMM)	Example
Triggering Event	Triggering Event	0.32	Triggering Event: I need help with a couple of math assignments Triggering Event: 21a) Calculate the volume of the balcony box 60 * 20 * 15
	Exploration	0.51	Triggering Event: What is the largest 90 cm or 893 mm? Exploration: so, it goes 10 mm on 1 cm?
	Integration	-	Triggering Event: and so I need help with division so if we take 146,173,146,135 as number a should calculate the median value how should I divide then? Integration: I know you have to add everything and it will be 600 a divided by 4
	Resolution	-	Triggering Event: (-1) +4 Resolution: 3 apples
Exploration	Triggering event	-	Exploration: so it should be x=-2 +- the root from 2^2+0 which then becomes x = -2+. The root from 4 +-* Triggering Event: 2 (x-2)(x + 4) = (x-3)^2 what should I use for method then ??
	Exploration	0.65	Exploration: then I do 0.9991 ^ (1/19) = 0 !! ??? Exploration: but the answer is 9.23
	Integration	0.18	Exploration: Why did I make a mistake? Integration: I think that 2a has a plus sign right next to it, so it should be added with 2a and then subtracted with 4f 2a + 2a - 4f
	Resolution	-	Exploration: yes. Resolution: or 47!
Integration	Triggering event	-	Integration: 2,5,9 Triggering Event: and so I need help with division so if we take 146,173,146,135 as a number a should calculate the median value how should I divide then?
	Exploration	0.39	Integration: 1a + 4r? Exploration: aa right. Can I have a slightly more difficult problem, to see if I can handle it then?
	Integration	0.32	Integration: is it maybe 2.2 cm then? Integration: 89, 3cm?

	Resolution	0.21	Integration: - 4x it should be Resolution: ok now I got it right so x = 6
Resolution	Triggering Event	0.12	Resolution: this I do not need pq for Triggering event: hi Coach do you want to help me a little with a problem??
	Exploration	0.36	Resolution: The answer is: 1301.5 Exploration: Aha now I understand What to multiply with
	Integration	0.14	Resolution: 18000 liters Integration: aha you should divide it by 1000 so it will be 18 liters
	Resolution	0.27	Resolution: 6 if you round off Resolution: got the answer 5.6569

Discussion

The foundational work on cognitive presence and CoI argued that the four categories of cognitive presence are, in fact, four phases in the Practical Inquiry model (Garrison et al., 2001). The categories were described as an idealized logical sequence of cognitive presence, although the categories were argued not to be regarded as immutable. New triggering events can be introduced in a conversation, causing the process to start over (Garrison et al., 2001), and sometimes phases are skipped, and conceptual leaps are made (Garrison & Archer, 2000). However, while these categories have been used and tested in many empirical studies, few have investigated how the categories develop over time. In doing this, one of the key theoretical claims of cognitive presence is empirically tested. This article adopted LA methods to analyze how the four categories developed over time in a setting of online mathematics tutoring. More specifically, the first research question asked to what degree the categories of cognitive presence followed an idealized logical sequence?

An index plot, frequency map, and stochastic process map, the latter computed based on the First Order Markov Models (FOMM) algorithm, were developed. It was most probable that tutoring sessions started with a Triggering Event (95%). This finding is not aligned with a systematic review of cognitive presence suggesting that most contribution were categorized as Exploration and Integration, rather than Triggering Event and Resolution (Sadaf et al., 2021). However, this can be explained by that the Maths Coach Online project offers K-12 students help with their homework in mathematics from online tutors during evenings. Students typically use the service when they need help with a certain mathematical problem. In line with the theoretical claim of the cognitive presence element (Garrison et al., 2001), it is probable that students, after describing the problem, transition to Exploration (51%), during which the tutor and student brainstorm and exchange information. It is common that students then continue to write messages coded as Exploration (65%). However, the probability that the remaining idealized logical phases of cognitive presence would occur was much lower. The probability that students transition from Exploration to Integration was 18% and from Integration to Resolution was 21%. This finding is aligned with previous research, which has found that it is often challenging for students to move beyond Triggering Event and Exploration in order to engage in Integration and

Resolution (Garrison et al., 1999; Galikyan & Admiraal, 2019; Gašević et al., 2015; Vaughan & Garrison, 2005). This is essential because engagement in Integration and Resolution has been found to predict academic performance (Galikyan & Admiraal, 2019). That said, some students that use the Maths Coach Online service might only need help to get started and might reach the Integration and Resolution independently after the tutoring session.

The second research question investigated how the categories of cognitive presence developed over time in tutoring sessions. The findings related to the first research question confirmed that the categories of cognitive presence followed the idealized logical sequence to some extent, especially for the first two categories (Triggering Event and Exploration). Interestingly, it was more likely that students transitioned from Integration to Exploration (39%) and from Resolution to Exploration (36%) rather than according to the theoretical sequence. After briefly describing the Triggering Event, it seemed that Exploration was often the center of attention for students during the tutoring sessions. Gašević et al. (2015) found that the use of participation guidelines combined with grading decreased the number of posts characterized as Triggering Event and Exploration and increased the number of posts characterized as Integration and Resolution. This suggests that there might be a need to develop improved teaching and tutoring practices in order to encourage students to engage in Integration and Resolution. It is also important to consider the effects of the subject discipline. In mathematics, it is clear whether a student is able to solve a problem or not, while in other subject disciplines, the act of reaching resolution might be more subjective.

The practical implications for teachers and tutors relate to how they can facilitate students' practical inquiry during the four phases. According to the present study and several others (e.g., Garrison et al., 2001; Neto et al., 2018; Guo et al., 2021), the vast majority of dialogue is focused on exploration. To achieve a more even distribution of cognitive presence categories in dialogue, teachers and tutors should develop strategies for promoting students' transitions to and retention during Integration and Resolution. Furthermore, it is clear that the Practical Inquiry model and the idealized logical sequence of the categories of cognitive presence should not be seen purely in deterministic ways. As noted by Garrison et al. (1999), the categories should not be regarded as immutable: New Triggering Events can be introduced, categories are skipped and conceptual leaps are made (Garrison & Archer, 2000). In our setting, Triggering Events especially occurred in the beginning of a conversation, while the remaining conversations mainly centered around Exploration. It is important that practitioners understand that the Practical Inquiry Model describes an idealized sequence rather than a detailed account of how inquiry processes play out in practice. Tutors and educators could reflect on what kind of inquiry processes they are aspiring to achieve. In some cases, Exploration could be the focus of a conversation, while in other cases it might be desirable to achieve Integration and/or Resolution. A key challenge for tutors and educators seems to not only be how to support Exploration, but also how inquiry processes could enter the Integration and Resolution phases, while also being receptive to new Triggering Events that might support students to engage in further inquiry processes.

Limitations and Further Research

The present study involves examining cognitive presence sequencing and development over time as measured by transcript coding. The transcript coding method is described as a "technique to understand interaction patterns and the quality of the discourse in online communities of inquiry ... It is through the use of transcript analysis that educators can investigate beyond what students say they do to review what they actually do" (Garrison, et al. 2006, p. 8). That said, transcript analysis only involves the discourse of an inquiry process and not the individual's critical thinking. Garrison et al. (2001) describe that cognitive presence involves students' practical inquiry through individual critical thinking and shared discourse. Following this, the present study is limited to the shared discourse as documented in the transcripts, while students' individual inquiry, e.g., what they are thinking or doing that is not visible in the chat, is not analyzed. The individual sequence of cognitive presence may follow different patterns than written communication.

This article focused on online mathematics tutoring, in which a tutor helps a K-12 student with a homework problem during the evening. This is of course a very different setting as compared with the studies of online classes that often characterize CoI research. In the Maths Coach Online project, the community consists of many dyadic relationships between tutors and students. It is likely that the sequence of categories of cognitive presence will look different in different settings. We believe online mathematics tutoring is a suitable case because one student was consistently the center of attention during tutoring. The purpose is to help somebody who is less adult or less expert (Wood et al., 1976) to solve, and *most importantly*, understand how to solve a mathematical problem. A complete understanding of the immutable and dynamic aspects of cognitive presence will require studies in several empirical contexts (i.e., small and large communities, synchronous and asynchronous interactions, shorter and longer sessions, written and spoken communication).

In this study, we focused on investigating how the categories of cognitive presence developed over time. Although we present how the categories of cognitive presence develop over time in a specific education situation, complementary methods would be necessary to explain why these transitions occur. A key challenge for the future is to gain an improved understanding of the inquiry process, i.e., how the different elements and categories of the CoI framework interplay and develop over time in different education settings.

Declarations

The authors have no conflicts of interest to disclose.

There is no need for ethical approval according to the Swedish Ethical Review Act (SFS 2003:460). The research adheres to the good research practice guidelines from the Swedish Research Council (2017).

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Two Stories to Tell: Racial Equity and the Impact of Different Instructor Adaptations to COVID-19

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Abstract
During the COVID-19 pandemic, college faculty took many different actions to support student success during the transition to online instruction. However, the conclusions we draw about the *impact* of these adaptations and their implications for racial equity may vary depending on the outcome measures we examine. We explore this possibility through a mixed-methods study of 10 courses taught at a Hispanic-Serving Institution in the United States in Spring 2020. First, using qualitative analytical methods, we identify five types of instructional adaptations students noticed their instructors made early in the pandemic. Second, we use quantitative methods to uncover associations between these instructional adaptations and several student- and course-level outcome variables. While all five instructional adaptations were perceived as beneficial by students, only two—*ensuring access to class resources* and *ensuring access to instructor time*—were significantly correlated with racially marginalized students' self-reported motivational and personal gains from their coursework. None of the adaptations were significantly associated with more equitable course outcomes, however. We discuss the implications of these findings and the differing narratives they imply for researchers, practitioners, and policymakers.

Keywords: COVID-19, digital remote teaching, Hispanic-Serving Institution, online learning, emergency remote teaching, equity, STEM

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How did instructors adapt their course policies and teaching practices as they moved online during the COVID-19 pandemic, and how did these adaptations relate to student outcomes? In this manuscript, we explore this question in the specific context of a Hispanic-Serving Institution (HSI) in the western United States. We illustrate how different outcome measures and different units of analysis can lead us to draw novel—and, in some cases, contradictory—conclusions about the impact of instructors' adaptations to their courses.

We first provide a brief overview of the importance of HSIs for advancing educational equity and the role research can play in advancing equity, particularly in the wake of a global pandemic. We then examine the important and sometimes conflicting stories that research has already told us about equity and online learning during the pandemic, both across the world and in the specific context of HSIs in the United States. Finally, we report on the current study and its implications for future teaching, research, and policymaking.

Contextualizing Hispanic-Serving Institutions

The United States has a long and ongoing history of systemic racism and discrimination against People of Color, including Hispanic or Latinx Americans (Gonzalez, 2011). Hispanic or Latinx Americans have historically faced marginalized in higher education, though many have fought this marginalization and worked to reform and diversify academia (MacDonald & García, 2003). Hundreds of U.S. colleges and universities are now designated as *Hispanic-Serving Institutions* (HSIs), meaning that at least 25% of enrolled students identify as Hispanic or Latinx (Fosnacht & Nailos, 2016). Such institutions serve approximately one-third of all Hispanic undergraduates in the U.S., and thus play a crucial role in advancing educational equity.

HSIs have crucial differences from other U.S. institutions that serve marginalized racial groups (e.g., Historically Black Colleges and Universities) or nationalities (e.g., Tribal Colleges). Most HSIs were not founded with the explicit *mission* of serving Hispanic or Latinx students (Garcia & Ramirez, 2018). Since HSIs have been defined by the *numbers* of Hispanic or Latinx students enrolled, many are institutions which *became* HSIs sometime after their founding. Therefore, these institutions were not necessarily created with Hispanic or Latinx students' needs in mind. Franco and Hernández (2018) argue that HSI faculty and staff must work to identify and collect data that could enable them to understand how specific courses, policies, or practices are succeeding or failing at serving Hispanic and Latinx students.

Understanding how HSI course policies and teaching practices succeed or fail at serving Hispanic and Latinx students took on renewed urgency[1] during the recent coronavirus pandemic. During the pandemic, many colleges—including HSIs—moved from in-person instruction to online instruction for an extended period, and students at many institutions disliked online instruction and reported facing a variety of technical and non-technical challenges (Gonzalez-Ramirez et al., 2021). These challenges may have disproportionately harmed students who were already marginalized in higher education and/or those who had only limited access to technology needed for online learning (Katz et al., 2021; Means & Neisler, 2021). Since HSIs are defined based on enrollment and not on specific policies or pedagogical practices, it is logistically difficult to make empirical claims that apply to *all* HSIs (Fosnacht & Nailos, 2016); however, Bell et al. (2021) recently found evidence to suggest that the "digital divide [in student access to technology and internet during COVID-19] may be more prevalent at HSIs than at previously

[1] This need has been present throughout the history of higher education in the United States, even if it historically went largely unacknowledged by White-dominated institutions and power structures (MacDonald & García, 2003).

studied institutions" (p. 115). Furthermore, in the academic years just prior to the pandemic, Cottrell (2021) used propensity score matching to compare HSI student outcomes in online and face-to-face courses and found comparable grades but higher withdrawal rates in online classes.

Given these challenges and the important role HSIs play in advancing educational equity, it is imperative to understand how the shift to online instruction played out in the specific context of HSIs. Our study sought to go beyond documenting existing inequities to ask what policies and practices best supported HSI students (including, but not limited to, Hispanic and Latinx students) during the pandemic.

Telling stories about pandemic teaching and learning

To deal with pandemic challenges, many instructors across the world made changes to their teaching practices to address students' online learning needs. A survey of faculty and administrators from over 600 U.S. colleges and universities found that nearly half of faculty lowered the volume of work expected from students during the early months of the pandemic (Johnson et al., 2020). Many faculty reported other changes as well, such as moving course content online, using Zoom to meet with classes, and changing or lowering expectations about the type or quality of work students should do (2020). On the other hand, faculty *themselves* sometimes reported devoting considerably *more* time than usual to their work—both extra time devoted to learning new technologies and extra time devoted to interacting with students. For example, in a mixed-methods study of Malaysian faculty's responses to the pandemic, Badiozaman (2021) reported that faculty were working 12- or 15-hour days and weekends to master new technological tools and create online media and materials for students; furthermore, "communication with students...became constant" for many faculty (p. 12). These extraordinary time commitments might have been a powerful support for student success during the crisis; at the same time, they may also have been a major source of stress and burnout for faculty (see, for example, Arrona-Palacios et al., 2022).

Moving forward, we can expect ongoing debates and controversies over the proper "lessons learned" from the shift to online instruction, both at HSIs and in higher education more broadly. Research involves telling stories with data (Alexander, 2022), and such stories are presently in high demand. Indeed, one of the top needs that became apparent early in the pandemic—reported by over half of faculty and nearly two-thirds of administrators—was a demand for information on how best to support students' remote learning (Johnson et al., 2020).

Researchers and policymakers will likely examine the different ways in which college faculty members adapted their instruction and use these data to advance competing visions for the future of higher education. Neoliberal perspectives might focus on identifying the efforts that were most cost-effective from an institutional standpoint and capitalizing on these efforts—for example, by preserving asynchronous course materials created during the pandemic and gradually replacing full-time faculty with adjuncts who administer these courses but receive lower pay and benefits (Le Grange, 2020; Orleck, 2021). In contrast, more critical perspectives might focus on the working conditions and constraints that made student-supporting actions feasible or infeasible for higher education faculty. For example, the time and resources available to adjunct faculty to adapt their instruction may have been, on average, very limited compared to faculty with permanent positions (Leathwood & Read, 2020). This latter framing of the issue may encourage solutions that involve *decreasing*, rather than increasing, the ratio of students to full-time faculty in higher education.

The challenge of quantifying equity during a pandemic

How did instructors' adaptations in response to the pandemic advance educational equity[2] or exacerbate inequities? Unfortunately, this question is challenging to answer. One common measure of educational equity, the "achievement gap" or "equity gap" in course grades, was particularly difficult to measure in college courses during the pandemic because educational disruptions often resulted in substantial changes to both teaching and assessment practices (Means & Neisler, 2020). Such changes may have introduced greater-than-normal sources of variability and error into course assessments. For example, Zuckerman and colleagues (2021) examined biology course grades at a large doctoral-granting institution and found that racial equity gaps *decreased* between Fall 2019 and Spring 2020. At the same time, the authors paradoxically found that students also reported *fewer* opportunities to discuss course content with their peers (a practice often associated with reduced equity gaps; see Theobald et al., 2019).

Zuckerman et al. argued that their finding was likely an artifact of flexible course policies and grading practices implemented in response to the pandemic: if all students tended to receive higher grades than they might have received in a pre-pandemic environment, ceiling effects would have resulted in reduced equity gaps. For some readers, this may raise the question of whether equity gaps were "really" reduced. If traditional course policies and grading practices are assumed to be a valid proxy for student learning, then changing such practices may result in a less accurate measure of learning outcomes, and reduced equity gaps in one course may simply hide disparities in student learning that could re-emerge in future courses. However, some scholars argue that traditional course policies and grading practices are relatively poor proxies for student learning, since they often include measures of student attendance, participation, or other non-cognitive outcomes (Feldman, 2018). In fact, the grades generated in courses with more flexible, pandemic-driven policies (e.g., where attendance was no longer graded) could conceivably be *better* proxies for student learning compared with pre-pandemic grades. Importantly, the very technological tools that were sometimes used to establish assessment validity (e.g., by surveilling students to prevent cheating) may themselves have contributed to equity gaps by directly or indirectly harming the performance of students with limited internet connectivity (Morris et al., 2021; Petillion & McNeil, 2020).

In this complex information landscape, we argue that it is crucial to attend to multiple data sources to examine the impact of instructors' actions during these difficult days—particularly at HSIs, given the crucial role these institutions play in serving Hispanic and Latinx students. We must attend to both institutional data (e.g., equity gaps based on course grades) and to students' *own* perspectives on pandemic instruction.

Student perspectives on online learning during the pandemic

Researchers are already telling important stories about how instructors adapted their courses to online modalities and how students perceived these adaptations. In a survey of a nationally representative sample of U.S. college students, Means and Neisler (2021) found that certain practices (drawn from a list of recommended best practices for online instruction) were

[2] Equity has multiple definitions and dimensions. For example, some educators and researchers define equity as equal access to resources or equal educational achievement, while others argue that equity also requires attention to identity and power (Gutierrez, 2012). We argue that all of these definitions are valid and important; in the present manuscript, however, we conceptualize equity primarily in terms of achievement (which we in turn operationalize through course grades).

strongly associated with student satisfaction, even among historically marginalized student populations. These included personal messages from faculty to students about their progress in the course and the use of activities that prompted student reflection on their learning.

Pagoto and colleagues (2021) explored student perceptions of instructional adaptations across multiple institutions using focus group methods. They found that some adaptations were often seen as ineffective (e.g., prerecorded lectures) while others were often seen as effective (e.g., instructor flexibility and instructor accessibility, as well as providing students with access to extra tools and resources). On the other hand, an open-ended survey of community college students by Prokes and Housel (2021) suggested that instructor flexibility, instructor accessibility, *and* prerecorded lectures were all seen as helpful by students.

Online learning at HSIs during the pandemic

Numerous studies have already examined the challenges HSI students faced during their transition to online learning (e.g., Black et al., 2020), and some have examined the strategies or technologies that HSI instructors used to support students during this transition (e.g., Davila-Diaz, 2022; Morales-Cruz et al., 2021). Shapiro and colleagues (2020) did both, asking students to share the challenges they faced and asking instructors to share steps they took to mitigate such challenges.

However, few studies have *paired* these analyses to examine how specific instructional adaptations contributed to specific positive outcomes for students. One important exception is Mshigeni et al. (2022), who showed that students at one HSI slightly preferred synchronous course meetings over asynchronous course meetings but felt both were inferior to in-person instruction. Students also identified frequent communication from instructors as an important recommendation for future online learning. Another important exception is the work of Vielma and Brey (2021), who surveyed engineering students in a large HSI and asked an open-ended question about "what aspect of the online course content [students felt] was the most effective," (p. 140). Qualitative analyses of their data showed that the two most common responses were "Faculty availability (office hours, responsiveness)" and "Recorded lectures," (p. 140), both of which were mentioned by at least 50 of the 352 respondents in their survey.

Vielma and Brey also asked students to offer suggestions for how to improve online course delivery in the future. Response rates for this question were far lower (no single suggestion was named by more than 5% of respondents) but included intriguing suggestions, including better-quality online resources, expressions of faculty empathy and compassion for students, more effective communication, and more one-on-one access to instructors through virtual office hours.

However, most students who completed this survey were describing instructional adaptations they had seen across multiple courses (an average of 2.1 courses per student), meaning it was not possible to match these data with course-level outcome variables. In our study, we build upon this prior research by examining how instructional adaptations at HSIs were associated with both student-level and course-level outcomes. Using multiple data sources with different units of analysis may enable us to triangulate stronger conclusions about online learning during the pandemic; just as importantly, it can tell us which conclusions *fail* to triangulate. In our study, we found that different sources of data told contradictory stories about how these adaptations did or did not advance educational equity.

The present study

California State University, Monterey Bay (CSUMB) was uniquely positioned to help address some of these questions. The university has an ongoing faculty development program to support a major curricular reform—specifically, the implementation of course-based undergraduate research experiences across the sciences and humanities. Every semester, faculty and staff collaborate to conduct surveys of student experiences in courses where these curricular changes have recently been implemented, or in courses where such changes are planned for an upcoming semester. In Spring 2020, we used this existing data collection architecture to examine student perceptions of faculty members' instructional adaptations in the early months of the pandemic. Using a dataset from 10 different courses across the biological, physical, and social sciences as well as the humanities, we asked:

1. What types of instructional adaptations did students notice in their courses?
2. At the student level, which instructional adaptations were positively associated with self-reported motivational gains and other affective outcomes?
3. At the course level, which instructional adaptations were negatively associated with "equity gaps" in an institutionally reported learning outcome (course grades)?

By answering these questions, we can begin to understand how different outcome metrics and different units of analysis might lead us to tell different stories with different implications for higher education policy and practice.

Methods

We used mixed methods to investigate our research questions, conducting a qualitative content analysis to answer research question #1 and quantitative correlational analyses to answer questions #2 and #3. Using qualitative methods enabled us to identify unexpected or unforeseen categories of instructional adaptations as perceived by students; for instance, we did not initially expect a category of "demonstrated patience" to emerge from the data, yet this category became apparent during our analyses. Meanwhile, using quantitative methods enabled us to add to previous literature by specifically relating qualitatively derived categories to quantitative student outcome measures. In doing so, we were able to look for effects and patterns that might be missed in purely qualitative or purely quantitative studies.

Some researchers have enlisted undergraduate students themselves in conducting research on student perspectives during COVID-19. For example, Barber et al. (2021) enlisted students in designing a survey to generate data about their peers' experiences during the pandemic. Such an approach is invaluable because it can generate original questions and novel insights that might be overlooked by researchers who approach the study from a different standpoint (Harding, 1992). In our study, half of the research team were undergraduate researchers while the remaining half were university staff or faculty.

Context

Participants were undergraduate students at CSUMB, a midsize public four-year Hispanic Serving Institution in the western United States. The institution serves over 6,000 undergraduates and approximately 43% are residents of the tri-county area surrounding the university campus. During the Spring 2020 semester, approximately 53% of undergraduates were first-generation college students. Approximately 44% identified as Hispanic or Latinx and approximately 29% as Non-Hispanic White, while an additional 4% identified as African American, 8% as Asian American, 1% as Native American or Alaska Native, 1% as Native Hawaiian or Pacific Islander, and 8% as Multiracial. Nearly one-third of CSUMB undergraduates came from low-income families (CSUMB IAR, 2020).

This project was conducted under research protocol CPHS 21-052-K122. As mentioned above, pre- and post-course surveys are regularly conducted with students in many CSUMB courses that have recently undergone curricular reforms, or in courses where such reforms are planned for future semesters. Students provide informed consent during the administration of these surveys. The pre-course survey collects a small amount of demographic information and baseline information about students' career goals; the post-course survey is more extensive and collects information about student experiences in (and perceived outcomes of) coursework. In Spring 2020, an open-ended question was added at the beginning of the post-course survey to elicit students' perceptions of the ways instructors adapted their teaching practices in response to the COVID-19 pandemic. Our analysis focuses on this post-course survey data.

The survey was administered to students via email or during synchronous online course meetings between April 20 and May 20, 2020. A total of 452 students started the survey, and there were 308 complete or mostly complete[3] responses attributed to 19 different courses.

As we were interested in understanding potential variation across different courses, we chose to conduct quantitative analyses using only the responses from courses with at least 10 complete or mostly complete responses. Ultimately, we analyzed 274 responses from students in 10 different courses, out of a total of 686 students enrolled in these courses (thus our survey response rate was 40%). Most of these courses had already undergone curricular reforms converting them into course-based undergraduate research experiences, or CUREs. However, a few were courses where instructors *intended* to implement CUREs during the following academic year. To preserve instructors' confidentiality, we aggregated responses by disciplinary area in our analysis: three Social Sciences and Humanities courses, four Biological Sciences courses, and three Math and Physical Sciences courses. Course enrollment numbers and survey response rates for each disciplinary area by student ethnicity and by combined racial/ethnic identity are shown in Table 1.

We also asked students about demographic data such as Hispanic ethnicity and racial identity. In addition to comparing Hispanic and non-Hispanic student outcomes, we were interested in outcomes among the broader category of all students with historically marginalized racial identities. However, we elected not to use the category "underrepresented minority" because these students are, in fact, a majority in many higher education settings (including our own). We also wished to avoid this term because it typically excludes Asian American students, implicitly contributing to a so-called "model minority myth" while obscuring unique forms of racism faced by Asian American students and considerable heterogeneity in college enrollment and outcomes among students of various Asian ethnicities and nationalities (Museus & Kiang, 2009).

Instead, we used the category "Students of Color" to denote all students who are likely to have experienced inequities caused by systemic racism or colonialism. For this reason, we combined data on racial and ethnic identity, categorizing survey respondents as Students of

[3] Mostly-complete responses were those that did not complete the entire survey but did answer all ten questions about motivational gains and personal gains, the two student-level outcome variables we consider in this study.

Color if they identified as Native American[4] or Alaska Native, Asian, Black, or African American, Native Hawaiian or Pacific Islander, Multi-racial, or any other identity other than White, *and/or* if they identified as Hispanic. Thus, in our analyses the category "Students of Color" always includes all self-identified Hispanic students, even those who self-identified their racial identity as White.

We recognize the complexity of Hispanic or Latinx ethnicity and the diverse *Latinidades* encompassed by this label (Aparicio, 2017; Román et al., 2022), including but not limited to Afro-Latinx, Indigenous, Multi-racial, and White identities as well as dozens of ethnicities and nationalities (Blackwell, 2017; Dowling, 2017; Hernández, 2017). We do not wish to elide or obscure this diversity. We merely use the combined "Students of Color" category to indicate that, in our analysis, we are interested in equity gaps between *students who are typically disadvantaged by any mechanism(s) of systemic racism* in comparison to *students who are typically privileged by systemic racism*. All students who were not classified as "Students of Color" will be referred to as "non-Hispanic White students" throughout the remainder of this manuscript. Students who were missing *both* racial identity *and* ethnic identity data were excluded from our analyses.

[4] We also acknowledge that using terms such as Native American, Alaska Native, or Native Hawaiian to describe *racial* categories rather than membership in indigenous *nations* is problematic. Racialized concepts of indigeneity and "blood quantum" have historically formed an important part of colonizers' efforts to steal indigenous land and deny indigenous sovereignty, although some indigenous nations have also historically used these concepts to protect their land and resources from further unjust expropriation (Teves et al., 2015).

Table 1

Student Demographic Data by Discipline (Course Enrollees versus Survey Respondents)

		Ethnicity			Combined Racial/Ethnic Identity		
	N	**Hispanic**	**Non-Hispanic**	**Ethnicity Missing**	**Students of Color***	**Non-Hispanic White**	**Race and Ethnicity Missing**
Social Sciences / Humanities (3 courses)							
Course Enrollments	182	50%	39%	11%	65%	24%	11%
Survey (55% response)	101	63%	35%	2%	79%	21%	0%
Biological Sciences (4 courses)							
Course Enrollments	260	36%	53%	11%	52%	37%	11%
Survey (47% response)	122	42%	56%	3%	59%	39%	3%
Math / Physical Sciences (3 courses)							
Course Enrollments	244	39%	49%	11%	56%	32%	11%
Survey (21% response)	51	35%	55%	10%	71%	20%	10%
Total (10 courses)							
Course Enrollments	686	43%	45%	12%	59%	28%	12%
Survey (40% response)	274	48%	48%	4%	69%	29%	3%

* Includes students who self-identified as Asian, Black, or African American, Native Hawaiian or Pacific Islander, Native American or Alaska Native, Multi-racial, and all others who did not identify as White students, as well as all students who self-identified their ethnicity as Hispanic.

Compared to the CSUMB student body, course enrollment data showed that Hispanic students were slightly over-represented in our Social Sciences and Humanities courses and slightly under-represented in our Math and Physical Sciences courses. Students of Color were slightly under-represented in both our Biological Sciences courses and our Math and Physical Sciences courses compared to the CSUMB student body as a whole.

Survey response rates were far higher in Social Sciences and Humanities courses (55%) and in Biological Sciences courses (47%) than in Math and Physical Sciences courses (21%). Ninety-six percent of survey respondents self-identified their ethnicity (as either Hispanic or Non-Hispanic) while only 87% self-identified a racial identity. Most students who answered the ethnicity question but not the race question identified their ethnicity as Hispanic; this pattern is unsurprising, since previous survey studies have found that separating questions about Hispanic or Latinx ethnicity from questions about racial identity tends to increase non-response rates to racial identity questions among persons who identify as Hispanic or Latinx (see for example Hirschman et al., 2000). In our study, since we categorized self-identified Hispanic students as Students of Color in our racial equity gap analyses, data on the combined racial/ethnic identity variable was available for 97% of all respondents.

Hispanic students, and Students of Color in general, were disproportionately likely to complete the survey in Social Sciences and Humanities courses but were slightly less likely than their Non-Hispanic White peers to complete the survey in Biological Sciences and Math and Physical Sciences courses.

Instructional adaptations

To answer research question #1, regarding the type(s) of instructional adaptations noticed by students, the following open-ended item was added to the Spring 2020 administration of our survey:

> We know that this has been a difficult semester for everyone given the ongoing public health crisis. We are interested in learning what actions your instructor(s) took to help support you and your peers during this time, and how helpful you felt these actions were.
>
> In the spaces below, please list any action(s) which your instructor took to support you **DURING THE TRANSITION TO ONLINE INSTRUCTION (before and during Spring Break).** You can list up to 5 actions. Please list each action on a separate line.

An additional item was included immediately thereafter, replacing the phrase "DURING THE TRANSITION TO ONLINE INSTRUCTION (before and during Spring Break)" with the phrase "AFTER THE TRANSITION TO ONLINE INSTRUCTION (after Spring Break)." Thus, participants were prompted to list up to 10 different adaptations their instructors had enacted. On average, each participant listed about three adaptations.

To identify the types of instructional adaptations students reported, open-ended responses were coded by the authors using an inductive approach to conventional content analysis (Carley, 1993; Hsieh & Shannon, 2005). We used this method (as opposed to alternative methods such as grounded theory) because we were interested in categorizing the data rather than engaging in comprehensive theory-building (Cho & Lee, 2014). Initially, four members of the research team were each given the set of all statements (23 text strings) submitted by the first five survey respondents. At this stage, these research team members did not have access to other attributes of the data such as the identity of the course that produced the data, participant-level demographic variables, or the helpfulness ratings participants had associated with each of the text strings. Research team members independently developed in vivo codes to summarize these responses (Saldaña, 2012), identifying broader themes which linked similar responses. A fifth member of the research team reviewed these themes and integrated them into a single codebook, which the full research team discussed and revised. This codebook is shown in Table 2.

Table 2
Types of Instructional Adaptations Reported by Students

Adaptation	Definition	Example #1	Example #2
Ensured access to class resources	The instructor took actions that increased student access to class resources, e.g., by sending the class extra instructional videos or online resources or showing students how to use tech tools such as Zoom.	Made videos on Youtube lecturing the different chapters we were learning that week.	making content for the course easily accessible
Ensured access to instructor time	The instructor took actions that increased student access to the instructor, e.g., by providing extra office hours or by providing unstructured time after class Zoom meetings for students to speak with their professor.	She would always stay after class to answer any questions we had.	Held Zoom Office Hours
Ensured communication	The instructor took actions that increased their overall communication with students, e.g., by sending frequent or regular email updates.	weekly email updates	keep in touch
Demonstrated flexibility	The instructor took actions to change course requirements, e.g., by postponing deadlines or allowing alternative format(s) for an assignment. Also includes any action the student calls "flexible," e.g., flexible meeting times.	He took the time and allowed an extension on a paper I was really struggling on.	offering extra time to finish assignments for those struggling with mental health issues
Demonstrated patience	Students perceived their instructor as "patient," "compassionate," "considerate," "empathetic," "understanding," or "wanting to understand" what students were experiencing.	Being understanding of our situations	be understanding
Other adaptations	The instructor took actions that did not fall clearly into any of the other five categories of adaptations.	following her gut for the interest of her students' sanity	Surveys to see how we were doing

Next, three members of the research team coded all text strings submitted by all respondents to the survey, including respondents who did not complete most of the survey but who answered the question about instructor responses to COVID-19. Some responses received more than one code. Finally, all coding was reviewed and discussed by at least two members of the research team to resolve disagreements.

Next, we created categorical variables at the level of the individual student to signify whether a student reported *any* instructional adaptations of a particular type. Thus, if a student listed three instances of *ensured communication* and two instances of *demonstrated patience*, for a total of five adaptations altogether, they would receive a rating of 1 for the categorical variables *ensured communication* and *demonstrated patience* and a rating of 0 for the categorical variables *ensured access to class resources, ensured access to instructor time*, *demonstrated flexibility*, and *other adaptations.*

Course outcomes

Students' perceptions of motivational gains in their coursework were measured using a set of items adapted from the Science Motivation Questionnaire II (SMQ II) (Glynn et al., 2011). The term "science" was replaced in each item with the names of the department offering the relevant course. Responses used a five-point, single-construct Likert-type scale ranging from "not more likely" to "extremely more likely."

> Compared to BEFORE doing research in this course, HOW LIKELY ARE YOU NOW to agree with the statement:
> 1. Learning [Biology, Mathematics, etc.] is interesting.
> 2. I am curious about new developments in [Biology, Mathematics, etc.]
> 3. Learning about [Biology, Mathematics, etc.] is relevant to my life.
> 4. Learning about [Biology, Mathematics, etc.] makes my life more meaningful.
> 5. Learning about [Biology, Mathematics, etc.] will help me get a good job.

Self-reported personal gains, which students derived from the courses, were measured using slightly modified items from the Undergraduate Research Student Self-Assessment (URSSA) (Weston & Laursen, 2015). The URSSA is a measure of self-reported student gains in several domains; we focused on the domain of *personal gains*, which includes five items such as "confidence in my ability to contribute to science," "ability to work independently," and "confidence in my ability to do well in future science courses," rated on a five-point Likert-type scale from 1 ("No gain") to 5 ("Great gain"). We adapted these items by substituting the name of the department in which each CURE was offered, e.g., "confidence in my ability to contribute to the discipline of [Biology, Mathematics, etc.]."

We did not have access to grade data for individual survey respondents. However, we did have access to course-level institutional data that included average course grades and equity gaps. Since instructors widely reported changing their course expectations for students in response to the pandemic (Johnson et al., 2020; Zuckerman et al., 2021), we decided not to directly compare average course grades from Spring 2020 with grade data from previous semesters. Instead, we examined various equity gaps in Spring 2020 and compared these with previous semesters—asking not whether learning outcomes were *higher or lower* than in previous terms, but whether they were *more or less equitable* than in previous terms. We also chose to compare Spring 2020 to previous *Spring* semesters—Spring 2019 and Spring 2018—because several of these courses have historically been offered in Spring but not Fall semesters.

Equity gaps were computed by subtracting the mean course GPA (on a four-point scale) of an historically marginalized category of students from the mean course GPA of an historically relatively privileged comparison category. For example, if Non-Hispanic White students in a given course had an average final grade of 3.7 and Students of Color in the same course had an average final grade of 3.5, the equity gap between these two categories of students would be +0.2. This meant that equity gaps could also be negative; for instance, if non-Hispanic students in a course had an average final grade of 3.2, and Hispanic students in the same course had an average final grade of 3.35, the equity gap between these two categories would be -0.15.

Given the widespread use of credit/no credit grading at many institutions during the first semester of the COVID-19 pandemic, it is possible that equity gaps may have been affected by students who elected to take courses credit/no credit rather than being assigned a letter grade that would factor into their GPA. We tested this possibility and found the proportion of students who elected a credit/no credit option was relatively low: on average, only 15% of the students in these 10 courses chose this option. This ratio was relatively consistent across disciplines: letter grades were ultimately awarded to 88% of students in the three Social Sciences or Humanities courses in our study, 82% of students in the four Biological Sciences courses, and 86% of students in the three Math or Physical Sciences courses. However, in the previous Spring 2018 and Spring 2019 offerings of these classes, 100% of students in all 10 courses had taken these courses for a letter grade. The increased use of credit/no credit grading is thus an important limitation of our equity gap analysis. Given the low number of courses (n = 10), we elected to share median, minimum, and maximum values for course-level outcomes rather than mean values.

Findings

Table 3 shows the proportion of survey respondents who reported each type of instructional adaptation, disaggregated by ethnicity (Hispanic vs. Non-Hispanic) and by combined racial/ethnic identity (Students of Color vs. Non-Hispanic White students). Table 3 also shows the mean motivational and personal gains reported by students in each category. Respondents who were missing both race data and ethnicity data are excluded. (Course-level median, minimum, and maximum values for these variables, including values for students missing race and ethnicity data, can be found in the “Descriptives” column of Table 5.)

Table 3
Student-Level Means of Instructional Adaptations and Student Gains, by Ethnicity and Combined Race/Ethnicity (Survey Respondents)

	Mean (SE)			
	Ethnicity		**Combined Racial/Ethnic Identity**	
Variable	**Hispanic (n = 133)**	**Non-Hispanic (n = 131)**	**Students of Color (n = 188)**	**Non-Hispanic White Students (n = 78)**
Ensured Access to Class Resources	0.50 (0.04)	0.60 (0.04)	0.54 (0.04)	0.59 (0.06)
Ensured Access to Instructor Time	0.41 (0.04)	0.33 (0.04)	0.38 (0.04)	0.33 (0.05)
Ensured Communication	0.52 (0.04)	0.55 (0.04)	0.49 (0.04)	0.64 (0.06)
Demonstrated Flexibility	0.75 (0.04)	0.80 (0.04)	0.78 (0.03)	0.77 (0.05)
Demonstrated Patience	0.30 (0.04)	0.18 (0.03)	0.27 (0.03)	0.15 (0.04)
Other Adaptations	0.23 (0.04)	0.22 (0.04)	0.21 (0.03)	0.26 (0.05)
Motivational Gains	4.09 (0.09)	3.81 (0.10)	3.98 (0.08)	3.90 (0.12)
Personal Gains	3.61 (0.08)	3.47 (0.08)	3.53 (0.07)	3.60 (0.10)

Note. Includes survey respondents with non-missing demographic data (96% of respondents reported an ethnicity, while 97% reported either an ethnicity, a race, or both). For presence of instructional adaptations, mean values represent percentage of respondents who reported the adaptation, e.g., 0.51 represents 51% of respondents.

The most widely reported type of instructional adaptation was *demonstrated flexibility*, and the proportions of students who reported this adaptation did not differ significantly between Hispanic and Non-Hispanic students ($t(262) = -0.97$, $p = .34$, two-tailed) nor between Non-Hispanic White students and Students of Color ($t(264) = -0.22$, $p = .82$, two-tailed). We also found that Hispanic students reported their instructors *demonstrated patience* at significantly rates higher than Non-Hispanic students ($t(262) = 2.40$, $p < .05$, two-tailed) and reported higher motivational gains ($t(262) = 2.07$, $p < .05$, two-tailed). In comparing Students of Color with Non-Hispanic White students, we found that Non-Hispanic White students reported their instructors *ensured communication* at higher rates than Students of Color ($t(264) = 2.27$, $p < .05$, two-tailed).

Table 4 shows the student-level correlations between each specific type of instructional adaptation and students' self-reported motivational or personal gains, disaggregated by ethnicity (Hispanic vs. Non-Hispanic) and by combined racial/ethnic identity (Students of Color vs. Non-Hispanic White students). Respondents who were missing both race data and ethnicity data are excluded.

Table 4

Student-Level Correlations of Instructional Adaptations and Student Gains, by Ethnicity and Combined Race/Ethnicity (Survey Respondents)

	Correlations: Hispanic		**Correlations: Non-Hispanic**		**Correlations: Students of Color**		**Correlations: Non-Hispanic White**	
Variable	**Motivational Gains**	**Personal Gains**	**Motivational Gains**	**Personal Gains**	**Motivational Gains**	**Personal Gains**	**Motivational Gains**	**Personal Gains**
Ensured Access to Class Resources	0.26**	0.18*	- 0.01	0.00	0.15*	0.14	- 0.01	- 0.02
Ensured Access to Instructor Time	0.25**	0.24**	0.19*	0.18*	0.29**	0.25**	0.06	0.09
Ensured Communication	0.09	0.09	0.11	0.09	0.13	0.11	0.06	0.03
Demonstrated Flexibility	0.08	0.04	- 0.08	0.10	0.00	0.05	- 0.04	0.10
Demonstrated Patience	- 0.04	0.10	- 0.03	0.07	- 0.05	0.09	0.08	0.12
Other Adaptations	- 0.20*	- 0.04	- 0.13	0.08	- 0.15*	0.01	- 0.18	0.02
Motivational Gains	-	0.63**	-	0.64**	-	0.63**	-	0.64**
Personal Gains	-	-	-	-	-		-	-

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed). Correlations are calculated using Spearman's rho.

Table 4 shows that two specific types of instructional adaptations, *ensured access to class resources* and *ensured access to instructor time*, were positively and significantly associated with motivational gains and personal gains for Hispanic students, and *ensured access to instructor* time was also positively and significantly associated with motivational gains and personal gains for non-Hispanic students. When looking at Students of Color as a broader category, however, the association with *ensured access to class resources* appeared somewhat diminished, whereas the association with *ensured access to instructor time* appeared to be even stronger. Meanwhile, neither of these types of adaptations was associated with motivational or personal gains reported by Non-Hispanic White students.

Table 5 shows course-level median, minimum, and maximum values for the percentage of students who reported each type of instructional adaptation and for motivational and personal gains. It also shows median, minimum, and maximum equity gaps across all 10 courses in the Spring 2018, Spring 2019, and Spring 2020 semesters. Finally, the last two columns show how each of these variables is correlated with equity gaps between Hispanic and Non-Hispanic students and between Students of Color and White Non-Hispanic students in Spring 2020.

Table 5
Course-Level Medians and Correlations of Instructional Adaptations, Student Gains, and Equity Gaps

	Descriptives	Correlations with Equity Gaps in Spring 2020	
Course-Level Variable	**Median (Min, Max)**	**Hispanic vs. Non-Hispanic**	**Students of Color vs. White Non-Hispanic**
% Respondents Reporting Adaptation in Spring 2020			
Ensured Access to Class Resources	57% (43%, 75%)	- 0.33	- 0.37
Ensured Access to Instructor Time	33%% (0%, 75%)	0.15	0.47
Ensured Communication	53% (31%, 90%)	- 0.10	- 0.10
Demonstrated Flexibility	78% (64%, 94%)	- 0.09	- 0.38
Demonstrated Patience	16% (4%, 60%)	- 0.19	- 0.16
Other Adaptations	25% (8%, 39%)	0.40	0.23
Gain Scores in Spring 2020			
Motivational Gains	4.15 (2.63, 4.45)	- 0.38	0.06
Personal Gains	3.52 (2.64, 4.34)	- 0.33	0.20
Equity Gap (Hispanic vs. Non-Hispanic)			
Spring 2018	0.16 (0.02, 0.50)	0.36	0.75*
Spring 2019	0.35 (- 0.38, 1.06)	0.59	0.65*
Spring 2020	0.06 (- 0.44, 0.53)	-	0.69*
Equity Gap (Students of Color vs. Non-Hispanic White)			
Spring 2018	0.43 (- 0.01, 0.88)	- 0.15	0.19
Spring 2019	0.55 (- 0.07, 0.91)	0.13	0.42
Spring 2020	0.14 (- 0.26, 0.31)	0.69*	-

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed). Course-level values (N = 10) calculated based on survey respondents (% respondents within this course reporting adaptation; average gain score among respondents in this course) or enrollees (course-level equity gaps) within each course. Correlations are calculated using Spearman's rho. Comparisons exclude students for whom neither race nor ethnicity data were available.

None of the relationships between instructional adaptations and Spring 2020 equity gaps are statistically significant. This does not necessarily mean these variables are wholly unrelated; our survey response rates were relatively low in most courses, making it difficult to make compelling claims based on these correlations. We merely *failed* to find statistically significant evidence that these variables *are* related. Yet we argue it is still important to examine these data, since they complicate our interpretation of the student-level survey results.

Finally, Table 5 also shows that *ethnic* equity gaps in all three years were correlated with the size of *racial* equity gaps in 2020. In other words, courses with larger gaps in GPA between Hispanic students and non-Hispanic students in earlier years tended to show larger gaps between Students of Color and Non-Hispanic White students in 2020. Interestingly, though, the size of Hispanic/Non-Hispanic equity gaps in earlier years did not predict the size of the Hispanic/Non-Hispanic equity gap in 2020, nor did the size of the Students of Color/Non-Hispanic White student equity gaps in earlier years predict the size of this gap in 2020. This suggests that there were substantial fluctuations in the equity gaps over time, raising the possibility that some of this fluctuation is obscuring relationships that might otherwise be visible in our data.

Discussion

We were concerned that, given the systemic inequities exacerbated by the pandemic, we might find increases in various types of equity gaps in course grades during Spring 2020. We were also concerned that historically marginalized students (e.g., Hispanic or Latinx students or Students of Color more broadly) may have had less access to instructional adaptations or weaker motivational and personal gains during these difficult months. Happily, we found that this did not appear to be the case. Many equity gaps shrank in comparison to the same courses taught in previous years (although this pattern could be partially explained by the increased use of credit/no credit grading during the pandemic). Furthermore, we found that Hispanic or Latina/o/x students reported their instructors *demonstrated patience* with them at even higher rates than non-Hispanic students, and on average, Hispanic or Latinx students in our survey reported even greater motivational gains from these courses compared with their non-Hispanic peers. We found this encouraging.

However, these results must be interpreted with caution. For example, it was often difficult to infer from students' responses what specific actions instructors had taken which constituted *demonstrat[ing] patience*. Causal relationships involving this variable could conceivably flow in either direction: some instructors may have taken actions which demonstrated patience and thereby supported students' well-being, but it is also possible that students who felt for any reason that instructors cared about their well-being may simply have been more likely to ascribe the quality of patience to these instructors.

In general, our qualitative findings strongly echoed those of Vielma and Brey (2021) mentioned above, who found that HSI engineering students identified instructor availability, high-quality online resources, clear communication, and expressions of compassion as instructional adaptations that they either experienced or wished they had experienced. One additional adaptation that students described, *demonstrat[ing] flexibility*, echoed the findings of studies in non-HSI contexts such as Prokes and Housel (2021) or Pagoto et al. (2021). Our dataset enabled us to extend such findings by matching them to multiple specific courses and to both institutional and student-reported outcome data.

Students across many different courses reported several additional types of adaptations their instructors made in response to the pandemic. In parallel with the findings of faculty surveys (Johnson et al., 2020), many of our students reported that instructors *demonstrated flexibility* in terms of due dates and requirements for course assignments. This was the most commonly and consistently reported type of adaptation. Meanwhile, in parallel with the findings of other student surveys (Means & Neisler, 2021), many of our students reported that instructors also helpfully *ensured communication* during and following the transition to online learning. For instance, faculty responded quickly to academic or school-related queries or reached out frequently to the whole class via email. Students mentioned weekly email updates or "walk-through" emails that gave overviews of course requirements or content, clarifying instructor expectations for students during a time of uncertainty and transition. These findings are in keeping with past research on U.S. higher education in times of crisis, which has shown that many (but not all) faculty have historically made similar adaptations (DiPietro, 2003; Huston & DiPietro, 2007; Linsenmeyer & Lucas, 2017).

Two other important types of instructional adaptations that students reported were *ensur[ing] access to class resources* and *ensur[ing] access to instructor time*. *Ensuring access to class resources* manifested in several ways; for example, sharing instructional videos and other resources on online platforms, or showing students how to use new tech tools. Some students mentioned they found recorded lecture videos, YouTube videos, or online labs to be particularly helpful, as well as digital access to course readings. Students also mentioned occasions when their instructors showed them how to use tech tools such as Zoom. It seems unsurprising that this type of adaptation would benefit students. The popular framework of Universal Design for Learning (UDL) draws on principles from architecture and disability studies to argue that teaching is likely to be most equitable when it represents information in multiple ways, provides students with multiple means of engagement, and provides students with multiple ways to express and communicate their thinking (CAST, 2018; King-Sears, 2009). Although online-only instruction during the pandemic may have limited students' means of engagement or communication, access to class resources in a wide variety of formats may have provided multiple forms of representation and may even have provided several new means of engagement. Thus, increased access to class resources could have supported positive outcomes for Hispanic students and for Students of Color more broadly.

Ensuring access to instructor time involved instructors providing extra office hours or unstructured time to interact with students in one-on-one or small group video conference conversations. Increased access to the instructor (e.g., through extra office hours) may have provided increased opportunities for students to learn about connections between the course content and their everyday lives, as well as opportunities to have their interests validated and reinforced. One-on-one interaction might also have helped instructors and students get to know each other and build positive relationships, which could have increased students' social motivations to engage with their coursework and perceive it as meaningful and interesting. Such interactions could differentially benefit Students of Color by mitigating some of the harmful impacts of "belonging uncertainty"—a common phenomenon in which systemic racism and insufficiently supportive campus environments generate self-doubt and impede the formation of positive relationships (Fink et al., 2020; Thiem & Dasgupta, 2022). Pre-pandemic research suggested that students often lack clarity about the purpose of office hours and feel they are not worth the effort to attend in person (Smith et al., 2017). However, during the pandemic, with in person interactions reduced to zero, students may have felt an increased desire to seek out interaction with faculty.

We found that both *access to class resources* and *access to instructor time* were positively and significantly correlated with the student-level gains reported by Hispanic students. When looking at Students of Color more broadly, *access to class resources* showed a smaller correlation with motivational gains and only a non-significant correlation with personal gains. Meanwhile, *access to instructor time* showed correlations with motivational and personal gains for Students of Color. These patterns do not necessarily imply causal relationships; for example, perhaps students in certain courses were (for unknown reasons) more likely to *notice and later* *recall* resources available for online learning, and these same unknown reasons might have driven more equitable outcomes in these courses. On the other hand, this pattern *could* represent a causal relationship. With this ambiguity in mind, one story we could tell based on our findings is that *providing students with substantial and deliberate access to instructor time (e.g., extra office hours) may be an especially valuable way to support Hispanic students and other Students of Color during a crisis, and providing access to class resources (e.g., high-quality online course videos) may be valuable for these students as well*.

However, a different story began to emerge when we looked at institutional, course-level outcome data. In these data, no type of instructional adaptation was significantly correlated with equity gaps—but the non-significant relationships among variables were suggestive. While four of the five specific adaptations students reported were negatively associated with equity gaps, there was one exception: the proportion who said their instructor *ensured access to instructor time* was positively associated with equity gaps. Thus, if our study had relied on course-level outcome data, we might have told a very different story: *providing students with access to class resources, consistent communication, etc. may be valuable ways to support equity during a crisis, but providing students extra access to instructor time is associated with* less *equitable course outcomes.*

How are we to resolve these seemingly very different stories about access to instructor time? We might begin by noting that this adaptation was relatively rare. There was only one course in which more than 50% of students mentioned *access to instructor time*, and in another course, no students reported this type of adaptation at all. There are several possible explanations for this finding. Faculty members may have offered extra office hours or stayed after class to meet with students during the pandemic, but if students themselves did not have sufficient time to take advantage of these opportunities, such adaptations may not have been salient or memorable enough to be reported in response to our survey question. Alternatively, it is possible that some faculty members were unable to offer considerable extra time to make themselves available to students; while several of the reported adaptations were likely time-consuming for faculty, *ensuring access to class resources* would likely benefit all students in a classroom at once, while *ensuring access to instructor time* adaptation was more likely to benefit only one or a few students at a time. Faculty may therefore have prioritized adaptations that seemed more time efficient.

We do not mean this as a criticism of faculty members; many instructors may have wanted to devote the necessary time to provide office hours or one-on-one meetings with students but may simply have been unable to do so given the time constraints generated by intensive teaching loads, large class sizes, and the casualization of teaching roles (Leathwood & Read, 2020). The logistical limitations on students' access to instructor time might help explain why this adaptation was not associated with reduced equity gaps; unless extra time with instructors was *available to, utilized by, and beneficial for* most or all students who are struggling in a course, this adaptation would not be expected to reduce equity gaps. Furthermore, the relationships we found are not necessarily causal; perhaps students who simply enjoyed the course were more likely to take advantage of office hours *and* more likely to feel like they had gained something valuable from their experiences. Individual students' enjoyment might not necessarily influence course equity gaps in a statistically significant way.

There are strong theory-driven reasons to suspect that students probably benefited from *both* the new instructional resources provided by faculty *and* the extra time faculty provided to meet with students. Readers might infer that both new resources and the provision of extra office hours are beneficial interventions in a crisis, and they might recommend that faculty use these in future crises. However, we do not necessarily make these recommendations—at least, not in a vacuum separated from the context of higher education policies and labor practices. There are a finite number of hours in a day, and we are acutely aware that many instructors may be unable to develop new resources or meet individually with many students if their class sizes are too large, if their teaching loads are too intense, or if they are adjuncts who must deal with responsibilities and time commitments spread across multiple institutions. With this in mind, we advocate for the use of evidence-based practices to support student success within the constraints of what is reasonable and feasible for faculty. Even more importantly, we argue that higher education administrators and policymakers must proactively allocate sufficient resources so that course sizes, teaching loads, and instructor roles ensure faculty have adequate time and resources to implement such practices, both now and in future crises.

Limitations

An important methodological limitation of the study is the use of content analysis to code very short text strings into researcher-derived categories for quantitative analysis. Jackson and Trochim (2002) have critiqued the reliability and validity of such methods, pointing out the lack of context often present in such short responses as well as other methodological concerns. To help address this concern, all responses in our study were coded by at least two undergraduate student researchers who had themselves recently experienced CSUMB instructors' adaptations to COVID-19, increasing the likelihood that coders would be familiar with the context of survey responses. However, conclusions drawn from our analysis should still be interpreted cautiously.

Equity gaps are an important but imperfect outcome measure, in part because they focus on only a single conception of equity while other comparably important conceptions go unmeasured (for a discussion of alternative conceptions of equity, see Gutiérrez, 2012). It is also possible–indeed, likely–that the decision of approximately 15% of students to take their courses credit/no credit may have reduced equity gaps in comparison to previous years. Furthermore, instructors or instructional teams in several courses changed from 2018 to 2019 or from 2019 to 2020 (although teaching teams remained consistent in most of the courses in our study). Thus, some of the variation in equity gaps may have been influenced by year-to-year variation in instructors or in grading policies. Such effects are—with our limited dataset—impossible to distinguish from effects driven by changes in instructional practices.

Finally, many quantitative outcome measures may be suspect during the pandemic. Readers may wonder whether reduced equity gaps "really" represent more equitable outcomes in terms of student learning, or whether they are instead an artifact of increased measurement error as some instructors became more flexible and created multiple paths for students to meet the grading requirements of their courses. In response, we might argue that instructor flexibility and multiple paths to success are often fundamental features of high-quality instruction that tend to promote equitable outcomes (see, for example, Cohen & Lotan, 1997). In other words, while it is certainly possible—indeed, likely—that the disruptions caused by the pandemic introduced greater-than-usual uncertainty into measures of student learning and achievement, it is also possible and even likely that many such instructional adaptations may have contributed to more equitable and effective student learning.

We also wish to emphasize the situated-ness of our data in a particular geographic and sociocultural context. Students in the study came from only 10 courses at one public university in the United States that serves a relatively high proportion of first-generation, Pell-eligible, commuter, and Hispanic students. This context could have played a meaningful but as-yet-unstudied role in shaping students' affective experiences of campus closure and adaptations to COVID-19. Our findings may differ from those which may be found at non-HSIs and at institutions with a lower proportion of first-generation, Pell-eligible, and commuter students.

Summary and Future Directions

Our study sought to understand some of the ways that HSI faculty adapted their instruction to support students during an unprecedented crisis, and how student-level and course-level outcomes were associated with these supports. We were pleased to find that several of these adaptations to instructional practices appeared to correlate with better individual student outcomes, especially *ensuring access to class resources* and *ensuring access to instructor time*, but the interpretation of these results was complicated by our analysis of course-level outcomes. We hope future research will expand on such analyses to better investigate the relationship between supports for individual students and classroom-level equity. We also hope that future research will explore how the effects of these instructional practices during the pandemic might relate to students' long-term success and persistence in college. In the meantime, we hope these insights can be useful for instructors, university administrators, and higher education policymakers—not only in preparing for future crises, but also in working to make higher education more just, equitable, and humanizing today.

We hoped to identify strategies that we could recommend faculty implement to support students during future crises. However, our findings also reminded us that teaching and learning do not unfold in a vacuum. Ensuring student access to instructors' time was significantly associated with motivational and personal gains for individual racially marginalized students, but it did not appear associated with racial equity at the classroom level. Ensuring access to class resources was also associated with motivational and personal gains for individual racially marginalized students, but more weakly, and it too was not significantly associated with racial equity at the classroom level. Both adaptations are likely valuable but are also difficult to implement for faculty with heavy teaching loads or adjunct positions. Thus, while we recommend that faculty work to ensure students' access to class resources and instructor time during future crises, we cannot make this recommendation without also arguing that higher education leaders and policymakers must collaborate to create working conditions in which faculty are *able* to make such adaptations. By understanding teaching and learning as situated in context, we can ease transitions in times of crises and ensure more positive, equitable outcomes for our students.

Declarations

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

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Technologies, Strategies, and Supports Helpful to Faculty in the E-mentoring of Doctoral Dissertations

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Abstract
Prior research has established the importance of the supervisor-doctoral candidate relationship and highlighted the importance of mentoring practices for the successful completion of doctoral theses/dissertations in the online environment. This article presents the findings of a survey with faculty members who work as supervisors in online and blended doctoral programs, and e-mentor students working on dissertations, or did so at a distance as a result of COVID-19. The survey was designed around the five sections of technology use in e-mentoring, strategies related to communications and expectations, strategies related to research processes, strategies related to emotional and social support for students, and institutional support, with a focus on which technologies and strategies faculty found most helpful. The results of the e-mentoring survey are presented and discussed in the context of prior literature and future research.

Keywords: E-mentoring, online supervision, online mentoring, virtual mentoring, faculty strategies

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Online and blended doctoral education has seen steady growth in the last two decades, driven by the spread of online education (Seaman et al., 2018) and the increasing need for terminal degrees in non-academic workplace environments. Doctoral programs are offered completely online or in a blended format (including face-to-face experiences), often enroll cohorts of students, and encompass different dissertation formats (Kumar & Dawson, 2018). Online dissertation supervision or the e-mentoring of students working on dissertations is thus increasingly being practiced and saw universal application during the COVID-19 pandemic when institutions of higher education pivoted to emergency remote or online teaching (Hodges et al., 2020; Kumar & Wisker, 2021). During the continuing COVID-19 pandemic, e-mentoring has, in many ways, eclipsed the traditional relationship held between faculty and graduate students. It has also proven beneficial for many graduate students by improving access to further learning and making graduate studies more manageable for working learners (Jameson & Torres, 2019).

Prior research has established the importance of the supervisor-doctoral candidate relationship and the practices of dissertation chairs to doctoral candidate progress and completion of doctoral theses/dissertations in the online environment (Kumar & Johnson, 2017). Individual studies have highlighted challenges and strategies that work in the e-mentoring of dissertations, as have recent literature reviews (Pollard & Kumar, 2021). This research endeavors to identify the technologies, strategies, and institutional support that faculty have found most helpful in their e-mentoring of doctoral dissertations. Knowledge of strategies that have been most helpful can be valuable to new faculty members embarking on doctoral e-mentoring in online and blended doctoral programs or those adopting e-mentoring due to the ongoing COVID-19 pandemic. The results about helpful institutional support can also better enable institutions to provide resources for faculty as they work remotely or in online and blended doctoral programs.

Literature Review

Although dissertation e-mentoring has been practiced for a while in online and blended doctoral programs, the 2020-21 global COVID19 pandemic brought the imperative for identifying helpful strategies for e-mentoring into much clearer focus. This review of prior research on the e-mentoring of dissertations is organized according to the technology use for dissertation e-mentoring, communication and expectations, e-mentoring and the research process, psychosocial support, and institutional support.

Technology Use for Dissertation e-Mentoring

Obviously, the ability to successfully utilize the technological tools and applications that make e-mentoring possible is a necessity. E-mentors and online doctoral students in prior research have emphasized the importance of “choosing and using appropriate technologies” and using “both synchronous and asynchronous online technologies for different purposes” during the dissertation process (Kumar & Coe, 2017, p. 132). Both doctoral students and mentors in the literature have valued online video conferencing technologies over the years that simulate face-to-face conversations and enable them to communicate with their mentors in real-time, such as Skype, Adobe Connect, Elluminate, Big Blue Button, Google Hangouts, Wimba, and Zoom (Andrew, 2012; Guerin & Aitchison, 2021; Kumar et al, 2013; Kumar et al., 2018; Roumell & Bolliger, 2017; Torka, 2021). Although phone calls have been mentioned in this literature as convenient, especially when technical issues occur, online video conferencing technologies have become increasingly common for one-on-one or group meetings, presentations, feedback and clarification, screensharing, data analysis, and dissertation or proposal meetings. The usefulness of email for asynchronous communication, exchanging drafts, and feedback on those drafts, with track changes or comments in MS Word have also been detailed in the literature (Guerin & Aitchison, 2021; Gumbo, 2019; Kumar & Coe, 2017; Kumar et al., 2018; Roumell & Bolliger, 2017). Although Learning Management Systems (LMSs) have been traditionally used, more recently, students and faculty have utilized technologies such as MS Teams or Slack, and WhatsApp or other social media that integrate several asynchronous, synchronous, and collaborative features (Byrnes et al., 2019; Crosta et al., 2018; Guerin & Aitchison, 2021; Gumbo, 2019; Torka, 2021).

The use of online research databases and bibliographic software, as well as qualitative and quantitative research analysis tools are essential during research processes in dissertations. E-mentors' familiarity with these technologies and their ability to apply and, on occasion, teach them to doctoral students can greatly facilitate research skill development and research implementation (Kumar & Dawson, 2018; Kumar et al., 2020). Researchers have highlighted the value of software for collaborative resource sharing, storage, editing, and the development of research ideas and writing between e-mentors, doctoral students, and research groups in the online environment (Guerin & Aitchison, 2021; Kumar et al., 2018; Kumar et al., 2021). Notwithstanding the various technologies used in e-mentoring, technological anxiety, and unfamiliarity with the online environment can influence e-mentors' abilities to supervise in the online environment, as well as doctoral student satisfaction and success during dissertations completed at a distance (Bolliger & Halupa, 2012; Kumar & Dawson, 2018; Nasiri & Mafakheri, 2015). Distance and blended doctoral programs should therefore include generous amounts of support and tutorials for the use of technology as an essential component of the program to address limited familiarity with applications and tools (Erichsen et al., 2013). Such opportunities must be provided for both faculty and students to improve their digital capabilities in the doctoral learning environment (Zhang et al., 2020).

Communication and Expectations

A recurring theme in Pollard and Kumar's (2021) review of empirical studies in reference to e-mentoring doctoral students was the potential for miscommunication. Their review found that within the virtual e-mentoring relationship, information exchanged may be reduced or confused during online interactions, suffer the loss of non-verbal cues, get lost in the one-way-at-a-time nature of asynchronous communication, and lose clarity due to unknown cultural differences, ultimately leading to misunderstandings. These challenges with miscommunication increase the importance of making sure expectations are clearly articulated and communicated to mentees. Frequent communication and feedback remain the primary forms of support faculty can offer students in the e-mentoring relationship (Kumar & Coe, 2017), and are crucial in establishing trust and positive relationships, encouraging engagement, and offering the requisite guidance and support needed for success.

The foundation of all recommendations for the online environment is frequent and effective communication that build a sense of connection and a relationship between faculty mentor and doctoral mentee, especially because mentees might hesitate to initiate contact or communicate online (Black, 2017; Erichsen et al., 2014; Rademaker et al., 2016). Such communication, be it asynchronous or synchronous, has to be initiated by the e-mentor, and synchronous communications have to be scheduled and structured purposefully by the e-mentor, e.g., in the form of virtual office hours or regularly scheduled meetings (Kumar & Coe, 2017;

Kumar & Johnson, 2019; Nasiri & Mafakheri, 2015). E-mentor availability and flexibility for communications and meetings is also extremely important for doctoral student progress (Byrnes et al., 2019; Kumar et al., 2018). The frequency of meetings can also differ based on the mentee's dissertation stage (Jacobs et al., 2015). Timely, clear, and constructive feedback on writing and drafts are crucial for student progress and success (Byrnes et al., 2019; Erichsen et al., 2014; Kumar & Coe, 2017).

Given the absence of prior e-mentoring experiences and possibility for misunderstanding in the online environment, e-mentors should also make their expectations explicit verbally or in written form when embarking on the e-mentoring of dissertations (Andrew, 2012; Jacobs et al., 2015; Roumell & Bolliger, 2017). These expectations and initial discussions can relate to the e-mentoring process; the roles and responsibilities of the e-mentor and mentee; synchronous and asynchronous communications; modes, netiquette, and a strategy for communication; the availability of the mentor, deadlines and timelines; the types of technologies to be used during the e-mentoring process; and might need to recur and be renegotiated during various parts of the research process (Crawford et al., 2014; Kumar et al., 2018; Kumar & Johnson, 2019; Kumar et al., 2020; Pollard & Kumar, 2021). The discussion of goals and expectations of the e-mentor and mentee is crucial for all e-mentoring relationships, but especially when social and cultural differences are experienced (Berg, 2016; Deshpande, 2017; Nasiri & Mafakheri, 2015).

E-mentoring and Research Processes

The building of e-mentoring relationships has been found to hinge on making expectations explicit and providing clear guidance and structure for the dissertating process (Kumar & Johnson, 2019; Norcross et al., 2020). Faculty members in Kumar and Johnson's (2019) study and students in Kumar and Coe's (2017) study discussed the importance of structure in the online environment—not only to reduce isolation, keep students connected, and ensure productive interactions, but also in the form of research education. In the absence of research apprenticeships or the modeling and emulation of research processes and behaviors in an on-campus environment, structured guidance for research skill development and research implementation is crucial during e-mentoring processes (Kumar & Johnson, 2019; Kumar et al., 2018). Templates, structured writing aids, and exemplars of dissertations or other forms of scholarship can be very helpful to online doctoral students (Kumar & Johnson, 2019; Kumar et al., 2020). E-mentors should also be able to not only share relevant online resources, but also connect their mentees with experts who can help them with their research or provide research interactions in their geographical area (Kumar et al., 2020).

At the same time, students might need different types of structure or support at different points in their writing or research process, therefore resources as well as guidance regarding the dissertation process, research designs, ethical reviews, data analysis (e.g., use of research software), and writing can contribute to their success (Jameson & Torres, 2019; Kumar et al., 2018). Guerin and Aitchison (2021, p. 626) also emphasize "the need for explicit instruction to develop research writing skills" in the online environment. In addition to timely and constructive feedback, several researchers have also highlighted the usefulness of peer reviews and peer critiques of writing among candidates in the online environment (Byrnes et al., 2019; Guerin & Aitchison, 2021; Kumar & Coe, 2017; Nasiri & Mafakheri, 2015). Finally, opportunities to engage in collaborative research, publications, and presentations with their e-mentors can contribute to online doctoral student success (Roumell & Bolliger, 2017).

Psychosocial Support

In this paper, we employ the term *e-mentoring* as encompassing "the various roles played by faculty with respect to the academic, professional, psychosocial, and cognitive development of students" (Kumar & Johnson, 2019, p. 270). While the dissertation process can be a difficult and lonely endeavor even in on-campus programs, psychosocial support is especially important for doctoral students in the online environment where the absence of academic interactions, community, and embeddedness in a research-rich environment cause feelings of disconnect and isolation (Andrew, 2012; Erichsen et al., 2014; Pollard & Kumar, 2021; Roumell & Bolliger, 2017). Mentor responsiveness and feedback, the cultivation of trust, the expression of care and concern for the mentee, discussion of well-being, and awareness and consideration of cultural, social, and individual differences can be helpful to mentees (Berg, 2016; Deshpande, 2017; Jacobs et al., 2015; Kumar & Coe, 2017; Yob & Crawford, 2012). Interpersonal relationships between e-mentors and their mentees have assumed even more importance for mentee well-being and progress during the COVID-19 pandemic (Bendrups et al., 2021).

E-mentors' facilitation of relationships between mentees and connections with institutional resources have also been reported as beneficial to mitigate feelings of isolation and contribute to dissertation progress in the literature (Kumar et al., 2018; Kumar et al., 2021). Outcomes of peer e-mentoring, as reported by Norcross et al. (2020), comprised reports of improved levels of satisfaction, mutual assistance and collaboration, a greater sense of social support, reduced perceptions of stress, higher levels of perceived self-efficacy, and personal career growth resulting from interacting and co-peer-mentoring (Jacobs et al., 2015).

Institutional Support

Institutions must establish the necessary mechanisms and structures to ensure that all online or remote doctoral students, regardless of their location or part/full-time status, have access to the needed technologies and resources for research and their scholarly development (Roumell & Bolliger, 2017). The provision of these resources by institutions is helpful to faculty who e-mentor dissertations. Information literacy instruction and off-campus access to research databases as well as librarians are fundamental for doctoral student success (Kumar & Dawson, 2018). In addition to these resources, online or remote doctoral students need institutional support in the form of online tutorials and support for research-related processes (e.g., Institutional Review Board processes) and technologies used during research (e.g., SPSS) (Kumar & Coe, 2017; Kumar et al., 2018).

While institutional support is particularly important for student success, it is also important for faculty who e-mentor doctoral students (Deshpande, 2017; Kumar & Johnson, 2019; Roumell & Bolliger, 2017). Research has demonstrated that faculty positively respond to professional development opportunities related to the effective e-mentoring of remote doctoral students (Jameson & Torres, 2019; Steinert et al., 2016). Institutional acknowledgement of and support for the development of effective online pedagogies and practices are also important in cultivating an environment that systematically supports remote and hybrid student success (Roumell & Bolliger, 2017).

Research Purpose and Questions

The purpose of this study was to explore the technologies, strategies, and institutional resources that faculty who e-mentor doctoral students find helpful during the dissertation process. E-mentoring in our research refers to online, virtual, or distance supervision, advising, or mentoring in doctoral programs but focuses primarily on the dissertation stage. The following research questions informed this study:

1. What technologies do faculty who e-mentor doctoral students use during the dissertation process?

2. What strategies do faculty who e-mentor doctoral students find helpful during the dissertation process?

3. How helpful are institutional resources that are available to faculty who e-mentor doctoral students during the dissertation process?

Methodology

A survey-based approach was used to study the research questions. This section details the survey instrument, participants, and the procedures used for data collection and analysis.

Instrument

Based on the literature review, a previous survey (Roumell & Bolliger, 2017) and an e-mentoring framework resulting from prior research (Kumar et al., 2018), we created a survey about e-mentoring strategies in four sections (communications, research process, student support, and institutional support). We also included demographic questions and a fifth section on technology use. The survey underwent review by a panel of six experts from four different institutions who provided feedback on content validity, construct validity, and face validity. These faculty members were considered experts because they had several years of experience mentoring doctoral students online and/or had conducted research on doctoral student supervision. Their feedback resulted in the addition and deletion of items, and some minor edits. The final survey comprised of five sections: Technologies, Communication and Expectations, Research Process, Student Support, and Institutional Support. Faculty use or non-use of technologies was surveyed and a five-point Likert scale (1 = *Not Very Helpful*, 2 = *Not Helpful*, 3 = *Neutral*, 4 = *Helpful*, 5 = *Very Helpful*) was used for the other four sections. The definition of e-mentoring was provided in the survey introduction and participants were asked how helpful they found these technologies, strategies, or types of support when e-mentoring students through the dissertation process. After the data collection, a reliability analysis was performed on the questionnaire. The internal reliability coefficient was sufficient ($\alpha = .78$). Additionally, the survey included items for demographic information (e.g., gender, discipline, faculty rank).

Data Collection and Analysis

Convenience sampling was used for this study. In the last week of April 2021, faculty members who supervise doctoral students in the dissertation phase online were invited to complete an online questionnaire housed in Qualtrics after permissions from all relevant Institutional Review Boards were obtained. The invitation was distributed via email and listservs at two large public universities where two of the authors worked at the time and which offered online and blended doctoral programs. To reach and survey faculty who supervise dissertations online, the survey was also sent through professional organizations of which the authors are members (the Association of Educational Communications and Technology, the Online Teaching and Learning SIG of the American Educational Research Association, the Carnegie Project on the Education Doctorate, the Commission of Professors of Adult Education), and through social media. The invitation included a description of the study, definitions, and an embedded link to the survey site. The participants gave informed consent before completing the survey. Participation was voluntary and anonymous, and no incentives were offered to individuals who participated in the study. The survey was open for four weeks.

Twenty-seven individuals accessed the online survey without entering responses. A total of 65 individuals completed the survey between end-April and May 2021. Two cases were deleted because one case had more than one-third of the data missing, and one individual did not meet all selection requirements. Replacing missing data with the series means was not necessary because none of the remaining 63 cases had missing data. Descriptive statistics and frequencies were generated.

Participants

The majority of participants was female (69.8%), and diverse faculty ranks and four disciplines were represented in the sample (see Table 1). Faculty members' doctoral student mentoring experience ranged from 1 to 25 years (M = 6.82; SD = 5.44). Most participating mentors worked in the United States (93.7%); however, one respondent each was from Canada, Pakistan, and the Netherlands. The number of doctoral advisees who were at the dissertation/thesis phase that participants were advising at the time of the survey ranged from 0 to 75 (M = 7.48; SD = 11.52). Most respondents supervised between 0 to 23 doctoral students; only one person advised 45 and another supported 75 students.

Most doctoral programs in which participants worked were delivered either online (48.3%) or in a blended format (25.0%). Five percent of respondents had both online and on-campus doctoral programs, and 1.7% indicated their programs were delivered online, blended, and on-campus. Twenty percent had on-campus doctoral programs but had shifted to online or remote delivery due to COVID-19. Of those who taught in primarily online programs, 50.9% had required on-campus sessions. Most programs utilized a cohort-based model (59.0%), whereas 31.1% did not have cohorts. Some individuals were unsure about cohorts (9.8%).

When asked about the culminating product doctoral students had to deliver in their programs, 85.0% of participants indicated students completed a traditional 5-chapter dissertation. Other products included a 3-chapter dissertation (1.7%), 6 to 10-chapter dissertation with 4 to 6 published studies (1.7%), dissertation in practice (1.7%), and capstone project (1.7%). In some programs students had options regarding the dissertation format: a 5-chapter dissertation or three published studies/papers (6.7%) or a 5-chapter dissertation or two articles (1.7%).

Table 1
Demographics of Participants

Demographics	*n*	%
Gender		
Female	44	71.0
Male	16	25.8
Transition or fluid	1	1.6
Not disclosed	1	1.6
Faculty rank		
Assistant professor	7	11.3
Clinical assistant professor	5	8.1
Associate professor	20	32.3
Clinical associate professor	3	4.8
Full professor	14	22.6
Clinical full professor	1	1.6
Instructor/lecturer	3	4.8
Senior lecturer	1	1.6
Adjunct faculty	8	12.9
Discipline		
Education	52	83.9
Health sciences	6	9.7
Humanities & social sciences	2	3.2
Psychology	2	3.2

Results

The results of the survey are presented here according to the research questions.

Research Question 1: Technologies

Participants were asked to select technologies they used to e-mentor doctoral students during the dissertation/thesis process from a provided list of tools. The five most often used resources in the mentoring process were: email (98.4%), videoconferencing (95.2%), Word processing software (84.1%), phones (73.0%), and collaborative documents (61.9%). In contrast, social media was used by the fewest respondents (Table 2).

Table 2
Technologies Utilized by Doctoral Mentors

Tools	**Use**	
	n	*%*
email	62	98.4
Videoconferencing (e.g., Zoom, WebEx, Skype)	60	95.2
Word processing software (e.g., Word)	53	84.1
Phones	46	73.0
Collaborative documents (e.g., Google Docs, Office 365	39	61.9
Shared storage (e.g., Dropbox, Google Drive)	34	54.0
Learning management systems (e.g., Moodle, Canvas)	30	47.6
Qualitative research software (e.g., Nvivo, Atlas)	21	33.3
Quantitative research software (e.g., SPSS)	19	30.2
Instant messaging	17	27.0
Bibliographic software (e.g., RefWorks, Mendeley)	13	20.6
Social media	6	9.5

Additional technology resources respondents provided in a write-in option included Google Scholar (a search engine for scholarly literature), Grammarly (a writing-assist program), OneNote (a note-taking program), Reciteworks (a reference check program), Slack (a communication platform), TextNow (a phone calling and texting application), and a platform for dissertation services. The number of provided resources that were used ranged from three to 11 (M = 6.35; SD = 1.89) indicating that mentors use a variety of resources in the e-mentoring process.

Research Question 2: Strategies

Communication and expectations. In this category 12 of the 13 strategies had a mean score above 4.00 (Table 3). The three items with the highest means scores and which were also either *helpful* or *very helpful* for over 90% of participating mentors addressed giving constructive feedback to students (M = 4.90; SD = 0.35), speaking to students about the mentor's expectations (M = 4.83; SD = 0.49), and meeting regularly synchronously with mentees (M = 4.81; SD = 0.54). Over 90% of participants also reported that asynchronous communication, adequate response times, and collaborative goal setting are helpful or very helpful strategies. Item 7, *Complete a formal mentoring contract or mentoring agreement*, was not applicable to 46% of respondents; this item had the lowest mean (M = 3.12; SD = 1.09).

Table 3

Frequencies and Descriptives for Communication and Expectations Items (*N* = 63)

Item	*NVH/NH*	*N*	*H/VH*	*N/A*	*M*	*SD*
	%					
1. Meet regularly (e.g., bi-weekly, or monthly) with mentees in real time (e.g., phone, videoconference)	1.6	1.6	96.8	0	4.81	0.54
2. Communicate asynchronously with mentees regularly (e.g., email)	0	4.8	95.2	0	4.67	0.57
3. Specify your availability and nonavailability to mentees	9.5	7.9	79.4	3.2	4.38	1.05
4. Discuss use of available technologies with mentees	1.6	19.0	73.0	6.3	4.29	0.85
5. Make online communication strategies explicit to mentees (e.g. frequency, initiating contact)	3.2	7.9	87.3	1.6	4.52	0.78
6. Discuss your expectations with mentees	0	4.8	95.2	0	4.83	0.49
7. Complete a formal mentoring contract or mentoring agreement	14.3	19.0	20.7	46.0	3.12	1.09
8. Respond to mentees in a timely manner (e.g., within 48 hours)	0	1.6	93.6	4.8	4.73	0.48
9. Outline milestones for mentees	3.2	3.2	87.3	6.3	4.61	0.72
10. Collaboratively decide on a timeline for mentee milestones	1.6	1.6	90.5	6.3	4.64	0.61
11. Specify time frame for feedback on student work	4.8	7.9	84.1	3.2	4.43	0.85
12. Provide constructive feedback	0	1.6	93.6	4.8	4.90	0.35
13. Discuss students' responsibilities	1.6	6.3	88.9	3.2	4.61	0.69

Note. Scale ranging from 1 = *not very helpful* to 5 = *very helpful. NVH* = not very helpful, *NH* = not helpful, *N* = Neutral, *H* = Helpful, *VH* = Very Helpful, *N/A* = Not applicable.

Research processes. All items in this category except for item 19 were considered either *very helpful* or *helpful* by the majority of participants as evident by mean scores above 4.00 (Table 4). These items included providing resources and an overview of the dissertation process, assisting students with the institutional review board review and data analysis, conducting collaborative research, and connecting students with other knowledgeable students or experts. Encouraging students to utilize a peer review process had the lowest mean (*M* = 3.60; *SD* = 1.05) and was not applicable to 9.5% of respondents.

Table 4

Frequencies and Descriptives for Research Process Items (*N* = 63)

Item	***NVH/NH***	***N***	***H/VH***	***N/A***	***M***	***SD***
			%			
14. Provide resources (e.g., example dissertations/thesis)	0	4.8	95.3	0	4.60	0.58
15. Provide an overview of all steps early in the process	3.2	4.8	90.5	1.6	4.52	0.74
16. Assist mentees with the IRB (institutional review board) or ethics review process	1.6	11.1	84.1	3.2	4.36	0.75
17. Assist mentees with data analysis	1.6	11.1	80.9	6.3	4.22	0.72
18. Connect mentees with peers or experts with research-related expertise	3.2	20.6	68.3	7.9	4.12	0.88
19. Encourage peer review of mentee work	14.3	22.2	54.0	9.5	3.60	1.05
20. Engage in collaborative research (e.g., publications, presentations)	4.8	14.3	68.2	12.7	4.13	0.94

Note. Scale ranging from 1 = *not very helpful* to 5 = *very helpful. NVH* = not very helpful, *NH* = not helpful, *N* = Neutral, *H* = Helpful, *VH* = Very Helpful, *N/A* = Not applicable.

Student support. Of the nine items in this category, five strategies had a mean score above 4.00 (Table 5). These items pertained to adapting mentoring strategies based on individuals (*M* = 4.56; *SD* = 0.67), providing emotional and social support (*M* = 4.40; *SD* = 0.87), making institutional resources available (*M* = 4.33; *SD* = 0.70), talking about time management (*M* = 4.13; *SD* = 0.89), and helping students to develop an online community (*M* = 4.07; *SD* = 1.00). Group mentoring was considered the least helpful strategy (*M* = 3.42; *SD* = 1.08) in the student support category, although this item did not apply to 12.7% of participating faculty mentors.

Table 5
Frequencies and Descriptives for Student Support Items (*N* = 63)

Item	***NVH/NH***	***N***	***H/VH***	***N/A***	***M***	***SD***
	%					
21. Provide psychosocial support (e.g., emotional support, social support)	4.8	6.3	88.8	0	4.40	0.87
22. Discuss mentees' time management (e.g., strategies, challenges)	6.4	9.5	84.1	0	4.13	0.89
23. Discuss work-life balance	6.4	9.5	84.1	1.6	3.98	0.93
24. Provide opportunities for mentees to form relationships with peers	6.4	14.3	73.0	6.3	4.07	1.00
25. Connect mentees with institutional resources	0	12.7	87.3	0	4.33	0.70
26. Discuss the mentoring experience with the mentee	4.8	30.2	61.9	3.2	3.90	0.96
27. Mentor students in groups	17.5	23.8	46.0	12.7	3.42	1.08
28. Adapt mentoring strategies based on mentee	1.6	4.8	92.1	1.6	4.56	0.67
29. Provide career guidance	6.4	19.0	61.9	12.7	3.91	0.95

Note. Scale ranging from 1 = *not very helpful* to 5 = *very helpful. NVH* = not very helpful, *NH* = not helpful, *N* = Neutral, *H* = Helpful, *VH* = Very Helpful, *N/A* = Not applicable.

Research Question 3: Institutional Support

The two institutional support resources that were considered most helpful by participants included statistical software for online or remote students (*M* = 4.30; *SD* = 0.82) and incentives provided by institutions for faculty who mentored doctoral students (*M* = 4.20; *SD* = 1.08) (Table 6). Items with a mean score at or above 4.00 included a dedicated librarian for online learners, and information literacy instruction and resources for students. Professional development for faculty who supervise doctoral student research was the least helpful resource (*M* = 3.35; *SD* = 1.36). Interestingly, neither incentives nor professional development were applicable for a large percentage of respondents, 44.4% and 41.3% respectively.

Table 6
Frequencies and Descriptives for Institutional Support Items (*N* = 63)

Item	*NVH/NH*	*N*	*H/VH*	*N/A*	*M*	*SD*
	%					
30. Just-in-time information literacy resources (e.g., tutorials, LibGuides) for online/remote doctoral students	4.8	22.2	63.4	9.6	4.00	0.91
31. Information literacy instruction (e.g., searching databases) for online/remote doctoral students	6.3	17.5	66.6	9.5	4.02	0.92
32. Dedicated librarian for online/remote students (e.g., e-librarian, embedded librarian)	4.8	19.0	63.5	12.7	4.09	0.99
33. Online support for IRB processes (e.g., tutorials)	9.5	23.8	54.0	12.7	3.85	1.03
34. Online support for formatting dissertations/theses (e.g., dissertation office support)	12.7	14.3	58.8	14.3	3.83	1.13
35. Statistical software programs for online/remote students (e.g., NVivo, SPSS)	4.8	4.8	76.2	14.3	4.30	0.82
36. Incentives for faculty e-mentoring of dissertations/theses (e.g., course release)	4.8	7.9	42.9	44.4	4.20	1.08
37. Professional development for e-mentoring of student research	17.4	12.7	28.6	41.3	3.35	1.36

Note. Scale ranging from 1 = *not very helpful* to 5 = *very helpful. NVH* = not very helpful, *NH* = not helpful, *N* = Neutral, *H* = Helpful, *VH* = Very Helpful, *N/A* = Not applicable.

Table 7 shows the statistics for all subscales of the questionnaire. The communication and expectations subscale had the highest mean score, whereas the institutional support subscale had the lowest mean. The standard deviations are relatively minor with the exception of the institutional support subscale.

Table 7
Summary Statistics

Subscale	No. of items	*M*	*SD*	Variance
Communication and expectations	13	4.25	0.57	0.329
Research process	7	3.98	0.64	0.410
Student support	9	3.92	0.60	0.355
Institutional support	8	3.18	1.09	1.182

Note: Scale ranging from 1 = *not very helpful* to 5 = *very helpful*.

Limitations

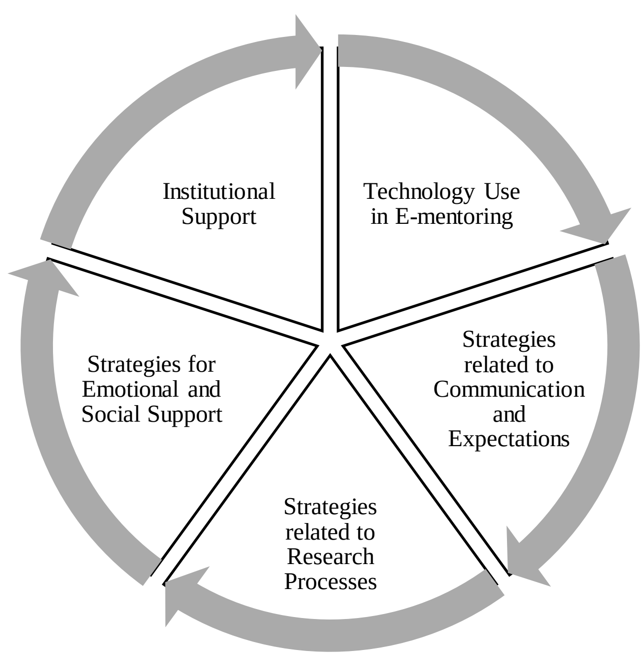
This study had several limitations. The sample size was small; 94% of participants worked in the United States, and 84% identified their discipline as education. The survey was disseminated between April and May 2021, during the ongoing COVID-19 pandemic, which impacted the response rate and might have impacted the data. Although 73% of the participants worked in online and blended doctoral programs, 20% had engaged in e-mentoring only because of the pandemic and might have therefore had different e-mentoring experiences from those working in online/blended doctoral programs. Additionally, over 61% of the participants held ranks at the (clinical) associate or full professor level, and their experiences might be different from junior or adjunct faculty. The response bias due to the self-reported nature of survey data also cannot be ignored, as the faculty who participated might have been different from those who were not able to do so due to other commitments during the pandemic or did not want to participate.

Discussion and Implications

The strategies that faculty found most helpful and least helpful during their e-mentoring of dissertations are discussed here in the context of prior literature and organized according to the sections in the survey: technology use in e-mentoring, strategies related to communications and expectations, strategies related to research processes, strategies related to emotional and social support for students, and institutional support (Figure 1). It is important to acknowledge that strategies in some sections could be related, for instance, communication and expectations are most likely focused on research process mentoring, and that all these areas together contribute to successful e-mentoring. Suggestions for future research are made within each section.

Figure 1

Helpful Technologies, Strategies, and Support for the e-Mentoring of Dissertations



Technology Use in e-Mentoring

Faculty in this study used email, videoconferencing, word processing, and phones most often when e-mentoring students doing dissertations, which is consistent with prior research that documented faculty use of Skype, Adobe Connect, Google Hangout, and phones (Andrew, 2012; Guerin & Aitchison, 2021; Kumar et al., 2018; Kumar & Johnson, 2019; Roumell & Bolliger, 2017). Given that this survey was conducted during the COVID-19 pandemic when many academic institutions had moved to a remote environment, faculty would not have had access to their offices and would have had to use personal phones with their students, which raises questions about the blurring of boundaries between personal communication tools and those provided by their institutions. This trend is, also, not reflected in their use of social media, which only 9.5% of faculty in this study used with their mentees, but which is highlighted in the literature as increasingly prevalent (Byrnes et al., 2019; Crosta et al., 2018, Gumbo, 2019).

Sixty-two percent of participants used collaborative document sharing (e.g., Google Docs, Office 365) and 54% used shared storage technologies (e.g., Dropbox) with their mentees. The value of these collaborative resources for both faculty and students has been highlighted in prior research by Guerin and Aitchison (2021), Kumar et al. (2018), and Kumar et al. (2021). An interesting finding was also the use of LMSs for e-mentoring by 47% of faculty, because dissertation e-mentoring often does not take place within online courses or seminars, but as individual dissertation credits and individual meetings at U.S.-based universities. These results suggest that faculty use LMSs, which are closed and protected spaces, with resources for e-mentoring usually provided by their institutions, whereas prior research has mainly described the use of videoconferencing software and shared storage. Future research could explore the different virtual spaces that are used for e-mentoring during dissertations, and how they are used. Furthermore, the provision of technologies and virtual spaces by institutions relates to convenient access for both faculty and students and also to the security of data and communications.

The mean number of technologies used by faculty for e-mentoring was 6.35, making it clear that faculty need to be familiar with a variety of technologies to e-mentor students effectively at a distance, and need to be able to choose, use, and manage appropriate technologies (Kumar et al., 2013). These results emphasize the need for faculty technology competencies for e-mentoring that not only encompass technical skills, but also online communication skills, online teaching skills, and online managerial skills (Schichtel, 2010). The results also highlight the importance of institutional resources and learning opportunities for faculty to develop those competencies both before they begin supervising students remotely and during the e-mentoring process (Bender et al., 2018; Deshpande, 2017; Erichsen et al., 2013; Zhang et al., 2020).

Communication and Expectations Strategies

The section about strategies related to communication and expectations had the largest number of items in the survey, the highest mean score, and the lowest standard deviation, indicating that these strategies are extremely helpful to faculty who e-mentor dissertation students. The most helpful strategies to faculty were giving constructive feedback, discussing expectations, meeting regularly synchronously with mentees, and responding to mentees in a timely manner. These strategies appear to be best practices for e-mentors because they are also reflected in several prior studies about faculty e-mentoring strategies (Kumar & Johnson, 2019;

Nasiri & Mafakheri, 2015; Roumell & Bolliger, 2017), and are also supported by students' perspectives in the literature when being e-mentored through the dissertation process (Kumar & Coe, 2017). For instance, Erichsen et al.'s (2014) survey found that effective communication on the part of the supervisor, outlining a timeline, the clarification of the process and roles in the relationships, and timely feedback were the strategies found most effective by students who were e-mentored during dissertations. These strategies play an important role in helping online students who are not immersed in academic culture understand the expectations of their doctoral programs and universities, and also in increasing e-mentors' understanding of their mentees and their individual situations. These findings reinforce the proactive role faculty supervisors have to take when e-mentoring students working on dissertations in the online environment, driving the process and communications, and providing structure.

The only item in this section with a mean rating below 4.29 was "Complete a formal mentoring contract or mentoring agreement" ($M = 3.12$), which was also rated as not applicable by 46% of the respondents. Although a suggested strategy in the literature (Andrew, 2012; Jacobs et al., 2015; Kumar et al., 2020) that is helpful to ensure common expectations and progress, the results indicate that institutions in the U.S. where most of the participants worked do not suggest or require the use of a formal mentoring agreement during the dissertation process.

Research Processes Strategies

While research is often the focus of communications and feedback during the e-mentoring of dissertation students, this section contained strategies related to research processes. The four strategies faculty found most helpful during e-mentoring were providing resources and an overview of the dissertation process and assisting their mentees with the IRB review and data analysis. These strategies have also been reported as useful by students and faculty in prior research on online and remote supervision (Jameson & Torres, 2019; Kumar et al., 2018; Kumar & Johnson, 2019; Norcross et al., 2020). In the absence of opportunities to observe and learn from peers and faculty engaged in research and dissertations in an on-campus environment, these strategies model and demystify the research process and contribute to online doctoral student success. However, the item with the lowest mean in this section was "encouraging students to utilize a peer review process," which contradicts previous research findings by Kumar et al. (2021) and Kumar and Coe (2017) where both faculty and students found peer review and feedback to be helpful. Almost 13% of faculty rated engaging in collaborative research as not applicable, which is understandable in online or blended programs where students are often full-time professionals and conduct research in their professional environments.

Sixty-eight percent of participants also rated the item "connect mentees with peers or experts with research-related expertise" as helpful or very helpful, further emphasizing the importance of helping online students connect with others engaged in similar research beyond one institution. The ways in which online doctoral students or those conducting research remotely network and learn from the expertise of other researchers in the field, not only in their program, is an area that merits further research. Eighty-four percent of participants in this study identified their discipline as education. Future research can focus on specific e-mentoring strategies related to research processes in various disciplines, the types of research conducted, expectations within the research, and the research guidance needed might differ across disciplines and necessitate different strategies in the online environment.

Emotional and Social Support Strategies

The importance of providing psychosocial support in addition to academic support and professional development has been well-documented in previous literature on supervision and e-mentoring of doctoral dissertations (Andrew, 2012; Erichsen et al., 2014). Student well-being and strategies for reducing isolation, increasing social support, and staying connected during the dissertation process gained renewed attention during the COVID-19 pandemic (Bendrups et al., 2021; Kumar & Wisker, 2021). The results of this study reinforce these developments, with faculty rating “adapting mentoring strategies based on mentees” and “providing emotional and social support” as the most helpful e-mentoring strategies in this section. While this is true of all dissertation supervision, an understanding of the unique contexts in which students live and work at a distance from the university, and their cultural backgrounds can greatly help e-mentors succeed in their e-mentoring. Individualized e-mentoring can also contribute to students feeling more connected to their e-mentors and the research process.

Other items in this category that were found helpful were discussing time management strategies and helping students to develop an online community. Unlike previous literature that has discussed the benefits of group and peer mentoring (Kumar et al., 2021; Norcross et al., 2020), only 17.5% of faculty in this survey found mentoring students in groups to be very helpful or helpful, with this being considered the least helpful strategy in this section. The item, however, did not apply to 12.7% of participants, indicating that they probably did not engage in group mentoring or did not have experience with it. Given that individualized student e-mentoring was most helpful to the participants in this study, it is understandable that group e-mentoring was not perceived as helpful. However, group e-mentoring has been documented as a form of social support and online community-building for students at a distance or in online doctoral programs (Bendrups et al., 2021; Kumar et al., 2021). Further research could help us understand how individualized and group e-mentoring could best be combined to achieve the benefits of both forms of mentoring, and what kinds of strategies could make group mentoring effective.

Institutional Support

Institutional support has been highlighted in the literature as essential to the success of both e-mentors and students who are being e-mentored (Deshpande, 2017; Kumar et al., 2018; Roumell & Bolliger, 2017). However, in this survey, the institutional support subscale had the lowest mean rating of all subscales. At the same time, several items in the section contained high percentages for the “not applicable” option. The question asked of faculty was “How helpful have you found the following institutional resources when e-mentoring students during the dissertation phase?” The high percentage of “not applicable” responses suggests that faculty did not rate items in this section because they were not available or applicable to the institutions in which they worked, or that they had had no experience with these forms of support.

The most helpful form of institutional support was data analysis software for online or remote students, which is understandably crucial for research, but can be very expensive for both faculty and students to buy. Institutional provision of software for quantitative and qualitative data analysis can provide them with common tools and reduce challenges for both faculty and students. For instance, faculty might have access to such software at their institution, but if the students are located in other parts of a country or overseas, they might adopt other free software with which faculty are unfamiliar. Providing institutional access through VPN or other means can help students and faculty. Dedicated librarians and information literacy instruction that are extremely important for students at a distance to access literature and appropriately situate their research (Kumar & Dawson, 2018) were also rated highly. Incentives for faculty who e-mentor dissertations/theses had the second highest mean but was also rated as not applicable by 44.4% of the participants. The findings indicate that institutions do not provide enough incentives to support faculty who work with online or blended doctoral students on dissertations, although they work with many mentees (the mean number of mentees in this study was 7.48), but that when provided, these are valued greatly by the faculty.

The item rated as least helpful in this category was professional development for the e-mentoring of student research, which was also rated as not applicable by 41.3% of participants. This might indicate that these participants do not have access to professional development in this area or are unaware that it exists. This is an interesting finding that needs further research because supervisor development has long been documented in the literature as effective and valuable for dissertation supervision (Jameson & Torres, 2019; Roumell, & Bolliger, 2017; Steinert et al., 2016). If faculty are to successfully e-mentor students through the dissertation process and guide their research while using multiple technologies effectively, providing psychosocial support, and driving and managing communications and expectations in the online environment, formal professional development should be provided by institutions.

Professional development can also include resources, tutorials, faculty communities or sharing sessions. It is also possible that such programs and resources exist at institutions, but that these resources are focused on face-to-face supervision and not on the e-mentoring of doctoral students' dissertations. Given the move to remote supervision during the pandemic, and the continued e-mentoring of students for various reasons, professional development for faculty that is specifically targeted at dissertation e-mentoring is needed (Huet & Casanova, 2021).

Conclusion

This article highlighted the various strategies that faculty find most helpful during the e-mentoring of students doing dissertations. In the context of the increased adoption of e-mentoring during and following the COVID-19 pandemic, identifying strategies that are more or less helpful for e-mentoring can be valuable to faculty members embarking on or engaged in the e-mentoring of dissertation students, especially if they were mentored in on-campus environments, where opportunities for communication, learning, and research abound within research apprenticeships and campus communities. The results of our survey can be useful to faculty and doctoral programs engaged in e-mentoring, as well as academic developers focused on online supervision as various forms of online supervision and e-mentoring continue to play a role in the continuing pandemic/post-pandemic world.

Declarations

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

The authors assert that approval was obtained from an ethics review board at the University of Florida and Texas A&M University, USA.

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The Supervisor of Undergraduate Dissertations in a Web-Based Context: How Much Support and How to Give it?

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Abstract
The provision of support has always been central to the role of the undergraduate dissertation (UD) supervisor, but little research has been done on its contextual determinants in web-facilitated contexts. Beyond the general recognition of the importance of institutional support for the development of supervisors' technological and pedagogical knowledge and the importance of technology and pedagogy in maximizing the impact of supervisors' support for students, the effect of technology tools and students' prior skills on the type and level of supervisors' support is not well understood. Drawing partially on the Technological Pedagogical and Content Knowledge (TPACK) framework, the present work uses Partial-Least Square Structural Equation Modelling to examine the effect of supervisors' Technological Pedagogical Knowledge (TPK), their perception of students' soft skills, and the technology tools they use (face-to-face, social media or a learning management system) on the level of educational and motivational support they provide. The results indicate that institutional support to UD supervisors positively affects their TPK, which in turn positively affects their educational and motivational support to students. However, supervisors' educational and motivational support is inversely related to their perception of students' soft skills and is also affected by the technological tools used. In short, supervision styles are not static since different contextual factors affect the management of the process of supervision. The implications for UD supervision are discussed, and some recommendations are proposed in the article.

Keywords: Higher education, undergraduate dissertation, supervisor's support, technological knowledge, technological tools

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The undergraduate dissertation (UD) is usually the first opportunity for students to apply their knowledge and demonstrate their research potential, critical thinking, and oral and written communication skills (Feather et al., 2014). For supervisors, however, UD supervision is an arduous task. Supervisors need to dedicate time and energy they may not have (Sloan et al., 2014; Vehviläinen & Löfström, 2016), or which could be channeled to other career-advancing tasks (Roberts & Seaman, 2018). The literature on UD supervision generally refers to the dilemma of supervisors' support versus students' autonomy (Vehviläinen & Löfström, 2016), but the ways various contextual factors affect supervisors' support for their students are largely under-researched. Particularly important in the current context of mass higher education (HE) and the fast-paced shift to web-based supervision (Scagnoli et al., 2019) are institutional support to supervisors, supervisors' perceptions of students' soft skills and the technological tools used in the process of supervision. The importance of institutional support for UD supervisors for the effective use of technology stands out, given the gamut of tools available to supervisors and the potential impact of any tool chosen on the supervision process. While institutional support is known to affect supervisors' use of Information and Communication Technologies (ICT) (Rienties et al., 2013; Wan & Zhao, 2021), whether this impact translates to more or less support to students is not well understood.

As a practice with a long tradition in higher education, UD supervision is generally resistant to change (Jaldemark & Lindberg, 2013), but the recent large-scale upheavals worldwide left no room for resistance as technology is now unavoidable (Bouziane & Elaasri, 2019; Roberts & Seaman, 2018). However, its use is constrained by the degree of institutional support for supervisors (Hénard & Roseveare, 2012), which affects both their pedagogical knowledge and the technological tools they use (Al-Busaidi & Al-Shihi, 2012; Pedro & Kumar, 2020). Another factor affecting UD supervision is the drive for soft skills development in educational contexts (Kyllonen, 2013). Many Moroccan universities institutionalized soft-skills courses during the first two years of undergraduate education with the objective that students would apply those skills in their UD and later for their employability. As a consequence, supervisors' evaluation of what students can or can't do affects the amount of time and energy they are willing to invest in the process of UD supervision (Augustsson & Jaldemark, 2014; Vehviläinen & Löfström, 2016). But here also, the extent and magnitude of the effect of supervisors' perception of students' prior soft skills are not well estimated.

Therefore, given today's centrality of soft skills, institutional support, and technology, it is important to examine their impact on the UD supervisor since, as mentioned above, the UD experience provides the first opportunity to see that impact. Specifically, the present study examines the effect of institutional support on supervisors' TPK as well as the effect of supervisors' TPK, their perception of students' soft skills, and the technological tools they use on the level of educational and motivational support provided to students.

Literature Review

Setting

The Moroccan Ministry of Higher Education, Scientific Research and Innovation (MHESRI) has recently launched The National Initiative for the Acceleration of the Transformation of the Higher Education, Scientific Research and Innovation Ecosystem (MHESRI, 2022). The reform's objective is to overhaul HE governance to improve knowledge production. In particular, it aims to develop students' soft skills and help faculty smoothly transition to online education. While the emphasis on soft skills and technology is not new, it now takes an increasingly greater place in the national debate over the role of undergraduate programs in public HE institutions, as indicated by the recent report by the Conseil Supérieur de l'Education, de la Formation et de la Recherche Scientifique (CSEFRS, 2018).

Concerning the task of UD supervision, supervisors in Moroccan public HE institutions acknowledge the benefits of the dissertation, but they admit that their ability to support students is limited by various hurdles related to supervisors' technological competence, students' skills, and institutional support (Zeddari, 2018). For this reason, the Moroccan context provides a suitable setting to explore how these hurdles affect the process of UD supervision. The Moroccan plan for the accelerated integration of technology mirrors similar responses to the new challenges facing higher education worldwide and the imperative to manage the role of technology for better teaching and learning (CSEFRS, 2018; Maor, 2017). The study of the effect of these factors is of paramount importance since it is likely to inform decision making concerning professional development for supervisors and training on the selection and pedagogical use of technology (Minocha & Petre, 2012). Likewise, examining supervisors' evaluation of soft skills is likely to uncover one source of bias that may affect, negatively or positively, the provision of adequate support for students when doing their UD (Chamorro-Premuzic et al., 2010).

Institutional Support for Supervisors

Institutional support is a key element for quality teaching and generally refers to the measures taken at the level of the institution to improve teaching staff knowledge and practices (Hénard & Roseveare, 2012). As a crucial contextual factor, institutional support includes training and the provision of adequate technological infrastructure (Zuvic-Butorac & Nebic, 2009, Koh, Chai & Tay, 2014). Hénard (2010) suggested that the institutional environment positively impacts students' learning outcomes through improving the knowledge and competence base of teachers (p.9). In addition, HE institutions today need to provide professional development opportunities and support units for teaching staff to address the challenges of the increasingly standard web-facilitated contexts (Bouziane & Elaasri, 2019; Pedro & Kumar, 2020). In online and web-facilitated contexts, researchers suggest that the provision of training is key for teachers to integrate technology pedagogically for content in their disciplines (Löfström & Nevgi, 2008). Rienties et al. (2013) found that teachers' TPACK—as well as their satisfaction—increased after training on ICT. A similar result was also obtained by other researchers (Wang & Zhao, 2021; Koh et al., 2014).

For the task of supervision, Maor and Currie (2017) suggest that it requires a pedagogy that is different from classroom pedagogies. Such pedagogy entails a shift from a product-oriented to a process-oriented form of supervision where supervisors use technology to support students. Therefore, notwithstanding the unanimity in the literature on the positive impact of institutional support on teachers' competence, little research focuses on the impact of institutional support on their role as supervisors and the consequences of that role for students.

Supervisors' Support for Students

For the type of support UD supervisors provide, McMichael (1992) distinguished between educational support on the one hand and personal support on the other. Educational support included help with goal setting, methodology, and the structuring of the dissertation. Motivation and rapport constituted key roles in the provision of personal support (McMichael, 1992). Similarly, Greenbank and Penketh (2009) referred to guidance and affiliation as critical tasks of the supervisor who represents a lifeline for students (Smith et al., 2009). In Del Río et al. (2018), the students surveyed identified the provision of motivation as one crucial token of affiliation. Strebel et al. (2019) and Vera and Briones (2015) found that educational support and motivational support correlated positively with students' satisfaction. In web-facilitated supervision, supervisors use technology to maintain connections and create communities to increase students' output in terms of collaboration and production (Maor & Currie, 2017; Donnelly & Fitzmaurice, 2013).

However, many studies also reported that supervisors struggle to maintain the balance between too much and too little support (Jamieson & Gray, 2006; Vehviläinen & Löfström, 2016). In particular, the factors affecting supervisors' enactment of support are little understood. Augustsson and Jaldemark's (2014) analysis of supervisors' written feedback resulted in the identification of different types of feedback that were qualitatively different in terms of their authoritative weight, which in turn depended on the purpose of feedback. De Kleijn et al. (2012) reported a positive correlation between students' perception of supervisors' degree of affiliation and control and their perceived contribution to the dissertation. Supervisors' knowledge of and competence in using technology is also reported as one determinant of the level of support for students, be it educational technology (Oehne & Bardua, 2019) or social media (Minocha & Petre, 2012).

In short, it is known that supervisors adapt their pedagogical interventions based on their diagnosis of the situation (Agricola et al., 2020; Vehviläinen & Löfström, 2016), but what exactly supervisors diagnose is not clear. In the present work, students' soft skills constitute one input in supervisors' diagnosis in addition to supervisors' TPK.

Students' Soft Skills

Kechagias' (2011) definition of soft skills as intra- and inter-personal skills essential for success at the personal, social, and professional level has been cited widely in the literature (Macqual et al., 2021), but the broadness of the inventory of soft skills has created a lack of conceptual precision of the term (Gibb, 2014; Tseng et al., 2019). The concept of "soft skills" is adapted here from Goldsmiths' inventory of soft skills to refer to critical thinking, oral and written communication, and time management (Chamorro-Premuzic et al., 2010). The rationale for this is that many studies underscore the importance of those skills in the Moroccan context (Elmouhtarim, 2018; Zeddari, 2018).

Generally speaking, research on UD supervision stresses the importance of supervisors' attitudes towards the UD and the role of students (Feather et al., 2014). In interviews, supervisors expect that students demonstrate their skills and abilities to conduct an independent piece of research (Feather et al., 2014; Jamieson & Gray, 2006). However, little work has been done on the impact of such expectations on UD supervision. Specifically, the impact of supervisors' assessment of students' soft skills on the level of support supervisors provide has not been empirically studied. Strebel et al. (2019), for example, found that students' previous grades—a proxy to their prior knowledge and skills—increase their satisfaction with the supervisor, but how prior grades affect supervisors themselves is not examined. Since the UD is the first opportunity for students to demonstrate their skills (Smith et al., 2009), and since supervisors' expectations affect the supervision process, whether supervisors' perception of students' prior soft skills impacts their level of support needs investigation.

Supervisor's Technological Pedagogical Knowledge

Technological Pedagogical Knowledge (TPK) is one component of the Technological Pedagogical and Content Knowledge framework (TPACK) (Scott, 2021). TPACK is a comprehensive framework to examine how the various forms of knowledge—technological, pedagogical and content—interact and the effect of their interaction on teaching practices (Schmidt et al., 2009). TPK is about adapting and customizing technology to maximize learning outcomes rather than knowledge of any particular content or technology (Cox, 2008). Cox's definition of TPK is apposite to UD supervision since "an individual with this type of knowledge understands how technology could be used with general pedagogical strategies that could be applied independent of the specific content or topic being taught." (Cox, 2008, p. 76). In the context of HE, TPACK is found to increase awareness of the affordances of technology for the delivery of content in pedagogically appropriate ways (Rienties et al., 2013). The use of specific technological tools in TPACK-based frameworks is also found to positively affect students' performance (Oehne & Bardua, 2019). However, while TPACK has been modified to suit different contexts and courses (Maor, 2017; Ouyang & Scharber, 2018), research on its use to drive instructional practice is limited. Limited still is research on its use in UD supervision.

Technological Tools

Since technology alone does not lead to change (Koehler et al., 2013), supervisors need to be aware of the affordances, limitations, and potential harms of the technological tools they use (Del Río et al., 2018; Jaldemark & Lindberg, 2013, Minocha & Petri, 2012). Angeli and Valanides (2015) suggest that technology is most effective when used to support instruction rather than teach content, and Benson, Ward and Liang (2015) stress the key role of pedagogy, rather than technology, in truly transforming teaching practices.

In HE, social media and Learning Management Systems (LMS) are increasingly adopted in online and web-facilitated settings (Sloan et al., 2014; Sun et al., 2018). Social media are social networking platforms endowed with capabilities for audio, visual and textual content sharing (Simon, 2012, p. 31). LMS are popular e-systems for the management of distance and web-facilitated education (Ouajdouni et al., 2021).

Increased opportunities for collaboration and interactivity have been cited as one advantage of technological tools (Gray & Crosta, 2018). Sun et al. (2018) compared the use of WeChat and Moodle for knowledge construction and social interaction and found that participants used WeChat more for socialization and Moodle more for knowledge construction. Dos Santos and Cechinel (2019) found that chat and forums did not differ much in terms of their use by students and supervisors, but both preferred forums more for academic discussions. Dos Santos and Cechinel (2019) suggest that asynchronous tools allow for more time to critically think and reflect on content, whereas synchronous tools are more conducive to socialization. This general result has also been reported by others (Tang & Hew, 2020). Relatedly, dos Santo and Cechinel found no difference concerning students' and supervisors' preferences for online or face-to-face meetings for supervision, but Dowling and Wilson (2015) referred to some kind of "digital conservatism" manifested in the slow pace of technology adoption and caused by time constraints, preference for face-to-face meetings, and students' perceptions of supervisors' comfort with digital tools. Within the framework adopted here, technological tools are understood as yet another contextual factor that impacts supervisors' educational and motivational support for students.

The Conceptual Framework

What can be gleaned from the literature review above is that several contextual factors affect the UD supervision process. The literature establishes a clear link between institutional support and the development of TPACK. In turn, researchers investigating TPACK confirm that it has a significant effect on supervision practices and ICT use. Albeit qualitative, many studies also have discussed the effect of supervisors' expectations on the process of supervision. Drawing partially on the TPACK theory and current work on ICT integration in education (Maor & Currie, 2017; Minocha & Petri 2012), the present work examines the effect of supervisors' TPK and their perception of students' prior soft skills on the level of support they provide during UD supervision. Also examined is the differential effect of WhatsApp, Learning Management Systems (LMS) and face-to-face meetings, (three tools available to supervisors), on the type and level of supervisors' support. A set of related hypotheses was developed. These are written as null hypotheses to reflect the exploratory nature of the model.

H1a: Supervisors' TPK has no effect on their educational support for students (ES).

H1b: Supervisors' TPK has no effect on their motivational support for students (MS).

H2a: Supervisors' perception of students' soft skills (SSS) has no effect on their educational support (ES).

H2b: Supervisors' perception of students' soft skills has no effect on their motivational support (MS).

Also in this study, we examine the effect of LMS, WhatsApp, and face-to-face channels on the level of ES and MS.

H3a: Supervisors' use of face-to-face meetings (F2F) has no effect on ES.

H3b: Supervisors' use of face-to-face meetings (F2F) has no effect on MS.

H4a: Supervisors' use of WhatsApp® (WA) has no effect on ES.

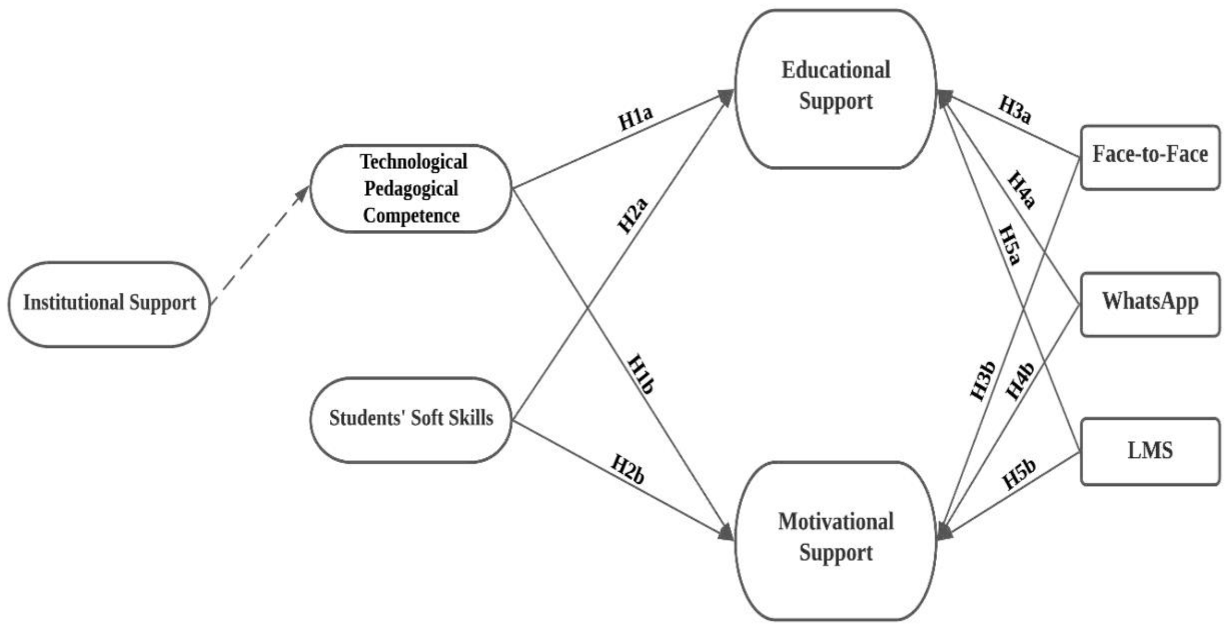
H4b: Supervisors' use of WhatsApp® (WA) has no effect on MS.

H5a: Supervisors' use of LMS has no effect on ES.

H5b: Supervisors' use of LMS has no effect on MS.

The alternative hypotheses to H1a and H1b translate the general belief that supervisors' decisions, if well informed by their TPK, will increase their level of support. For H2a and H2b, the alternative hypotheses reflect the assumption that supervisors' perception of students' soft skills impacts their balance of autonomy versus support or—to use the words of Strebel et al. (2019)—whether supervisors' will lean towards a more "laissez-faire" or a more "guidance" style. The alternative hypotheses to H3 to H5 link the tools used to the type and level of support. Finally, institutional support to supervisors is also included in the model as its impact on their TPACK and its components is well established in the literature. Figure 1 summarizes the relationships between the variables.

Figure 1
Model Specifications



Method

Measurement

A questionnaire was designed to test the hypotheses provided above. The indicators for each construct were adapted from the literature to the UD context from the literature and translated into Arabic (Table 1).

Smart-PLS-3 was used for Partial-Least Squares Structural Equation Modeling (PLS-SEM). One advantage of using PLS-SEM is that it is robust against small sample sizes, simultaneously assesses the measurement and the structural model, and is a method used in complex causal relationships in prediction-oriented models (Hair et al., 2017).

Table 1
Questionnaire Constructs and Items

Section A
Institutional Support (IS) (Simon, 2012)
IS1: My institution values online supervision as much as face-to-face supervision.
IS2: I attend training sessions that my institution organizes for supervisors.
IS3: Training is available on best practices of online supervision.
IS4: Training is available on how to use the technologies I need to supervise online.
Students' Soft Skills (SSS) (Chamorro-Premuzic et al., 2010)
SSS1: Students have critical thinking skills to complete their dissertations.
SSS2: Students have oral and written skills to do their dissertations.
SSS3: Students can manage their time to complete their dissertations.
SSS4: Students have the necessary skills to structure their dissertations.
Supervisors' Technological Pedagogical Knowledge (TPK) (Valtonen et al., 2017)
TPK1: I know how to use ICT in teaching as a tool for students' reflective thinking
TPK2: I know how to use ICT in teaching as a tool for students to plan their own learning
TPK3: I know how to use ICT in teaching as a tool for students' problem-solving in groups
TPK4: I know how to use ICT in teaching as a tool for students' critical thinking
Section B
Educational Support (ES) and Motivational Support (MS) (Strebel et al., 2019)
ES1: Supporting my students with the definition of specific, realistic goals was very important to me.
ES2: Supporting my students for the elaboration of a practical approach was very important to me.
ES3: Supporting my students with subject-specific knowledge was very important to me.
ES4: Supporting my students with the methodological approach was very important to me.
PS1: I used all the means possible to quickly react to my students' needs
PS2: I used all the means possible to constantly motivate my students.

Sample and Data Collection

The data frame for the present study consisted of a list of the email addresses of all teachers who supervise UD in two Moroccan public HE institutions. This list was obtained after contacting the Human Resources departments in the two institutions. In the academic school year 2020-2021, the questionnaire was administered in two rounds. Before the allocation of students to supervisors, the latter were sent section A of the questionnaire to measure IS, SSS and TPK. This enabled the measurement of those constructs as initial conditions at the beginning of the supervision process. Section B was administered in late June, with clear instructions to participate only if the respondent did supervise UD students. Of the 300 participants randomly chosen from the initial data frame, 248 responded in the first round and 163 in the second round. 163 responses were therefore considered. Of these, 35 responses were removed because the respondents answered less than 50% of the total items. This left 128 responses. Following Hair et al. (2014), the sample size was adequate since it was 10 times higher than the number of arrows pointing to a variable with the highest number of arrows (Figure 1). 38% of the respondents were female and 62% were male. By rank, Assistant Professors constituted 44% of the sample, Associate Professors 27%, and Senior Professors 29%.

Results

Reliability and Validity

Reliability and validity were tested using different measures. Items with loadings less than 0.600 were removed and the remaining items were retained for the subsequent analyses. Table 2 presents the loadings for the remaining items. Loadings greater than 0.600 mean good to very good reliability. Cronbach's alpha values were all greater than 0.700. The average variance extracted (AVE) values were all higher than 0.500 and all the values for Composite Reliability (CR) were higher than 0.700. This shows that all the items had good convergent validity (Hair et al., 2017). Discriminant validity was assessed using factor cross-loadings (Table 3), Fornell-Larcker Criterion and Heterotrait-Monotrait Ratio (HTMT) (Table 4). The cross-loadings on any other factor were smaller than the loadings for the factor and HTMT ratios were lower than the cut-off point of 0.8. Therefore, the items had good discriminant validity. Collinearity was checked using the Variance Inflation Factor (VIF) and all the VIF values were below the cut-off value of 5 and way below the cut-off value of 10 suggested by Pituch & Stevens (2016).

Table 2

Item Loadings, Reliability and Validity

	Λ	**VIF**	**Alpha**	**AVE**	**CR**
IS2	0.887	2.773	0.803	0.707	0.876
IS3	0.953	2.606			
IS4	0.651	1.344			
SSS1	0.761	1.798	0.862	0.692	0.899
SSS2	0.737	1.750			
SSS3	0.935	2.462			
SSS4	0.878	2.667			
TPK1	0.847	2.697	0.908	0.784	0.935
TPK2	0.928	4.517			
TPK3	0.848	2.263			
TPK4	0.913	3.519			
ES1	0.886	2.227	0.843	0.761	0.905
ES3	0.926	2.655			
ES4	0.800	1.738			
PS1	0.875	1.625	0.766	0.808	0.894
PS2	0.923	1.625			

Table 3
Factor Cross-Loadings

	TPK	ES	IS	MS	SSS
TPK 1	0.847	0.481	0.143	0.322	0.273
TPK 2	0.928	0.528	0.161	0.393	0.213
TPK3	0.848	0.467	0.199	0.428	0.096
TPK 4	0.913	0.514	0.222	0.459	0.212
ES1	0.488	0.886	0.348	0.589	-0.203
ES3	0.555	0.926	0.392	0.648	-0.204
ES4	0.413	0.800	0.307	0.463	-0.096
IS2	0.107	0.356	0.887	0.340	-0.347
IS3	0.246	0.396	0.953	0.361	-0.332
IS4	0.089	0.232	0.651	0.294	-0.242
MS1	0.375	0.556	0.273	0.875	-0.197
MS 2s	0.439	0.624	0.416	0.923	-0.321
SSS1	0.233	-0.105	-0.275	-0.136	0.761
SSS 2	0.186	-0.060	-0.086	-0.142	0.737
SSS 3	0.135	-0.273	-0.410	-0.361	0.935
SSS 4	0.280	-0.096	-0.298	-0.206	0.878

Table 4
HTMT Values and Fornell-Larcker Values

	IS	SSS	TPK	ES	MS
IS	0.841	0.387	0.203	0.467	0.489
SSS	-0.362	0.832	0.282	-0.199	-0.295
TPK	0.207	0.222	0.885	0.562	0.456
ES	0.403	0.178	0.636	0.872	0.804
MS	0.391	0.302	0.539	0.658	0.899

Note. The diagonal values are the square roots of AVE. Above the diagonal values are the HTMT values and below are the correlations between the constructs.

Descriptive Statistics

Table 5 gives the means for IS, supervisors TPK, SSS, ES and MS. Table 6 gives descriptive statistics of the type and level of support by the type of technological tool used. IS was lower than the mean value of 4 whereas the mean for ES was the highest. In addition, ES was highest using LMS, followed by WA. Both ES and MS were systematically higher when a technological tool was used than when it was not.

Table 5
Descriptive Statistics

	IS	TPK	SSS	ES	MS
Valid	127	119	122	122	125
Mean	2.723	4.706	4.201	5.464	4.588
SD	1.571	1.554	1.564	1.606	1.849
Min	1.000	1.000	1.000	1.000	1.000
Max	7.000	7.000	7.000	7.000	7.000

Table 6
Level of Support by Type of Technological Tool

			Educational Support				
	F2F		**WA**		**LMS**		**Overall Sample**
	No	Yes	No	Yes	No	Yes	
Mean	4.986	5.783	5.478	5.383	4.921	6.185	5.464
SD	1.940	1.249	1.690	1.598	1.826	0.984	1.606
			Motivational Support				
	F2F		**WA**		**LMS**		**Overall Sample**
Mean	4.191	4.828	4.120	4.825	4.123	5.000	4.588
SD	2.156	1.515	1.936	1.803	2.029	1.491	1.849

The Structural Model

Table 7 presents the path coefficients and the statistics related to each relationship. The results showed that supervisors TPK had a positive and significant effect on both ES (β = 0.609, t = 9.092, p < 0.001) and MS (β = 0.545, t = 7.512, p < 0.001). The null hypotheses H1a and H1b are therefore both rejected. Conversely, the effect of SSS on ES and MS is negative and significant (β = -0.327, t = 4.696, p < 0.001) and (β = -0.427, t = 6.059, p < 0.001) respectively. Therefore, H2a and H2b are both rejected and the alternative hypotheses are accepted. The categorical variables showed a mixed picture. The effect of F2F was significant on neither ES (β = -0.078, t = 0.981., p > 0.5) nor MS (β = -0.093, t = 1.127, p > 0.05) respectively. For technological tools, the results are varied since there is a positive and significant effect of WA on MS (β = 0.174, t = 2.360., p = 0.018), but its effect on ES is not significant (β = -0.019, t = 0.278., p > 0.5). Just the opposite is true for LMS. Whereas its impact on MS is not significant (β = 0.088, t = 1.136., p > 0.5), its impact on ES is positive and significant (β = 1.188, t = 2.551., p = 0.011). IS had a positive impact on supervisors' TPK (β = 0.207, t =1.995., p = 0.046). Using a 95%, bias-corrected confidence interval showed, however, that its effect is not significant (Table 7). Figure 2 summarizes the patch coefficients and provides the variance explained by the exogenous variables (Adjusted R^2).

Figure 2
Path Coefficients and Adjusted R^2

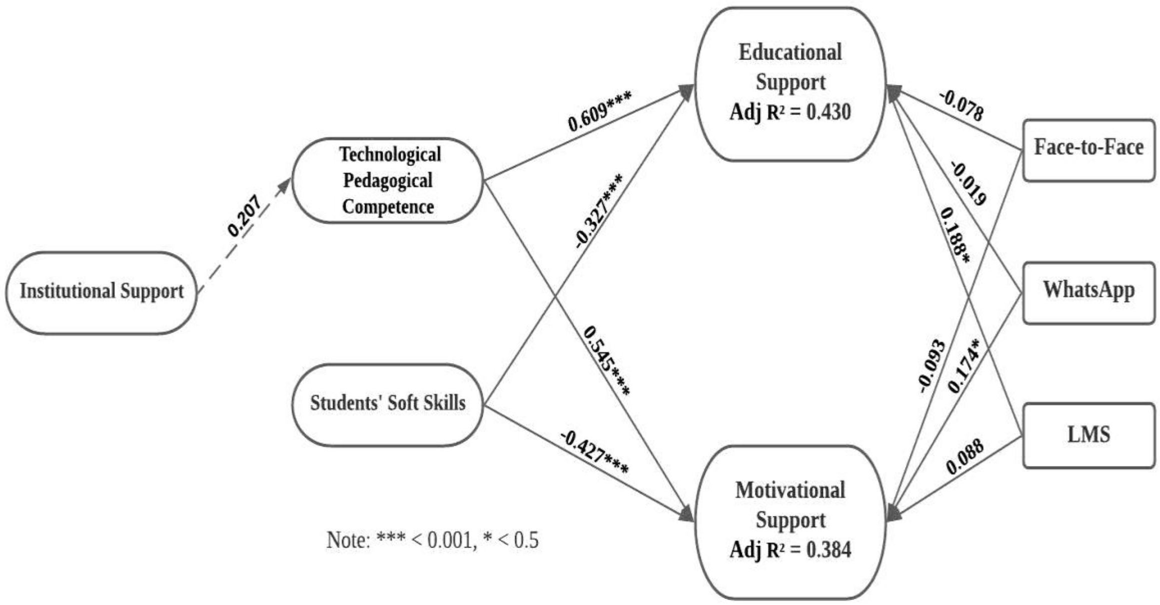


Table 7

Constructs Relationships and Bias-Corrected Intervals (Hypotheses H1a to H5b)

	B	T	P	2.5%	95.5%
H1a: TPK → ES	0.609	9.092	0.000	0.463	0.724
H1b: TPK → MS	0.545	7.512	0.000	0.393	0.674
H2a: SSS → ES	-0.327	4.696	0.000	-0.447	-0.184
H2b: SSS → PS	-0.427	6.059	0.000	-0.544	-0.280
H3a: F2F → ES	-0.078	0.981	0.327	-0.236	0.078
H3b: F2F → MS	-0.093	1.127	0.260	-0.245	0.077
H4a: WA → ES	-0.019	0.278	0.781	-0.153	0.116
H4b: WA → MS	0.174	2.360	0.018	0.027	0.317
H5a: LMS → ES	0.188	2.551	0.011	0.041	0.329
H5b: LMS → MS	0.088	1.136	0.256	-0.068	0.236
IS → TC	0.207	1.995	0.046	-0.272	0.325

Discussion

The present study examined the effect of supervisors' TPK and supervisors' perception of students' soft skills and technological tools on UD supervisors' educational and motivational support for students. In the context of web-facilitated teaching, the findings show that as supervisors' TPK increases, their level of support increases. This finding is in agreement with the literature suggesting that increased TPACK better informs teaching decisions and leads to effective measures taken by supervisors to increase the quality of supervisor-student relationships and foster student-centered learning (Ouyang & Scharber, 2018; Tai et al., 2015). On the other hand, the findings also reveal that supervisors' perception of students' soft skills negatively affects their level of support. This suggests that UD supervisors lean more toward a "laissez-faire" approach if they trust students can complete the dissertation with minimal interference. The result lends support to Deuchar's (2008) discussion of the interaction between students' style (autonomous vs. dependent) and supervisors' style (hands-on vs. hands-off) in postgraduate supervision and the resultant supervision styles that emerge based on supervisors' assumptions about the educational and affiliation needs of their students. One difference is that where supervisors in postgraduate can adjust their assumptions and styles given the time they have, UD supervisors face the dilemma of having to make quick decisions (Vehviläinen & Löfström, 2016). In short, supervisors ration the scarce resources they have and distribute them according to not just students' needs (Agricola et al., 2020), but also their perception of what those needs are.

For technological tools, the use WhatsApp® was found to significantly increase motivational support and the use of LMS educational support. The results agree with findings indicating that social media in general allows for increased interactivity (Sun et al., 2018). As mentioned above, dos Santos and Cechinel (2019) suggested that synchronous tools are conducive to non-academic tasks and facilitate social support while LMS, a platform specifically designed for online education, is optimized for task-oriented activities. In general, the use of technological tools can be seen as one way to strengthen communication between students and supervisors and tallies well with theories of teacher presence and online communities (Tang & Hew, 2020).

Lastly, institutional support had no significant effect on supervisors' TPK. While the result was not expected given the large body of evidence suggesting the positive impact of institutional support on teaching quality (Hénard, 2010; Zuvic-Butorac & Nebic, 2009), there is also evidence that top-down support is likely to result in supervisors resisting change (Mårtensson et al., 2011). An equally plausible explanation is that institutional support that is not task-specific, i.e. that targets a specific activity like supervision, is not useful even if present. This generally corroborates Maor and Currie's (2017) claim that supervision is different from teaching. In any case, the mean of institutional support is way below average, suggesting the absence of institutional support as such or the absence of its impact on supervisors' practices.

Implications, Limitations and Future Work

Prior work on UD supervision examined supervisors' support as an input factor, but the present study investigated supervisors' support as the outcome of various contextual factors. Supervisors' TPK and their perception of students' soft skills were found to affect the educational and motivational support students receive. In theory, then, the result points to the relevance of TPK and the TPACK model in general for the task of UD supervision. TPACK has preponderantly been adapted to study classroom practices, but its role in UD is unknown. The adaptation of the TPACK model for UD supervision is certainly a thread to follow in the future. Furthermore, future work needs to address the way teachers' knowledge interacts with that of students in shaping teaching practices in general and supervision in particular. This area is largely under-researched (Vermunt & Verloop, 1999).

In addition, the present study contributes to the existing scholarship on the use of technology in educational settings (Sloan et al., 2014; Sun et al., 2018). It confirms general trends observed in previous work, but general trends are unlikely to tell the whole story. Theories of online learning emphasize the role of online communities in the social construction of knowledge (Akyol & Garrison, 2008); this is likely to be true for LMS as well as social media, although the latter is less acknowledged as an educational tool. Future work can, therefore, examine the co-construction of knowledge in social media using appropriate frameworks.

Among the various limitations that the present study has, the absence of other relevant factors and/or mediators stands out. Several other variables are known to affect the choice of technological tools and their determinants (Ouajdouni et al., 2021). Similarly, several studies have examined the mediating role of technology anxiety in LMS use (Alkhawaja et al., 2021). These and many other contextual variables—number of students, workload, and attitude towards supervision (Zeddari, 2018)—could affect the role of the supervisor and should certainly be taken into consideration for a more in-depth understanding of UD supervision.

The generalizability of the findings from the study is limited by the relatively small size sample from only two public institutions. Multigroup comparisons across different institutions, private and public for example, are necessary to better understand the role of institutional variables in the process of UD supervision. Also, it is plausible that UD supervision is subject to cultural differences, be it in the choice of the tools to use, the type of support to give and the ways to give it. For example, the preference for WeChat in China and Apple apps in the United States may impact the type of level of support UD supervisors provide (Sun et al., 2018; Minocha & Petre, 2012). Future work needs to examine UD supervision and its contextual determinants across different institutions and cultures.

Conclusion

The present work has examined some factors that affect UD supervisors' level of support. In particular, supervisors' degree of educational and motivational support is affected by their perception of students' soft skills, their TPK, and the technological tools they use. The higher the TPK of supervisors is, the higher their level of support, but such support is also inversely conditioned by what supervisors believe students can do on their own. In addition, it was found that technological means were not created equal. Supervisors who used social media reported a higher level of motivational support, whereas supervisors who used an LMS reported a higher level of educational support. The study points to the important links existing between technology, pedagogy, soft skills, and UD supervision.

Declarations

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External and Internal Predictors of Student Satisfaction with Online Learning Achievement

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Abstract
Building and testing a framework of interactive and indirect predictors of student satisfaction would help us understand how to improve students' online learning experiences. The current study proposed that external predictors such as poor technological, environmental, and pedagogical factors would be internalized as negative psychological traits and indirectly predict student satisfaction in online learning. Results of multivariate regressions with 5824 Chinese undergraduate students demonstrated that instructors' online teaching experience and communication with students had a stronger predictive effect on student satisfaction than wireless network quality and learning environment. Structural equation modeling analysis results showed that inferior technological, environmental, and pedagogical factors would be internalized into negative attitudes and emotions toward online learning and indirectly predict student satisfaction. Third, providing after-class learning materials to students or having longer self-learning time would not buffer students from negative external factors. Our study has implications for better understanding the extensive influence of online learning barriers caused by external conditions and building preventive mechanisms through the improvement of instructors' teaching experience and communication with students.

Keywords: Online learning, higher education, student satisfaction, Chinese college students, Covid-19

Fang, S., Lu, Y., & Zhang, G. (2023). External and internal predictors of student satisfaction with onlne learning achiement. *Online Learning, 27(3)*, 339-362.

To respond to the public health emergencies caused by Covid-19 in 2020, most higher education institutes (HEIs) transferred their regular education activities online. The sudden burden caused by extra studying time (Fang, Lu, & Chen, 2020), psychological and physical unpreparedness (Razai et al., 2020), and social isolation (Akuratiya & Meddage, 2020) has enlarged the challenges that already existed in online learning for students. As a result, the Covid-19 global pandemic has created the largest-ever online learning practice worldwide, and also brought up a unique opportunity to investigate the quality of online learning during a time of urgent transition.

With numerous studies on online learning, several predictors of student satisfaction have emerged across research studies (e.g., Alqurashi, 2019; Zeng, & Wang, 2021). For example, Asoodar et al. (2016), created a framework with six dimensions to predict student satisfaction in online learning: student, instructor, course, design, technological, and environmental dimensions. Almusharraf and Khahro (2020) used the evaluation of instructors, facility performance, and recommendations by students to evaluate student satisfaction with online learning. However, most of these studies have limitations. First, some of these studies only tested the direct effect of environmental and personal factors on student satisfaction (see, e.g., Parahoo et al., 2016). They did not demonstrate the indirect or interactive relationships of factors that predict student satisfaction with a theoretical framework. The investigation of the complicated mechanism of predictors of online learning satisfaction would help us break those barriers students have to face in online learning. Second, most previous studies are based on students from the U.S., Europe, or the Middle East (Yunusa & Umar, 2021). Few studies on student satisfaction with online learning focus on East Asian or Chinese college students, who usually prefer to learn directly from teachers, which is different from student-centered learning beliefs in Western countries (Chan, 1999; Sit, 2013). Literature in online learning regarding Western college students may not always be applicable to Chinese students considering the varied ideologies of the ideal way of learning. The factors or mechanisms that may determine student learning outcomes or satisfaction could be different among Asian students.

As a result, the current study aims to develop and test an online learning framework to examine technological, environmental, and pedagogical factors as external factors, psychological traits as internal factors, and their mechanism for predicting student satisfaction in online learning during Covid-19 with Chinese college students.

Theoretical Framework

The framework of online learning satisfaction of Chinese students in the current study was inspired by Rovai's (2003) theoretical model of online learning persistence. We adopted the concept of environmental and psychological factors in Rovai's (2003) persistence model and revised them based on Chinese students' cultural context of online learning. Researchers have extensively studied students' persistence and attrition in a face-to-face setting (Tinto, 1993; Bean & Metzner, 1985) and applied those results to the online learning context (Rovai, 2003). However, few researchers have examined student satisfaction as an online learning outcome with a systematically tested theoretical framework, especially in the Chinese context. It may be because persistence or attrition is usually considered an outcome of different levels of satisfaction in Western countries (Lakhal, Khechine, & Mukamurera, 2021; Rahim, 2020; Rovai, 2003; Park, 2007). High satisfaction is assumed to be only one of the factors that keeps students in online classes. However, if we want a better understanding of how to build up a high-quality and large-scale online class, student satisfaction has to be one of the focuses (Zeng & Wang, 2021), and should be as important as persistence or retention.

Rovai (2003) proposes in his persistent model that two sets of prior-admission factors, including student characteristics and student skills, and another two sets of after-admission factors, internal and external factors, altogether determined students' persistence decisions. Rovai (2003) defines external and internal factors from the perspective of the class context, where external factors are factors that happened outside the classes, like family issues or financial problems, and internal factors are factors observed within the classes, like academic integration and technology issues. Park (2007) builds on Rovai's (2003) model, where he defines external factors as those that could affect inside and outside online classes. He argues that external and internal variables should interactively work together, thus in Park's model, external variables would affect students' persistence through the entire process of online learning.

Rovai's (2003) and Park's (2007) models for online learning persistence may not be applicable to Chinese college students though they were tested and expanded by numerous studies (e.g., Park, & Choi, 2009), as Chinese students have very high persistence rates and rarely drop out of college (Marioulas, 2017). Few Chinese college students are part-time or adult learners, making most external factors in Rovai's (2003) and Park's (2007) models not applicable. They mostly do not have challenges from, for example, scheduling conflicts, employment, or family responsibilities. Thus, the external and internal factors for student online satisfaction should be restructured considering cultural differences and the realistic needs of Chinese students.

The current study suggests a new theoretical framework, including student characteristics, internal, and external factors to predict Chinese student satisfaction in online learning based on Rovai's (2003) and Park's (2007) models. However, we make several revisions based on previous literature and Chinese students' characteristics (Figure 1). The current study defines external and internal factors from the perspective of individual students instead of the class setting. Technological, environmental, and pedagogical factors would be external factors as they are barriers out of students' control. In comparison, students' psychological traits, for example, attitudes and emotions, and demographic information are internal factors, as they are related to individual students within the online learning classroom. In the next four sections, we describe these external and internal factors specifically related to this study.

External: Technological and Environmental Factors

Wireless network quality is one of the most important technological factors in efficiently delivering course content and has the potential to greatly affect student satisfaction with online learning (Aguilera-Hermida, 2020; Dhawan, 2020; Putri et al., 2020; Rajabalee, & Santally, 2021; Selim, 2007; Volery & Lord, 2000). Internet difficulties may occur at home when students are not prepared to study in quarantine in an emergency (Simamora, 2020). Students from low socioeconomic status (SES) families are the most vulnerable with limited access to high-quality internet service, which is a necessity for learning online (Putri et al., 2020). Based on Akuratiya and Meddage's (2020) research with 130 students in Sri Lanka during the pandemic, 69.5% of students relied on streaming mobile data to learn online and 46.1% had a limited internet connection speed. An unstable internet connection would diminish the accessibility and quality of learning online experience. In this case, the quality of the internet technology could greatly affect student satisfaction and make online learning quality less comparable to face-to-face learning.

The home environment is not ideal for online learning. Studying at home, which is supposed to be a place of relaxation and rest, students have to make extra effort to maintain a working status (Kay, 2020). Students feel that home is a private and comfortable space in which obligations and work should be excluded (Karim, 2021). To study productively, they have to resist distractions from family members and issues. Nambiar (2020) surveyed 412 students in Indian colleges and universities during the pandemic and found that 23.3% of students found it harder to concentrate and were more distracted when studying online at home as compared to in a face-to-face classroom. Some students reported that their home environment was not supportive and family issues made them less involved in online classes (Nambiar, 2020). Another study had a similar finding that college students reported the biggest challenge of online learning was that it was hard to concentrate at home, which usually was full of noise, family members, and housework (Aguilera-Hermida, 2020). These studies suggest that a congested and distracting living environment can be challenging for students, which may lead to diminishing their satisfaction with online learning (Aguilera-Hermida, 2020; Masha'al, Rababa, & Shahrour, 2020; Meishar-Tal, Weinblat, & Shapira, 2022).

External: Pedagogical Factors

Instructors' teaching experience and their communication with students are two main predictors of student satisfaction in online learning. Particularly during the pandemic, previous online teaching experience would help instructors quickly adapt to online teaching and increase their positive attitudes toward online learning (Ulmer, Watson, & Derby, 2007). Podolsky et al. (2019) conducted a literature review of research studies within the United States and found that the length of teaching experience is highly and positively associated with student achievement. Another study with 132 teachers in Canada found that online teaching experience was associated with instructors' self-efficacy and acceptance of technology during the transition to online learning (Dolighan & Owen, 2021). This leads to the current study assuming that previous teaching experience would associate with better teaching practices for instructors and higher student satisfaction.

Instructors' interaction and communication with students are one of the most effective teaching practices to predict student satisfaction (Gergen, 2015; Herrington & Oliver, 2000). In Vygotsky's (1978) zone of proximal development theory, instructors' facilitation and interaction would be the bridge between what students know and what they need to know and do. Instructors' availability and response are particularly important for keeping students engaged and motivated (Bolliger & Martindale, 2004). Unfortunately, students are more likely to face a loss of communication or fewer interactions with instructors due to the nature of online learning throughout the pandemic (Ives, 2021), disturbing their regular learning process. In this case, online interaction and communication would be particularly important in facilitating a virtual community and social context between instructors and students (McInnerney & Roberts, 2004). It would promote the feeling of connectedness and belonging especially during the global shutdown (Palloff & Pratt, 2001). Instructor-student communication should be a critical part of pedagogical factors associated with student satisfaction in online learning.

Internal: Psychological Traits

Students' positive psychological traits, including attitudes and emotions, play a supporting role in online learning quality (Alavudeen, et al., 2021; Flesia et al., 2020; Wan et al., 2008). They may be the mechanism explaining the link between external environmental, technological, and pedagogical factors affecting students' satisfaction with online learning.

Attitudes Toward Online Learning

The technology acceptance model (TAM) argues that attitudes toward online learning determine online learning quality (Al-Emran, Mezhuyev, & Kamaludin, 2018; Davis, 1989; Al-hawari & Mouakket, 2010). Based on TAM, people's actual use of technology would be explained by their attitudes toward it, including perceived usefulness and perceived ease of use. Several studies have demonstrated the importance of students' attitudes toward online learning satisfaction (e.g., Han & Sa, 2022; Aguilera-Hermida, 2020; Sun et al., 2008). For example, Han and Sa, (2022) found that students' positive perceptions of the use and usefulness of online learning were significantly associated with their education satisfaction with 313 university students who took online classes. Sahin and Shelley's (2008) study with 195 undergraduate students showed that students' recognition of the flexibility of distance learning would predict their perception of the usefulness of distance learning and their learning satisfaction. Both studies suggest the significance of students' attitudes toward online learning in explaining their satisfaction.

Emotions Toward Online Learning

Another important psychological trait that should be involved when investigating student satisfaction is the emotions toward online learning. Pekrun (2006; 2011) argues in his control-value theory of achievement emotion that emotions related to learning activities or outcomes should be called achievement emotions. These emotions include both positive and negative traits, including, for example, joy, pride, hopelessness, anxiety, and boredom. Students' achievement emotions in online learning have been well studied (e.g. Daniels, & Stupnisky, 2012). For instance, a study with 730 undergraduate students found that students' emotions have a strong effect on their preference for online learning (Tempelaar et al., 2012). Negative learning emotions like boredom or hopelessness would prevent students from online learning. Artino (2009) found in his study with 481 undergraduate students that boredom and frustration were associated with lower online learning satisfaction and lower continuing motivation. During the pandemic, adapting to new learning methods and technology, distracting environments, and lack of communication could surely bring negative emotions to new online learners, resulting in low satisfaction and a poor learning experience.

Support from Learning Materials

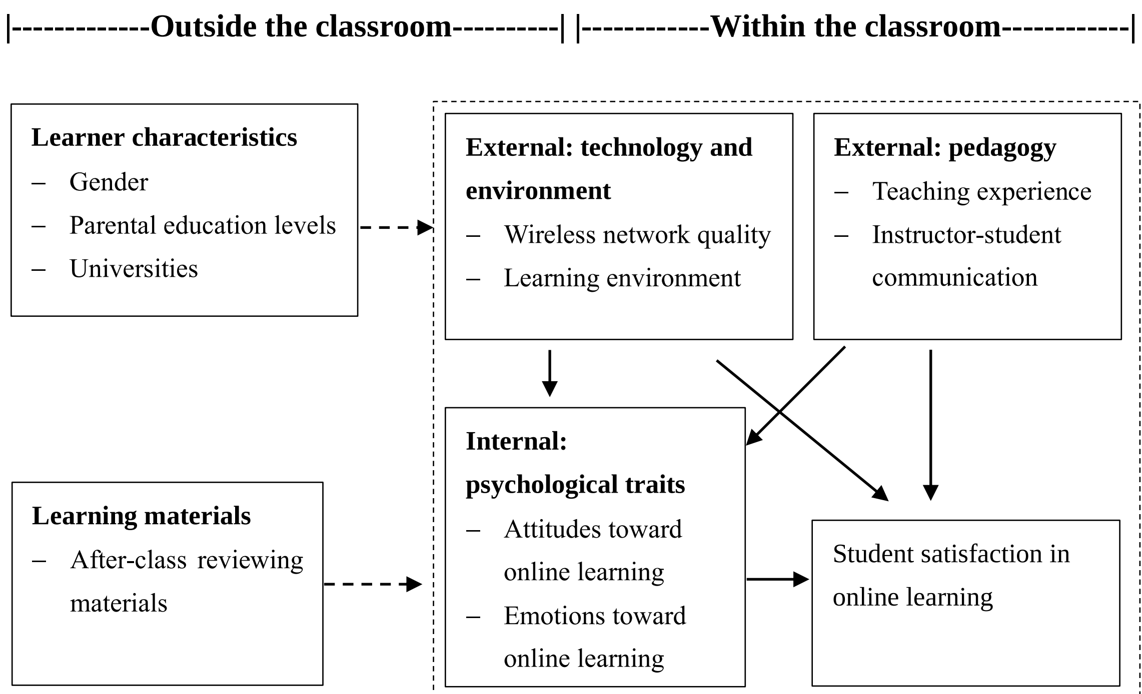
Supplemental learning materials could be a supportive scaffold in online learning. It could motivate student-material interaction, which is associated with students' reflection, engagement, and elaboration in online learning based on the social constructive theory (Anderson, 2008). Moore et al. (1989; 1992; 2011) are some of the earliest researchers who define online interaction. They argue in their online interaction theory that there are three types of interaction: instructor-student, student-student, and student-materials interaction. Student-material/content interaction is one of the most important methods to improve online learning satisfaction. Kuo et al. (2014) surveyed 221 graduate and undergraduate students online and found that student-content interaction was the strongest predictor of student satisfaction in online learning. Sari and Oktaviani's (2021) study with 185 undergraduate students found that most students were highly motivated by online learning materials provided by instructors. Thus, learning materials play a facilitating or scaffolding role in online learning and are associated with student satisfaction. Through the process of interacting with learning materials, students would be encouraged to integrate new ideas or knowledge obtained from online courses with the content provided by learning materials and formulate new questions and thoughts. They are expected to compensate for what students miss or misunderstand in online learning and encourage students to explore new knowledge and ideas.

Research Questions

Considering the supporting role of learning materials and the explaining mechanism of psychological traits between external factors and online learning satisfaction, a theoretical framework is presented in Figure 1. The current study aims to test the proposed student satisfaction model and explores how each factor is associated with online learning satisfaction in different directions and levels.

Figure 1

The Proposed Student Satisfaction Model in Online Learning



1. Are external factors, including wireless network quality, learning environment, instructors' teaching experience, and instructor-student communication associated with student satisfaction?

2. Does providing after-class reviewing materials moderate the association between external factors and student satisfaction in online learning?

3. Are internal factors, including attitudes and emotions toward online learning mediate the association between external factors and student satisfaction?

Method

Participants

The current study had a total of 5980 students who completed course evaluation surveys of general education courses from universities A and B in China. Both universities are known for their well-developed general education systems. University A is located in Wuhan, one of the biggest cities in Central China. University B is located in Beijing, which represents one of the biggest cities in Northern China. There were 2370 (40.69%) female-identifying students and 3454 (59.31%) male-identifying students. For mothers' education levels, 1286 (27.78%) students' mothers had junior high school or lower degrees; 1066 (25.57%) had high school degrees; 574 (15.30%) had associated degrees; 855 (25.81%) had Bachelor's degree, and 123 (5.55%) had Master's degree or above. Most students (2046) were engineering and technology majors (55.48%). Natural science students were 24.78%. Social science students were 15.06% and humanities students were 4.69%.

Table 1

Demographic Information of Students from Universities A and B

		University		Total	Percentage
		A	B		
Gender	Female	1695	675	2370	40.69%
	Male	2209	1245	3454	59.31%
Mother's education levels	Junior high school or lower	1286	332	1618	27.78%
	High school	1066	423	1489	25.57%
	Associated degree	574	317	891	15.30%
	Bachelor's degree	855	648	1503	25.81%
	Master's degree or above	123	200	323	5.55%
Major	Humanities	60	213	273	4.69%
	Social science	653	224	877	15.06%
	Natural sciences	1145	298	1443	24.78%
	Engineering and technology	2046	1185	3231	55.48%
Total		3904	1920	5824	100%

Procedure

Our data were collected through the Chinese University Course Evaluation (CUCE) project. The CUCE project aims to evaluate general education courses within seven top universities in China. It has been conducted for six years since 2016. The current study only adopted the data from the spring semester of 2020 from two universities, which was a remote online-learning semester due to the lockdown during the Covid-19 pandemic. All students were expected to take online courses at home during this semester as the quarantine policy was announced one day before the Spring Festival during winter break. It is the biggest holiday in China when most Chinese people would celebrate with their families at home.

The general education courses in these two universities were elective and open to all undergraduate students. Each undergraduate student had to fulfill a certain number of general education course credits to graduate. The number of credits depended on students' majors and colleges. To achieve a higher response rate, the teaching assistants and administration office would send out several reminder emails with the survey links to students at the end of the semester until the response rate reached 50%. Participation was voluntary and anonymous.

Measures and Instruments

All the items in the CUCE were designed by the authors of current studies corresponding to the specific need of teaching and learning practices collected from the administration office, instructors, and students. As each item reflected different aspects of teaching and learning online, variables were measured on single items.

External factors

The current study took technological, environmental, and pedagogical factors as external factors, including wireless network quality, learning environment, online teaching experience, and instructor-student communication. The student-reported survey items adopted respectively were "wireless network condition is poor"; "my learning environment is distracting and not good for online learning"; "the instructor is not experienced with online teaching"; "I can't get help and guidance when I have questions." For these four items, students reported their answers with a four-point scale from one (totally disagree) to four (totally agree). Higher scores indicated inferior external conditions perceived by students while lower scores indicated good external conditions. They were treated as continuous variables.

Internal Factors

For individual-level internal factors, we examined the level of negative emotions toward online learning through the item "I feel consistently confused and hopeless on how to learn well in this class," and students' attitudes toward online learning were tested through the item "online learning makes me disengaged, distracted, and low-achieving." They were continuous variables with a four-point scale from totally agree to totally disagree. Higher scores meant more negative attitudes toward online learning, and lower scores meant fewer negative attitudes.

Moderator

The survey item used as the moderator asked students whether their instructors provide "after-class reviewing materials." The answer is 0 (no, not provided) versus 1 (yes, provided).

Student satisfaction

The outcome variable was student satisfaction with learning achievement in the online course. The answer was a five-point Likert scale from 1 = very unsatisfied to 5 = very satisfied.

Covariates

Participants' universities (university A = 0) and gender (female = 0) were treated as dummy variables (Table 1). Mothers' education levels were continuous variables (Table 1). Five majors (humanities = 0) were run as four dummy variables (Table 2). Weekly study time (almost none = 0; less than 1 hour; 1-2 hours; 2-3 hours; 3-4 hours; more than 4 hours) were nominal and taken as five dummy variables.

Data Analysis Plan

The current study had four steps of data analysis. First, we conducted descriptive statistics of student demographic information (Table 1) and external and internal variables (Table 2). Second, we ran a series of multivariate linear regression models to answer research question one to examine the direct effect of external variables on student satisfaction. Third, a series of multivariate regression models were run to examine research question two to assess the moderating effect. We first tested the effect of control variables in the first model in Table 4. In the following models, we tested the direct and interactive effect of each independent variable and moderator in models 2 and 3. In model 4, we tested all interactors all together in one model. In model 5, we put in the weekly study time to examine and control the effect of self-learning time on student satisfaction. Variables for interactions were centered to reduce multicollinearity. Fourth, two mediating effect models were tested through structural equation modeling (SEM) to answer research question three. One was for environmental and technological factors and the other was for pedagogical factors considering their different roles playing on student satisfaction in our proposed online learning theoretical models (Figure 1).

Descriptive statistics and multivariate regression models were conducted with Stata 15.1, integrated statistical software for storing, managing, and visualizing data (Stata Corp, 2017). The assumptions of multivariate regression models, including linear relationship, no multicollinearity, independence, homoscedasticity, and multivariate normality were tested. Beta is the standardized coefficient. The robust standard error was adopted for heteroskedasticity. The path analysis models through SEM were used to evaluate the best-fitting model and its structural coefficients to assess the total effect of explanatory variables on dependent variables. The model fit was based on the acceptable thresholds of indices, for example, normed fit index (NFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). The value of NFI and CFI has to range from .90 to 1 to be good. The RMSEA examines the closeness of fit with an acceptable value smaller than .08. Bootstrapping was applied to better evaluate the indirect effect of the mediating models.

Results

Descriptive Statistics

The mean and standard deviation of internal and external variables are presented in Table 2. There were 590 students, who reported that their instructors did not provide after-class reviewing materials while 5134 said their instructors did.

Table 2

Descriptive Statistics of Internal and External Variables

Variables	Mean	S.D.	95% Confidence Interval	
Wireless network quality	2.11	0.013	2.08	2.13
Learning environment	1.88	0.012	1.85	1.90
Online teaching experience	1.54	0.010	1.52	1.56
Instructor-student communication	1.71	0.011	1.69	1.73

Multivariate Regression Results

Direct Effect

Five multivariate linear regression models were conducted to examine how external factors were associated with student satisfaction (Table 3). In the first model, controlling variables were added. In the second model, poor wireless network quality (*Beta* = -.05, p <.01) and learning environment (*Beta* = -.09, p <.001) were included. Both of them were significantly and negatively associated with student satisfaction. It indicated that the worse the wireless network quality and learning environment were, the lower student satisfaction with learning achievement was. Next, the lack of online teaching experience (*Beta* =-.10, p <.001) and instructor-student communication (*Beta* =-.17, p <.001) were added to the third model and showed a significant and negative association with student satisfaction (Table 3). It meant that instructors' insufficient online teaching experience or communication with students would be correlated with low student satisfaction

In the fourth model, we put in four external variables altogether. When online teaching experience and instructor-student communication were added, wireless network quality and learning environment became nonsignificant (Table 3; Model 4). It demonstrated that online teaching experience (*Beta* =-.11, p <.001) and instructor-student communication (*Beta* =-.17, p <.001) played a bigger explanatory role in predicting student satisfaction compared to environmental or technical factors.

In the fifth model, students' weekly study times were added as five dummy variables. Results found that study time was significant and positively associated with student satisfaction (Table 3). Moreover, the beta reached the largest value (*Beta* = .22) when study time ranged from one to three hours per week, and gradually diminished when it became longer than three hours. However, after adding in weekly study time, online teaching experience (*Beta* =-.10, p <.001), and instructor-student communication (*Beta* =-.17, p <.001) were still significantly associated with student satisfaction and their coefficients barely changed (Table 3). This implies that studying after classes for a longer time predicts higher student satisfaction, but it would not prevent students from the negative effect of instructors' insufficient online teaching experience and loss of instructor-student communication.

Table 3
Multivariate Regression of External Variables on Student Satisfaction

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
	Beta	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**
(Constant)	4.09***	.06	4.37***	.06	4.58***	.06	4.55***	.06	4.21***	.08
University	-.06***	.02	-.07***	.02	-.08***	.02	-.08***	.02	-.07***	.02
Social science	.02	.06	.01	.06	.01	.06	.01	.06	.00	.06
Natural sciences	.00	.06	-.02	.06	-.02	.05	-.02	.05	-.03	.05
Engineering and technology	.04	.05	.02	.05	.01	.05	.01	.05	-.00	.05
Gender (female)	.02	.02	.02	.02	.04***	.02	.04***	.02	.04***	.02
Mother's education levels	.09***	.01	.07***	.01	.07***	.01	.07***	.01	.07***	.01
Wireless network quality			-.05**	.01			.01	.01	.01	.01
Learning environment			-.09***	.02			.02	.02	.01	.02
Online teaching experience					-.10***	.02	-.11***	.02	-.10***	.02
Instructor-student communication					-.17***	.02	-.17***	.02	-.17***	.02
Weekly study time：Less than 1 hour									.16***	.30
1-2 hour									.22***	.36
2-3 hour									.22***	.41
3-4 hour									.16***	.46
More than 4 hours									.11***	.44
Adjusted R^2	.01		.02		.07		.07		.08	
Error *df*	5817		5815		5815		5813		5808	

Note: *p<0.05; **p<0.01, ***p<0.001.

Moderating Effect

The current study conducted four multivariate linear models to examine the effect of providing after-class reviewing materials and its interaction with each external variable on student satisfaction with learning achievement (Table 4). Results showed that providing after-class reviewing materials had a significant and positive association with student satisfaction across all three models (Table 4; Model 2: *Beta* = .10, $p < 0.01$; Model 3: *Beta* = .09, $p < 0.01$; Model 4: *Beta* = .09, $p < 0.01$). However, contradicting our original hypotheses, providing after-class reviewing materials did not show a significant moderating effect on the association between each external variable and student satisfaction with learning achievement in all three moderating models in Table 4.

Table 4

The Moderating Effect of Providing After-class Reviewing Materials on Student Satisfaction with Learning Achievement

	Model 1		**Model 2**		**Model 3**		**Model 4**	
	Beta	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**
(Constant)	3.73***	.08	3.80***	.08	3.82***	.07	3.82***	.08
University	-.05***	.02	-.06***	.02	-.07***	.02	-.07***	.02
Social science	.01	.06	.00	.06	.00	.06	.00	.06
Natural sciences	-.01	.06	-.02	.05	-.03	.05	-.03	.05
Engineering and technology	.02	.05	.01	.05.	.00	.05	.00	.05
Gender (female)	.02	.02	.02	.02	.04**	.02	.04**	.02
Mother's education levels	.09***	.01	.07***	.01	.07***	.01	.07***	.01
Less than 1 hour	.17***	.06	.16***	.06	.15***	.06	.15***	.06
1-2 hour	.24***	.06	.23***	.06	.21***	.06	.21***	.06
2-3 hour	.24***	.06	.23***	.06	.21***	.06	.21***	.06
3-4 hour	.18***	.07	.18***	.06	.16***	.06	.16***	.06
More than 4 hours	.13***	.08	.12***	.08	.11***	.08	.11***	.08
After-class reviewing materials			.10***	.03	.09***	.03	.09***	.03
Wireless network quality			-.04*	.01			.01	.01
Interaction1			-.00	.05			.00	.04
Learning environment			-.09***	.02			.01	.02
Interaction2			-.01	.05			.00	.05
Online teaching experience					-.10***	.02	-.10***	.02
Interaction3					-01	.07	-.01	.07
Instructor-student communication					-.16***	.02	-.16***	.02
Interaction4					-.02	.06	-.02	.06
Adjusted R^2	.03		.05		.09		.09	
Error *df*	5812		5807		5807		5803	

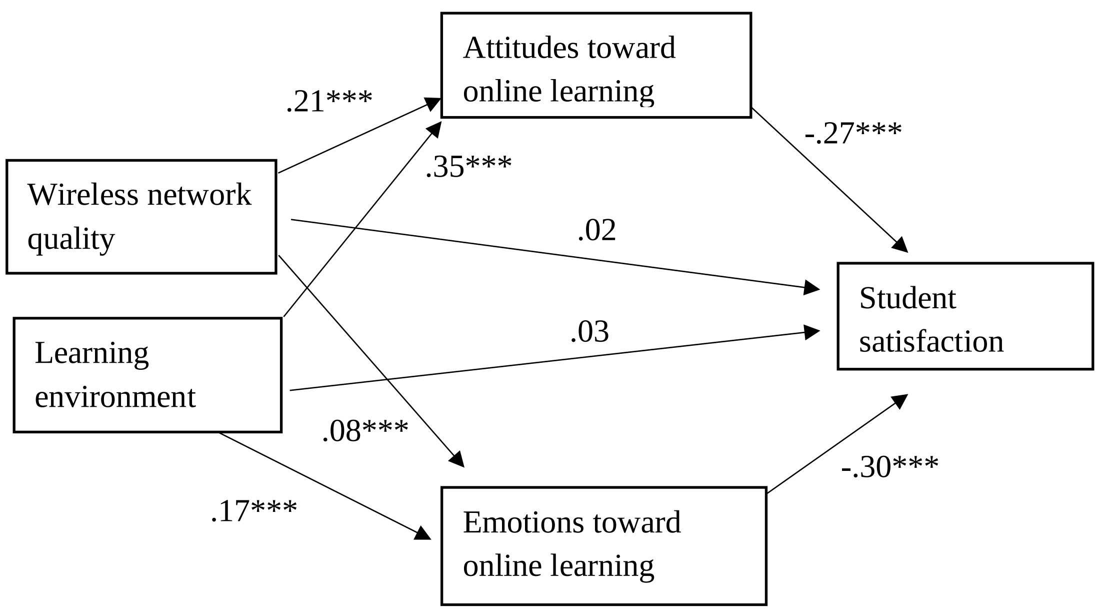
Note: *p<0.05; **p<0.01, ***p<0.001; Interaction1= After-class reviewing materials* Wireless Network quality; Interaction2= After-class reviewing materials* Learning environment; Interaction3= After-class reviewing materials* Online teaching experience; Interaction4= After-class reviewing materials* Instructor-student communication.

Mediating models

The current study conducted two path analysis models to examine the mediating effect of internal psychological traits in research question three. All estimates were standard regression coefficients. The results of the first model found that the wireless network quality and learning environment were associated with attitudes and emotions toward online learning, with the attitudes and emotions toward online learning also associated with student satisfaction (Figure 2). It demonstrated that student attitudes and emotions toward online learning mediated the links between wireless network quality, learning environment, and student satisfaction. The proposed model showed an acceptable fit to the data (RMSEA = .08, CFI = .82, NFI = .82). The total effect of wireless network quality and learning environment on student satisfaction was significant ($\beta = -.11$, $p < 0.01$). However, the two paths of direct effect from two external factors on student satisfaction were not significant. The indirect effect of wireless network quality ($\beta = -.03$, $p < 0.01$) and learning environment ($\beta = -.05$, $p < 0.01$) through attitudes toward online learning to student satisfaction were significant and negative. The indirect effect of wireless network quality ($\beta = -.02$, $p < 0.01$) and learning environment ($\beta = -.05$, $p < 0.05$) through emotions toward online learning to student satisfaction were significant and negative. Both negative environmental external factors were indirectly associated with lower student satisfaction through negative attitudes and emotions toward online learning.

Figure 2

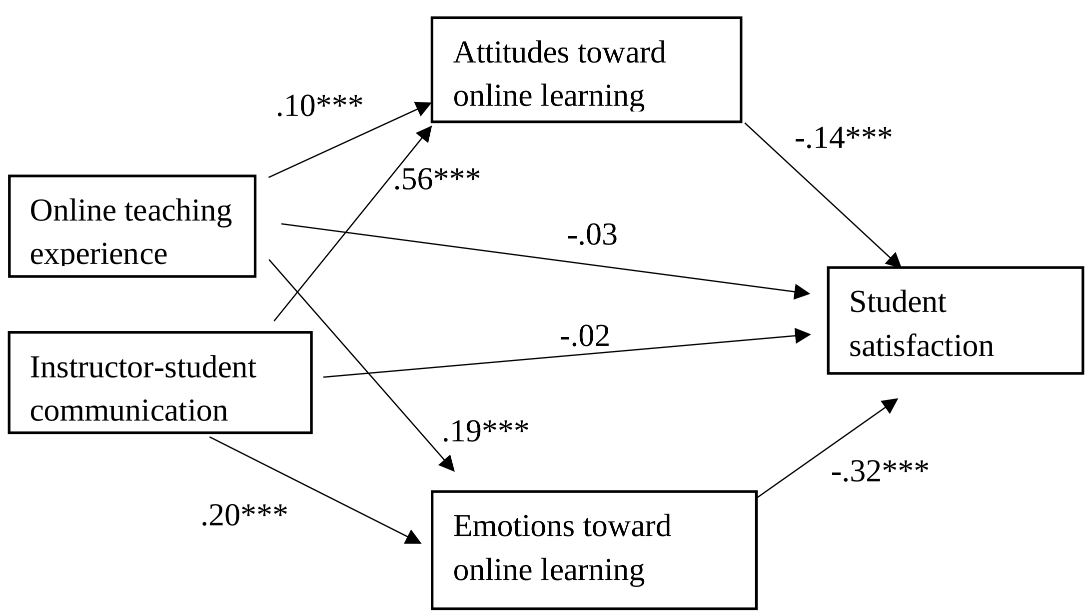
The Mediating Effect of Attitudes and Emotions Toward Online Learning on the Association Between Wireless Network Quality, Learning Environment, and Student Satisfaction



Note: **$p < .01$; ***$p < .001$.

The second path analysis model found a significant association between teaching experience, instructor-student communication, and attitudes and emotions toward online learning, and a significant association between attitudes and emotions toward online learning and student satisfaction with learning achievement (Figure 3). It demonstrated a significant mediating effect of attitudes and emotions toward online learning between online teaching experience, instructor-student communication, and student satisfaction. The model had good model fit (RMSEA = .06, CFI = .90, NFI = .90). The total effect was significant and negative ($\beta = -.26$, $p < 0.01$). The direct effect of teaching experience and instructor-student communication on student satisfaction was not significant. The indirect effect of teaching experience ($\beta = -.02$, $p < 0.01$) and instructor-student communication ($\beta = -.07$, $p < 0.01$) through attitudes toward online learning on student satisfaction was significantly negative. The indirect effect of teaching experience ($\beta = -.07$, $p < 0.01$) and instructor-student communication ($\beta = -.06$, $p < 0.01$) through emotions toward online learning on student satisfaction was significant and negative as well. It demonstrated that both pedagogical external factors only had an indirect effect on student satisfaction through attitudes and emotions toward online learning. Attitudes and emotions toward online learning were the mechanisms explaining the association between two negative external pedagogical factors and low student satisfaction.

Figure 3
The Mediating Effect of Attitudes and Emotions Toward Online Learning on the Association Between Online Teaching Experience, Instructor-Student Communication, and Student Satisfaction



Note: $^{**}p < .01$; $^{***}p < .001$.

Discussion

Detecting factors and mechanisms that explain student satisfaction with online learning has been the focus of online education research, which is also the aim of the current study. The present study has three main findings. First, among external factors, instructors play a bigger role than technological or environmental factors when predicting student satisfaction. Second, providing materials for learning after classes would not buffer the aversive effect of external factors in online learning. Third, our proposed student satisfaction model is supported. Inferior external factors would be internalized as negative attitudes and emotions toward online learning and indirectly relate to student satisfaction with online learning.

The Critical Role of Instructors

Our results aligned with previous theories of Rovai (2003) and Moore et al. (1989; 1992; 2011) that pedagogical factors are very important in explaining student learning outcomes, especially satisfaction. Based on our results, instructors could accumulate more online teaching experience and keep frequent communication with students to help them succeed in learning online, which is supported by previous research from Podolsky et al. (2019). These two factors have stronger predictive power on student satisfaction than wireless network quality and learning environment. This suggests that for HEIs, instructor training should be prioritized before information technology infrastructure upgrading, particularly when there is an emergency with limited resources. From another perspective, this finding is encouraging that it is easier to adjust instruction methods compared to making fundamental innovations in technical or environmental conditions within a short period. HEIs and instructors should play an active role in teacher training programs to improve online teaching practices and experience to help students succeed online.

The Challenges of Inferior Online Learning Conditions

Contrary to the researchers' hypotheses and previous study from Sari and Oktaviani's (2021), having longer study time with provided supplementary learning materials would not protect students from external challenges such as an inferior learning environment or absence of instructor-student communication. It suggested that missing content in online classes due to inferior external conditions may make self-learning at home less efficient after classes, especially with extra obstacles during the pandemic. Sufficient environmental and technological support is the precondition for a satisfactory learning experience at home alone. The results highlight the urgent necessity to improve the technological, environmental, and pedagogical support for students to succeed in learning online. Moreover, this may also explain why online learning has enlarged the educational disparities between students from different social economic statuses (SES) during the pandemic (Kuhfeld et al., 2020; Chetty et al., 2020). As students from low SES have more environmental and technological limitations at home than students from higher SES backgrounds, they might face additional challenges to success in learning online (Putri et al., 2020). Therefore, to achieve large-scale online learning while maintaining education equality, eliminating inferior environmental, technical, and pedagogy factors has to be the priority goal.

Internalization of Negative External Factors

The last finding of the current study suggests that the impact on student satisfaction brought by both internal and external factors may be larger and deeper than expected during the online learning experience. On top of previous literature on TAM (Davis, 1989) and control-value theory of achievement emotion (Pekrun, 2006; 2011) that psychological traits would affect online learning experience, we found that students would transfer external learning obstacles into negative attitudes and emotions toward online learning. Our proposed model in Figure 1 is supported. This is alerting as they are very stable and critical predictors of learning achievements, satisfaction, and retention (Al-Hawari & Mouakket, 2010) and are hard to reverse in a short time (Lee & Stankov, 2018). The psychological intervention for students would be time-consuming and require broad and intensive collaboration and effort of educators, researchers, and parents. Thus, the negative psychological traits caused by inferior environmental, technological, and pedagogical factors may not only hurt student satisfaction but also the long-term online learning process and outcomes.

Implications and Future Research

The current study has implications for advancing online learning quality and future online program development. First, it has a theoretical contribution to previous student satisfaction or persistence models that predictors may not only have a direct effect but also an indirect effect within online learning. Determinants of student learning satisfaction and outcomes may be more complex than previous literature has suggested. Second, it has practical implications for educational resource attribution and arrangement by investing in instructor training ahead of technological upgrades. This is particularly helpful when HEIs have limited educational resources and want to improve student online learning quality within a short time. It also calls upon HEIs to enrich instructors' online teaching experience with more availability of online courses and enhance students' attitudes and experience of new technologies to motivate them to take online programs in the future. Third, due to the intensive and broad effect of poor environmental and technological factors, the public sector should enlarge the investment in information technology infrastructure to prevent the negative influence of external factors and support students from all SES to have equal opportunity and access to online learning.

Furthermore, the current study has implications for demonstrating large-scale online programs as a promising and necessary method with stable technical and environmental support, and a well-designed interactive course structure. Particularly in China, online learning is a newly emerging education method and industry. China has just entered the higher education popularization stage in 2019, which meant the higher education enrollment rate exceeded 50%. The development of online programs could speed up progress in increasing the college education enrollment rate and maintaining regular education activities during the pandemic. There is a strong practical need for the expansion of online programs in China. More research based on the Chinese population for future online program development would be valuable.

Limitations

The current study has several limitations. First, it does not have data on instructors' demographic information and their perceptions of online teaching. Having actual data from the instructors could help us better understand the influence of instructors' teaching practice on online learning outcomes. Second, our data were collected from two top-tier universities. Their results may not fully represent universities from other levels. Third, we did not have data from major required courses, in which students and instructors may put more time and effort. Student behavior in major-required courses could be different from what we observed in general education courses. Fourth, our data is cross-sectional, which limits our ability to draw causal relationships between variables.

Conclusion

To better help students across various backgrounds, future research could focus on other common teaching methods that may prevent students from experiencing inferior learning conditions. For example, one approach is for better online course design with more types of instructor-student interactive activities. Future research in online learning could employ longitudinal studies or randomized experiments to establish causal relationships between possible mediators and moderators. For instance, researchers could use online class data with identical instructors and content to create treatment and control groups, and compare the effectiveness of different teaching practices, such as instructor-student interactions or learning materials provided. Additionally, future studies could track students who have taken online classes and subsequently returned to campus after pandemic, and compare their learning outcomes while controlling for other potential variables. These causal relationships would provide valuable evidence for identifying the most influential mechanisms that contribute to student satisfaction with online learning.

Declarations

The authors declare that they have no competing interests.

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Using a Variety of Interactive Learning Methods to Improve Learning Effectiveness: Insights from AI Models Based on Teaching Surveys

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Abstract
The last decade has brought far-reaching changes in higher education, leading institutions to shift some or all instruction online. This shift to distance learning has contributed to a more significant need for active learning: changing students from passive knowledge consumers into proactive knowledge producers using interactive teaching practices. The present study joins an emerging body of literature examining the relationship between active learning, the online environment, and students' performance. In this study, we examined the effect of four interactive learning methods (combined with technology) on students' overall assessments of the class, the clarity of the teaching, and the perceived effectiveness of online distance learning. The data source for the research is teaching evaluation surveys filled out by undergraduate and master's students. In total, we analyzed ~30,000 surveys completed by ~4,800 students from 23 departments, covering 1,265 classes taught by 385 lecturers. We used both classic statistical and AI-based methods. Our findings suggest associations between high use of interactive learning methods and higher student evaluation scores, higher perceived effectiveness of distance learning, and clearer course teaching. A more interesting finding indicates that not only the extent of use, but also use of a variety of interactive learning methods significantly affects the perceived clarity of teaching and learning effectiveness. Based on the findings, we recommend that academic staff integrate a variety of interactive teaching methods, and especially short knowledge tests, in their courses (both online and frontal). Beyond these results, the prediction model we built can be used to examine what mix of different interactive learning methods might improve students' evaluations of any given course.

Keywords: active learning, interactive learning methods, student evaluation, online learning

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The COVID-19 pandemic brought far-reaching changes in many realms of life, not least among them higher education. In the face of the pandemic, institutions around the world closed their (physical) doors and shifted all or most instruction online (e.g., via videoconferencing software such as Zoom, Microsoft Teams, etc.). Researchers have investigated the implications of this shift to distance learning on various aspects of the student experience, including satisfaction, course quality evaluations, self-regulated learning, and well-being (Ho et al., 2021; Holzer et al., 2021).

Active learning is a philosophy of teaching that, over the past two decades, has captured the interest of higher education institutions around the world (Johnson & Johnson, 2008). In essence, active learning entails transferring responsibility for learning from the lecturer to the student (Michel et al., 2009). That is, active learning is intended to replace the traditional frontal model in which lecturers take responsibility for the learning process, while students are passive listeners (Minhas et al., 2012; Hyun et al., 2017). Active learning practices include a variety of methods designed to support learning through meaningful interactions between the lecturer and students and between students themselves. Many active learning practices developed in recent years are supported by digital tools, which are intended to enhance this interactivity.

With the advent of COVID-19, traditional face-to-face (F2F) learning in physical campuses was abruptly halted, and academic staff were required to shift their courses online quickly with little or no warning. Under these conditions, both lecturers and students faced many challenges that hampered learning effectiveness. Yet after a period of adjustment following the onset of the pandemic, students and lecturers became aware of the advantages of online learning (along with the disadvantages). As such, the COVID-19 pandemic has created a reality that is not reversible. Even as pre-pandemic norms have begun to return in many areas of life, more and more academic institutions, often under the recommendation (or coercion) of regulators, are moving towards blended learning.

In online learning, the interactive possibilities enabled by sharing a physical space are eliminated, and lecturers need other means to attract and maintain students' attention. It follows that, in online courses, the sorts of interactive learning methods that fall under the active learning umbrella take on greater significance and even become mandatory (Bell & Federman, 2013). The COVID-19 period therefore offers an opportunity to examine the effect of different active learning practices on various parameters in online courses.

In the present study, we examined how the use of interactive learning methods (combined with technology) in the virtual space affects students' evaluations, along with their perceptions of how clearly the material was taught and the effectiveness of distance learning. The motivation behind the study was a decision in the late 2010s by our academic institute to experiment with elements of interactive learning under the *WeLearn* umbrella (https://welearn.org/#/). As part of this initiative, academic staff were encouraged to integrate active learning using digital and interactive teaching tools in all courses. Specifically, lecturers were encouraged to incorporate four active learning practices into class time: small group work; independent work; student presentations; and short knowledge tests.

To gauge the effects of the new practices, during the 2019–2020 academic year the university began including assessments of active learning in routine teaching evaluation surveys filled out by students. The present study examined the results of surveys distributed at the end of Semester B in 2019–2020 (i.e., in June 2020) and the end of Semester A in 2020–2021 (January 2021). This timing coincided with the onset of the COVID-19 pandemic and the shift to online learning. Thus, we examined *how active learning* ***in online courses****, and specifically the* ***extent*** *and*

***variety** of interactive learning methods used, is associated with students' (a) evaluations of the course, (b) perceptions of the effectiveness of distance learning, and (c) perceptions of the clarity of the teaching*. Thus, the present study adds to the literature on both online learning and active learning by examining the role of the latter in a distance learning context.

The data are based on nearly 30,000 surveys completed by about 4,800 students, including women and men in different years of study (first through fourth), who were studying in various departments (e.g., business administration, computer science, nursing) within four different faculties for either a bachelor's or master's degree. All students were enrolled at the same academic institution. The surveys related to 1,265 classes taught by 385 lecturers.

Data on the research questions was analyzed alongside a range of 13 class and student characteristics (e.g., class size, lecturer's gender, student's gender, etc.). Analysis of the data, using a variety of statistical research methods (including the Wilcoxon test and multivariate linear regressions), shows that, above and beyond the effect of class characteristics, high use of interactive learning methods is associated with higher student evaluation scores, higher perceived effectiveness of distance learning, and clearer teaching. Our results suggest that one key feature is the **variety** of active learning methods used, such that the more varied the practices the student experiences, the more satisfied that student is likely to be with the teaching in the class and the greater its perceived effectiveness. Among the four practices examined, our findings show the strongest results for short knowledge tests during classes. Following these results, we hope that the AI-based models we developed for the prediction of students' evaluations will help lecturers and teaching staff to better design and fine-tune their courses and their teaching approaches.

Background

Active Learning: Definition and examples

Active learning has been explored with increasing intensity over the last two decades. The literature offers different definitions of active learning. According to Felder and Brent (2009, p. 2), "Active learning consists of short course-related individual or small-group activities that all students in a class are called upon to do, alternating with instructor-led intervals in which student responses are processed and new information is presented." Prince (2004, p. 1) defined active learning more broadly as "any instructional method that engages students in the learning process." Many researchers prefer to define active learning in opposition to traditional learning, where students are expected to be passive recipients, doing only what is required of them, while the lecturer takes responsibility for the learning process (Mazur & Hilborn, 1997; Hake, 1998; Prince, 2004; Johnson & Johnson, 2008; Edwards, 2015). In the present study we follow this approach, defining active learning broadly as any set of methods that, when employed in the classroom, draw students out of their passive comfort zone into an active zone, where students commit to sharing responsibility for their own learning with the lecturer.

More precisely, active learning comprises a range of techniques that motivate students to engage with the material at higher levels, whether as individuals, in pairs, or in teams. They may include presenting complex issues in new contexts, encouraging students to consider a variety of solutions, presenting information in different ways, and providing immediate feedback (Khan & Madden, 2016). Specific active learning techniques include the following:

- **Peer learning.** In peer learning, students learn by teaching, a method which is known to be highly effective. Peer learning can take place in several ways. The first is student presentations, where students prepare material at home to present to their peers (and the lecturer) in class (Boud et al., 1999). The second is the inverted (or flipped) classroom, where students first learn material independently at home, and then work through questions or complex problems together in class. This is the reverse of the common practice where new content is introduced in the classroom, and then students work on mastering that content at home (Mazur & Hilborn, 1997; Bishop & Verleger, 2013; Jensen et al., 2015). Finally, in team-based learning (TBL), also known as collaborative learning, students work together on a series of group assignments in which they practice using course concepts to solve problems (Michaelsen & Sweet, 2008).
- **Peer evaluation.** In peer evaluation, students are required to evaluate the learning outcomes of others, usually on an indicator basis. Through this process, they improve their own understanding, application, or analysis of concepts learned in the course (Sengupta, 1998).
- **Case-based learning**, also called dilemma-based learning (Farashahi & Tajeddin 2018), is a well-established approach in which students are asked to apply their knowledge to real-world problems. As such, they learn by doing, while also developing interpersonal skills as they integrate and assess the perspectives of different team members. Case-based learning can be supported easily via collaborative digital tools like digital mind maps.

Other commonly used active learning methods include blended learning, simulations, role-playing, knowledge tests, active discussions, and more.

Discussions of active learning methods in the literature distinguish between two sets of orthogonal parameters: whether they employ multimedia/digital technologies; and whether the class meets in a physical (F2F) or virtual space (online, remote, or distance learning). A wealth of contemporary apps and technologies mean that most active learning methods can be carried out even in online classrooms (for example, small work groups can meet in breakout rooms on Zoom, while students can share content on virtual bulletin boards using the Padlet app). Some research has examined how different active learning tools affect measures of student satisfaction and perceptions of learning face-to-face versus distance learning. For example, Parrish et al. (2021) used embedded mixed methods to examine how students' perceptions of classroom community varied between face-to-face and online courses in the presence and absence of team-based learning (TBL). They found that students in online TBL courses experienced a similar sense of classroom community and connectedness as those in face-to-face courses. The present study adds value to this literature, in light of the transition in academia to distance learning necessitated by the pandemic.

Table 1 outlines the four course types created by the two sets of parameters. The present study is concerned only with the cell at top right—virtual classes employing digital technology.

Table 1
Active Learning Parameters

Class environment / Technology	**Physical**	**Virtual (online)**
Digital	Class meets F2F; active learning exploits multimedia/ digital tools and software	Class meets online; active learning exploits multimedia/ digital tools and software
Non-digital	Class meets F2F; active learning includes only F2F components	Class meets online; active learning limited to verbal, whole-group activities.

Active Learning Combined with Multimedia/Digital Tools

In the context of digital technologies, multimedia refers to interactive digital tools that employ more than one type of media, such as text (alphabetical or numerical), symbols, images, audio, video, or 3D (Guan et al., 2018). Many different multimedia applications are currently on the market, designed for different disciplines (e.g., mathematics, social sciences, natural sciences, physiology, and physical education), different age groups, and different goals (Abdulrahaman et al., 2020). Some applications have been found to significantly support and facilitate learning, while for others only marginal success has been recorded. For example, Dori and Belcher (2005) reported on the Technology-Enabled Active Learning (TEAL) project, conducted at MIT, in which media-rich software used for simulation and visualization was combined with group interaction in specially designed freshman physics classes. Most students who participated in the project reported that they would recommend the TEAL course, citing the benefits of interactivity, visualization, and hands-on experiments, which were enabled or supported by the technology. Milovanovic et al. (2013) and Werdiningsih et al. (2019) examined the use of multimedia tools in the context of mathematics and computer training, respectively. In both studies, students were divided into a control group, where lectures were given in the traditional way, and an experimental group, where interactive multimedia tools were used during the lessons. In both studies, students in the multimedia group demonstrated better theoretical and practical knowledge, and Milovanovic et al. (2013) also found that students in the multimedia group were more interested in the material being studied.

Balzotti and McCool (2016) examined whether the flipped classroom model could be extended by using digital platforms. To this end, they integrated into undergraduate courses a set of video modules that documented the opinions of experts on course-related topics. The researchers found that these videos, which simulated informal in-class conversations, expanded the possibilities of the flipped classroom model. The course instructors also reported that the use of digital platforms increased student engagement.

Werdiningsih et al. (2019) examined different multimedia tools and concluded that such tools are most effective when chosen to suit characteristics of the class and discipline. Abdulrahaman et al. (2020) also found that the design and sophistication of multimedia applications must be adapted to the learning process.

To summarize: The above studies show that using active learning combined with multimedia tools increases students' engagement and satisfaction with the course.

Related Works

In this section, we review studies with a similar goal to our work. Recall that we are interested in how diverse active learning methods (combined with technology), used in online courses, affect (a) students' overall evaluation of the course; (b) their perceptions of the clarity of the teaching; and (c) their perceptions of the effectiveness of distance learning.

We found in the literature a wide variety of studies dealing with active learning methods and their effects on students' perceptions, behavior, and success: learning satisfaction, performance, academic skills (e.g., time management), personal skills (e.g., self-esteem), commitment, and more (Sahin, 2007; Armbruster et al., 2009; Fisher et al., 2021; Mou, 2021; Parrish et al., 2021). Yet some of these studies do not explore online courses, and some chose to examine different effects than ours. In this section, we focus on the literature that investigates online courses with goals germane to our research goals.

Many studies have explored the relationship between distance learning and students' engagement (Cole et al., 2021), satisfaction (Sahin, 2007; Liaw, 2008; Stefanovic, 2011; Landrum, 2020; Ho, 2021), emotions (Ghaderizefreh & Hoover, 2018), and more. Sahin (2007) explored the characteristics of online learning environments using data collected via a survey of 917 undergraduate students. Results show that (a) personal relevance, (b) instructor support, (c) active learning, and (d) authentic learning were significantly and positively related to student satisfaction. It should be recalled that the capabilities of distance learning technology in 2007 were lower than those of the present day, suggesting that active learning might be even more relevant and useful in contemporary online courses. Ho and colleagues (2021) examined the effect of Emergency Remote Learning (ERL) on students' satisfaction with a sample comprising 425 students from multiple university departments in Hong Kong. While their research questions focused mainly on comparing machine learning and traditional multiple regression models as predictive tools, their results also showed that students prefer face-to-face learning over remote learning. In addition, the following factors influenced the satisfaction score: (a) the instructors' efforts, (b) the appropriateness of the assessment methods, and (c) the perception of online learning being well delivered. Ghaderizefreh and Hoover (2018) examined the effect of online learning on students' emotions and satisfaction with their online learning experience, as well as the effect of students' emotions on their satisfaction. The results show that the students' reports of higher understanding and greater use of illustrations to explain the material were associated with greater enjoyment and lower levels of anger, anxiety, and boredom. Additionally, higher levels of enjoyment and lower levels of anger and boredom increased student satisfaction with the online learning experience.

A few works have examined students' perceptions of the clarity of teaching and the effectiveness of online learning. Liaw (2007) investigated the effectiveness of the Blackboard e-learning system, in addition to students' satisfaction and behavioral intentions, by questioning 424 university students. The study's results showed a strong influence of multimedia instruction, interactive learning activities, and e-learning system quality on the effectiveness of distance learning. Arevalo et al. (2021) assessed both the clarity of teaching and difficulty of earth and space lessons in online personalized learning classes involving interactive approaches (such as task cards). The researchers found that the interactive approaches were useful as an intervention in online distance learning. In addition, lessons taught clearly were considered to be easier.

Table 2 provides an overview of relevant works, mapped according to study characteristics (including reference to data source, sample size, no. of classes in the sample, and whether a predicted model was presented), a list of dependent variables in the study, and independent variables in the study (including reference to whether the study examined the use of interactive learning methods, and, in particular, a variety of learning methods; class/course characteristics; student characteristics; and other characteristics).

As can be seen from Table 2, most of the reviewed studies deal with student satisfaction or evaluations, and only a few refer to students' perceptions about the clarity of teaching and the effectiveness of distance learning. In addition, only a few of the reviewed studies refer to interactive methods in online learning, and their effect on the outcome variables of interest in this study. The previous studies most similar to the present work are those of Liaw (2007) and Arevalo et al. (2021), described above. The present study expands on that previous work by examining how specific interactive learning methods affect the perceived clarity of teaching and the effectiveness of distance learning. In addition, we investigated the effect of using a variety of interactive methods, which to best of our knowledge has been addressed only minimally.

Table 2
Overview of Relevant Works, Mapped According to Study Characteristics

	Study characteristics				**Independent variables in the study**				
Reference	**Sample size and source**	**No. of classes in the sample**	**Predicted model?**	**Dependent variables in the study[1]**	**Use of interactive learning methods**	**Use of a variety of learning methods**	**Class/course characteristics**	**Student characteristics**	**Other characteristics**
Current work	~30,000 teaching surveys	1265	Yes	1,2,3	Yes (4 specific methods)	Yes	1. class size, 2. lecturer's gender, 3. semester 4. % of male students, 5. % of stu. with disabilities, 6. % of non-native speakers	1. gender, 2. faculty, 3. year of study	None
Ghaderizefreh & Hoover, 2018	29 questionnaires	1	No	1,4	No	NA	None	1. age, 2. experience in online learning	1. understandability, 2. illustration, 3. level of expectation, 4. difficulty, 5. lack of clarity, 6. pace, 7. enthusiasm, 8. fostering attention
Landrum, 2020	88 questionnaires	1	Yes	1,5,6,7	No	NA	None	1. gender, 2. age	None
Liaw, 2007	424 questionnaires	1	Yes	1,7,10	Yes (without specifying methods)	NA	None	1. gender, 2. study field, 3. experience in online learning, 4. attitudes to e-learning	1. perceived self-efficacy, 2. multimedia instruction, 3. e-learning system quality

[1] Dependent variables in the study: (1) evaluation/satisfaction scores, (2) clarity of teaching, (3) effectiveness of online learning, (4) emotions, (5) self-efficacy, (6) self-regulation, (7) usefulness, (8) perceived learning, (9) academic performance, (10) behavioral intentions, (11) difficulty in course, (12) learning outcome

Sahin, 2011	917 surveys	7	Yes	1	Yes (without specifying methods)	No	1. class type	1. gender, 2. department	1. instructor support, 2. student interaction & collaboration, 3. personal relevance,4. authentic learning, 5. student autonomy
Ho et al., 2021	425 questionnaires	NA	Yes	1	No	NA	None	1. gender, 2. mode of study, 3. year of study	1. readiness, 2. accessibility, 3. instructor-related factors, 4. assessment-related factors, 5. learning-related factors, 6. self-concern
Eom et al., 2006	397 quantitative surveys	?	No	1,8	No	NA	1. course structure, 2. instructor, 3. feedback, 4. interaction, 5. instructor facilitation	1. self-motivation, 2. learning style	None
Hassan et al., 2021	328 surveys	?	Yes	1	No	NA	None	1. gender, 2. age, 3. field of study, 4. academic degree, 5. year of study, 6. CGPA, 7. work status, 8. working conditions, 9. being a parent	1. perceptions of workload, 2. availability of technical support, 3. fear of failing in courses, 4. perceiving teachers as more demanding, 5. unable to catch up with academic tasks, 6. confidence in future career

Gray&DiLoreto, 2016	187 surveys	1	No	1,8	No	NA	1. course structure /org., 2. instructor presence	None	1.learner interaction, 2.student engagement
Al-Adwan, 2021	537 surveys	80	Yes	1,7,9	No	NA	1. instructor quality, 2. course content quality	None	1. self-regulated learning, 2. education system quality, 3. support service quality, 4. system use
Kuo, 2014	180 surveys	26	Yes	1	No	NA	1. course category, 2. programs offering the course	None	1. self-regulated learning, 2. internet self-efficacy, 3. learner-content interaction, 4. learner-learner interaction, 5. learner-instructor interaction
Parahoo, 2016	834 questionnaires	1	Yes	1	No	NA	None	None	1. student interactions, 2. IT/administrative staff interaction, 3. faculty empathy, 4. reputation of university, 5. physical facilities, 6. faculty feedback
Limperos, 2015	259 quizzes	1	No	3,12	No	Yes	None		1. experience with instructor 2. instructor credibility
Choy & Quek, 2016	227 surveys	1	No	1,9	No	NA	None	1. age, 2. academic level	1. teaching presence, 2. social presence, 3. cognitive presence

Arevalo et al., 2021	129 question naires	1	No	2,11	Yes	NA	None	1. socioeconomic status	1. task performance, 2. emotion regulation, 3. collaboration and engagement with others

Research Objectives

Our research examines the relationship between active learning in an online course, class characteristics, and three outcome metrics: students' evaluation scores, perceptions of the effectiveness of distance learning, and perceptions of the clarity of teaching in the course. The source of the data is routine student evaluation surveys administered at the end of the semester.

Based on the above, we formulated the following **research questions:**

RQ (1) *How do interactive learning methods in an online course affect students' evaluations of the course alongside different class and student characteristics?*

RQ (2) *How do interactive learning methods in an online course affect students' perceptions of the effectiveness of online learning alongside different class and student characteristics?*

RQ (3) *How do interactive learning methods in an online course affect students' perceptions of the clarity of teaching in the course alongside different class and student characteristics?*

RQ (4) *Does use of a variety of learning methods in an online course affect students' evaluation of the course?*

RQ (5) *Does use of a variety of learning methods in an online course affect perceptions of the effectiveness of online learning?*

RQ (6) *Does use of a variety of learning methods in an online course affect perceptions of the clarity of teaching in the course?*

We have three dependent variables and 13 independent variables: four for the different interactive learning methods (numbered 1–4), and nine for characteristics of the student and the class (numbered 5–13). We elaborate on these variables in Table 3.

Table 3
The Study's Dependent Variables and Independent Variables

Dependent variables	1) Student evaluation (a teaching evaluation from the student's point of view). 2) The student's perception of the effectiveness of online (distance) learning. 3) The student's perception of the clarity with which the course was taught.
Independent variables	1) Use of small working groups for discussion, thinking through, or performing a task (using breakout rooms on Zoom). 2) Independent work during lessons. 3) Student presentations during lessons. 4) Short knowledge tests during lessons (e.g., quizzes and questionnaires). 5) Class size (number of students; classes range from less than 10 to over 100 students). 6) Lecturer's gender. 7) Student's gender. 8) Student's faculty (one of the following: Social and Community Sciences, Marine Sciences, Engineering, Economics and Business Administration). 9) Semester in which the class was taken (Semester B in 2019-2020, or Semester A in 2020-2021). 10) % of male students in the class. 11) % of students in the class with learning disabilities (based on data held by the university's student accessibility office). 12) % of Arab students in the class. Arab students are a cultural and linguistic minority in the country and in particular in the institution, and the language of instruction is their second language. Therefore, we found it appropriate to examine this variable as well. 13) Student's year of study. Students in their first through third years of study were working toward a bachelor's degree. Students in their fourth year of study were primarily studying toward a master's degree, while typically also working in the industry.

Methods

As described above, the research relied on evaluation surveys filled out by students at the end of Semester B in 2019–2020 (i.e., in June 2020) and the end of Semester A in 2020-2021 (January 2021). Such surveys are routinely distributed by academic institutions to assess measures of student satisfaction and teaching quality. The surveys examined for the present study included, for the first time at our institution, questions related to the use of interactive learning methods. Machine learning models and probabilistic statistical tools were used to address the research questions.

It should be noted that following the onset of the COVID-19 pandemic, all educational institutions in the country were ordered to close for in-person studies as of March 15, 2020. Semester B in the 2019–2020 academic year began on March 8, 2020. Therefore, the Semester B survey relates to the first semester following the enforced shift to distance learning.

Participants and Procedure

As noted, survey participants were all students at the same academic institute. Survey questionnaires were distributed among 4,515 students in the 2019–2020 Semester B survey, and among 4,853 students in the 2020–2021 Semester A survey. Two thousand and sixteen students (a response rate of 45%) returned completed surveys in Semester B, and 2,778 (a response rate of 57%) in Semester A. Students were asked to complete a survey for each class in which they were registered. In total, we analyzed 29,382 surveys, covering 1,265 classes taught by 385 lecturers.

The analyzed surveys related to classes in 23 departments in all four of the institution's faculties (Social and Community Sciences, Marine Sciences, Engineering, Economics, and Business Administration). All surveys analyzed referred to lecture-style classes. We excluded seminars as these are held in small groups, and do not incorporate digital teaching tools. Because participants returned surveys anonymously, we do not know the overall number of males and females who responded to the survey. However, this figure is known for each class.

Measures

Each survey included several items designed to elicit students' overall assessment and specific perceptions regarding the course. We used a partial set of these items to address our research questions. The used items are presented in Table 4. Items 1–3 refer to student evaluation measures; for each one, students were asked to rate their degree of agreement or evaluation on a scale from 1 (lowest) to 6 (highest). Items 4–7 refer to interactive learning. Students were asked to report the frequency with which the four interactive learning methods were used in the class, from 1 (never used) to 4 (used very frequently. Our three dependent variables were defined based on survey items 1–3 as follows: course evaluation scores were based on item 1, clarity of teaching the course material was based on item 2, and the perceived effectiveness of remote learning was based on item 3.

Table 4
Selected Items Used in this Study

#	Question	Scale
1	Overall assessment (evaluation)	1–6
2	Clarity of teaching in this class	1–6
3	Effectiveness of distance learning in this class	1–6
4	Use of small working groups for discussion, thinking through, or performing a task (using breakout rooms on Zoom)	1–4
5	Independent work during lessons	1–4
6	Student presentations during lessons	1–4
7	Short knowledge tests during lessons (e.g., quizzes and questionnaires)	1–4

Analytical Strategy

Descriptive and inferential statistics.

Due to the non-normal distribution of the course evaluation scores, we used nonparametric statistical tests. Specifically, the Wilcoxon unpaired test was used to compare between evaluation scores in classes taught by male lecturers versus female lecturers; between evaluation scores from male students versus female students; and between evaluation scores from students working toward a bachelor's degree versus a master's degree.

Pearson and Spearman correlations were used to calculate the correlation between evaluation scores and the percentage of Arab students in the class. Pearson correlations were also used to calculate the correlation between evaluation scores and the student's year of study.

To overcome potential bias due to diversity in class sizes, we created class-related entries based on the average measures for each class. These entries include average evaluation scores and average use of interactive learning methods (as reported by students in the surveys). Wilcoxon nonparametric tests were used to compare the extent to which interactive learning methods were used between male and female lecturers and between lecturers from different faculties. Spearman correlations were used to calculate the correlation between the extent of use of interactive learning methods and the three dependent variables: course evaluation scores, clarity of the teaching, and the perceived effectiveness of remote learning.

To examine the effect of using a variety of interactive learning methods, we defined two groups of classes: (a) those which made high use of a variety of interactive learning methods, using at least three different interactive learning methods in most of the lessons; and (b) those which made little or no use of interactive learning methods, with no more than one interactive learning method being used only once in the class. Wilcoxon unpaired tests were used to compare the three dependent variables between the two groups. Classes that fell in the middle range, using a small number of interactive learning methods and using them less often, were not examined in this analysis.

Multivariate linear regressions and prediction models.

Interval parameters were normalized to range between 0 and 1. Multivariate linear regressions were used to predict scores for course evaluation, clarity of the teaching, and perceived effectiveness of remote learning, based on the independent variables: the six class characteristics (number of students, semester, lecturer's sex, percentage of male students, percentage of Arab students, and percentage of students with learning disabilities) and the four interactive learning methods (small working groups, independent tasks, student presentations, and short knowledge tests). Multivariate linear regressions were also conducted for each faculty separately.

To create a prediction model and to evaluate the performance of the multivariate linear regression, we randomly split the data into a training set (80% of the data) and a test set (20%). Multivariate linear regressions were built based on the training set and tested on the test set. The process was repeated 1,000 times and the average root mean square error (RMSE) for both the training and the test sets were calculated for each model. We compared the average training RMSE to the average test RMSE and to the standard deviation of each of the sets. All statistical analyses and prediction models were conducted using Matlab© version R2021b.

Findings

We present our findings for the general and univariate statistics in sections 5.1 and 5.2. Sections 5.3 and 5.4 describe the multivariate analyses addressing the research questions defined in section 3.

Effects of Student and Class Characteristics on Evaluation Scores

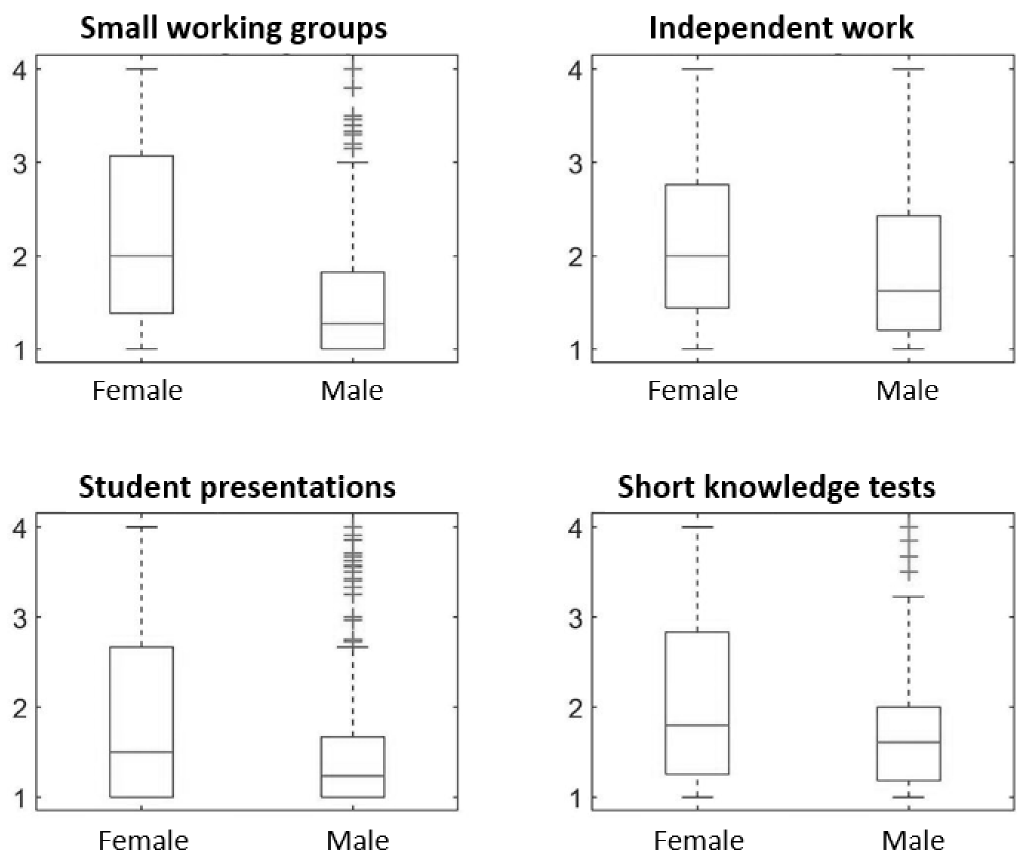
Course evaluation scores were statistically significantly higher for classes taught by female lecturers (mean: 5.0, median: 5.17, std: 0.7) than male lecturers (mean: 4.8, median: 5.0, std: 0.8), $p < 0.001$. In addition, evaluation scores were statistically significantly higher when given by female students (mean: 5.0, median: 5.0, std: 1.3) than by male students (mean: 4.7, median: 5.0, std: 1.4), $p < 0.001$. Arab students tended to provide slightly higher evaluation scores in comparison to students who belonged to the Jewish majority group ($R = 0.1$, $p < 0.001$). There was no statistically significant correlation between evaluation scores and the student's year of study ($R = -0.05$).

Effects of Interactive Learning Methods on Evaluation Scores, Perceived Effectiveness of Remote Learning, and Perceived Clarity of the Teaching

All interactive learning methods were statistically significantly more used by female lecturers compared to male lecturers (see Figure 1). Of note, use of these tools differed between different faculties. Specifically, classes in the faculty of Economics and Business Administration used more small working groups and more independent work during lessons compared to the other faculties; classes in the faculty of Social and Community Sciences used more student presentations compared to the other faculties; and class in the faculty of Marine Sciences used more short knowledge tests compared to the other faculties.

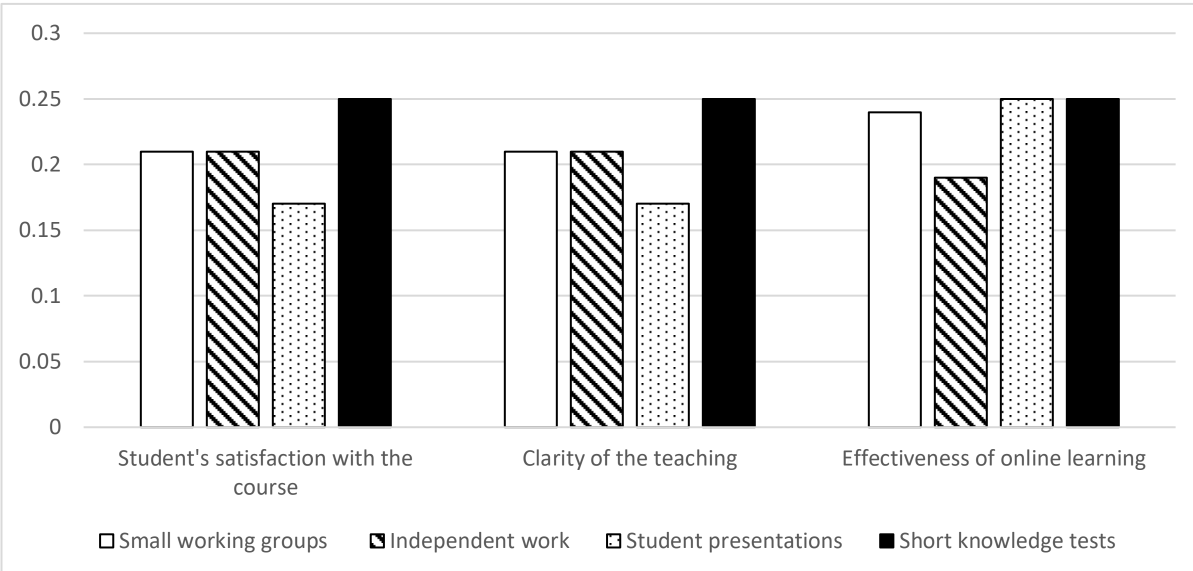
Figure 1

Use of interactive learning tools by female vs. male lecturers (working groups / independent work / presentations / knowledge tests). All comparisons by gender were statistically significant (p < 0.001)



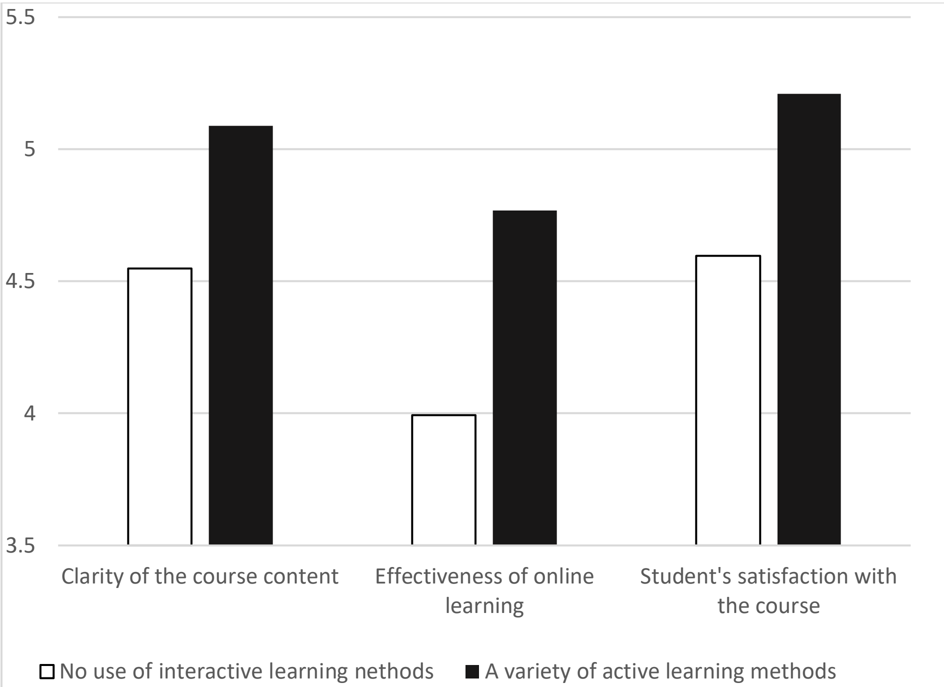
Importantly, there were statistically significant correlations ($p < 0.05$) between the use of interactive learning methods and the three dependent variables: course evaluation scores, clarity of teaching, and the perceived effectiveness of remote learning (see Figure 2).

Figure 2
Spearman correlation coefficients between the use of interactive learning tools and course metrics. All correlation coefficients were statistically significantly different from zero.



Effects of Using a Variety of Interactive Learning Methods
Comparison of the three dependent variables (course evaluation scores, clarity of teaching, and the perceived effectiveness of remote learning) between classes which used a variety of interactive learning methods and those that made little-to-no use of interactive learning methods shows that all three variables are statistically significantly higher in classes where lecturers made high use of a variety of interactive learning methods ($p < 0.001$). See Figure 3.

Figure 3
Comparison of the three variables between classes which used a high variety of learning methods vs. classes which used few or no interactive learning methods. All comparisons were statistically significant (p < 0.01)



Multivariate Models

Multivariate linear regression models were built to find the relative contribution of each of the studied features for predicting the three dependent variables. All models were statistically significant ($p < 0.001$). The contributions of each variable (teta values) and their statistical significance are shown in Table 5. In brief, both evaluation scores and perceptions of clarity of teaching were higher in courses with lower proportions of male students and of students with learning disabilities, and in courses that made high use of short knowledge tests and independent tasks. However, these outcome metrics (evaluation scores and perceptions of clarity of teaching) were not statistically significantly associated with the use of small working groups or with student presentations ($p < 0.05$). Clarity of teaching (but not evaluation scores) was also statistically significantly associated with the lecturer's sex: courses taught by female lecturers were reported as clearer relative to courses taught by male lecturers.

Remote learning was perceived as more effective in courses with many students, taught by female lecturers, taken in Semester A with a lower percentage of male students, a lower percentage of students with learning disabilities, and a higher percentage of Arab students. Regarding the four interactive teaching methods, remote learning was perceived as statistically significantly more effective in courses that used independent work, student presentations, and short knowledge tests, but not in courses that used small working groups. Of all the interactive teaching methods, student presentations and short knowledge tests showed the greatest contribution to the perceived effectiveness of remote learning.

Table 5
*Multivariate Linear Regression Models to Predict Evaluation Scores, Clarity of Teaching, and Perceived Effectiveness of Remote Learning**

Model (research question)	**Evaluation score (1)**		**Clarity of teaching (2)**		**Perceived effectiveness of remote learning (3)**	
Feature	**teta**	**p-value**	**teta**	**p-value**	**teta**	**p-value**
Intercept	4.71	<0.001	4.83	<0.001	4.02	<0.001
Number of students	~0	0.969	-0.24	0.120	**0.35**	**0.03**
Male lecturer	-0.08	0.083	**-0.12**	**0.013**	**-0.15**	**0.003**
Semester A	-0.02	0.590	-0.03	0.461	**-0.1**	**0.03**
% of male students	**-0.41**	**<0.001**	**-0.40**	**<0.001**	**-0.43**	**<0.001**
% of students with learning disabilities	**-0.81**	**<0.001**	**-0.99**	**<0.001**	**-0.91**	**<0.001**
% of Arab students	0.13	0.394	0.20	0.238	**0.5**	**0.006**
Small working groups	0.001	0.993	-0.17	0.209	0.11	0.23
Independent work	**0.53**	**<0.001**	**0.49**	**<0.001**	**0.36**	**0.018**
Student presentations	0.2	0.085	0.12	0.358	**0.55**	**<0.001**
Short knowledge tests	**0.45**	**<0.001**	**0.53**	**<0.001**	**0.61**	**<0.001**

*Statistically significant associations are in bold font

Linear Regression Models

In the final step, we built linear regression models to predict course evaluation scores based on the faculty, the number of students, the lecturer's sex, the semester, the percentage of male students, percentage of Arab students, percentage of students with learning disabilities, and the use of interactive learning methods. These models were statistically significant ($p < 0.05$). In addition, the low average RMSE for both the training set (0.7) and the test set (0.71) highlight the ability of the models to successfully predict course evaluation scores based on the tested variables. Furthermore, the RMSE values of both the training and test sets were lower than the standard deviation of the evaluation scores (0.75), bolstering the significance of the models.

Repeating the process while excluding the interactive learning variables resulted in higher average RMSE values (0.72 for the training set and 0.73 for the test set). These findings also underscore the importance of interactive learning tools as a source of positive student evaluations.

Discussion and Conclusions

Over recent decades, a large body of work has highlighted the limitations of traditional teaching, based on a frontal model in which the lecturer conveys information and students listen (Laws, 1991; Mazur & Hilborn, 1997; Hake, 1998). For example, students taught under the frontal model tend to be passive and unengaged in lessons, find it difficult to explain the main topics learned in the lesson, and do not express their views in the context of these topics (Fullan, 2001; McDermott, 1991). Such findings gave rise to the active learning framework, based on various methods designed to engage students during the lesson through writing, reading, discussions and other activities. Instead of frontal lectures in which students are passive consumers of knowledge, active learning has the potential to deepen and enhance learning by turning students into proactive knowledge producers (Haidet et al., 2004).

The present study took advantage of the convergence of two events: a move toward greater use of active learning in our academic institution, and the shift to distance learning sparked by the COVID-19 pandemic. Researchers have begun to examine the implications of the COVID-19 period, and specifically those arising from distance learning, on various educational outcomes, such as the psychological effects on students. This study adds to that literature, as well as the literature on active learning, by examining how the use of interactive learning methods in a distance learning environment affects students' evaluations, their perceptions of the clarity of teaching in the course, and their perceptions of the effectiveness of distance learning.

Using Spearman correlations, we found significant positive associations between the three outcome metrics and higher use of each of the four examined active learning methods: small working groups, independent work during lessons, student presentations, and short knowledge tests (Figure 2). However, in multivariable regression models that included the active learning methods along with a variety of class characteristics, only independent work, and short knowledge tests (and not small working groups or student presentations) were statistically positively associated with all three outcome metrics. Of note, these models show that short knowledge tests were not only significantly associated with the perceived effectiveness of remote learning and the clarity of teaching, but they also contribute the most to predicting these two metrics (Table 5). Short knowledge tests encourage students to learn effectively because they provide immediate feedback, and because students may compete with their fellow students over their performance (Cook & Babon, 2017). Therefore, short knowledge tests can lead to greater engagement, an improved learning process, higher evaluations, and increased perceived effectiveness of remote learning.

Another major finding was that these three outcome metrics were higher in classes that made frequent use of a large variety of interactive learning methods, in comparison to classes with little or no use of interactive learning methods. Note, however, that this conclusion stems from a binary comparison of the extreme groups (high use of a large variety of interactive learning methods versus little or no use of such methods) and not from a linear model, since classes that made moderate use of interactive learning methods were not included in this analysis. Therefore, no conclusions can be drawn about the effects of slight differences in the extent or variety of interactive learning methods used.

While we focused on the influence of active learning methods, we also examined several class and student characteristics. We found that female students tend to provide higher evaluation scores, and that female lecturers tend to receive higher scores in comparison to male lecturers. The latter finding contradicts findings published in recent years, in which female lecturers were given lower scores in comparison to male lecturers (MacNell et al., 2015; Boring & Ottoboni, 2016). These discrepancies may stem from differences in the studies' designs or settings, including cultural differences between participants, different learning environments, or effects of timing. We recommend that future research continue to investigate the role of gender in student evaluations.

This study has several limitations. Most notably, the surveys we used for our data are subjective, and some responses may have been biased, e.g., due to sympathy for or dislike of certain lecturers. Furthermore, some of the surveys may have been filled out carelessly. In addition, we relied on students' reports to measure the use of active learning methods. Finally, as noted above, our conclusions regarding the use of a variety of interactive learning methods, are based on a binary comparison rather than on a continuous linear model.

At the same time, the study has several significant strengths: First, it is based on many participants from different faculties, departments, and years of study. Second, the data derives from evaluations for many courses that were taught under the same conditions. Third, we studied class and student characteristics in addition to the active learning methods. Finally, from a practical perspective, lecturers and administrators can use the outcomes, and particularly the prediction models developed in this study, to plan their own use of interactive learning methods, to improve their students' evaluations, understanding, and learning.

Declarations
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Faculty Perspectives on Inclusion, Diversity, Equity, and Access (IDEA) in Online Teaching

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Abstract
This study contributes to a better understanding of instructors' perceptions of equity issues within online teaching and learning. The researchers conducted interviews with 21 instructors at one university across disciplines regarding their experience with, and recommendations for, attending to issues of inclusion, diversity, equity, and access (IDEA) in online teaching. Findings revealed that instructors characterized online teaching and IDEA issues as distinct skillsets and that they were not necessarily prepared to apply IDEA issues in online teaching. Participants also focused their attention much more on access and inclusion—with access as a baseline expectation and inclusion operationalized as relationship building—rather than on equity and diversity, areas in which faculty efforts often translated (or not) from their face-to-face teaching experience. We conclude the paper with implications for faculty, educational developers, administrators, and institutions.

Keywords: Online learning, diversity, equity, faculty, pedagogy, teaching and learning

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The COVID-19 pandemic has caused the rapid acceleration in the use of online technology to facilitate teaching and learning, and many instructors who had not previously taught online are now doing so. The health pandemic has also coincided with renewed attention to systemic racism and intersecting forms of oppression in the United States. Instructors teaching online courses contend with a variety of issues related to inclusion (defined as multiple perspectives voiced), diversity (specific social identities, categories, and groups addressed), equity (disparities in opportunities and outcomes), and access (whether and how individuals can engage), or collectively known as IDEA issues (Tan, 2019). A few of the pressing issues to be addressed included learners' access needs and social contexts, engaging and equitable course activities, representation of diverse perspectives in course materials, and professional development concerning equity and diversity in the online classroom.

While instructors can rely on a robust body of literature about online teaching (see Martin et al., 2020), issues of inclusion, diversity, equity, and access within online teaching are not sufficiently understood or highlighted. This study begins to bridge this gap, informed by the substantial literature in online teaching and learning. As part of a qualitative case study at a Southern urban research university in the U.S., the researchers conducted one-on-one interviews with 21 instructors across disciplines teaching online courses regarding their preparation for, experience with, and recommendations for infusing online courses with IDEA issues. Guided by literature on online learning at the organizational, course, instructor, and student levels (Martin et al., 2020), the primary research question is: How do online instructors across disciplines experience and approach IDEA issues within their online teaching? We were also specifically interested in how instructors perceived IDEA issues in online teaching at the organizational and course levels and through the lenses of their own identities and their students' identities and social contexts.

Relevant Literature

Issues of diversity and equity must be considered in the design and delivery of courses across the curricula in higher education (Hurtado et al., 2012). Scholars in higher education have introduced frameworks to measure the diversity and inclusiveness of courses (Nelson Laird & Engberg, 2011) and have documented positive student outcomes that result from courses with content on diversity and equity, including reduced racial prejudice and increased civic engagement (Denson & Bowman, 2017), yet attention to course modality or specific focus on diversity and equity within online courses is often lacking in higher education (Sublett, 2020).

From their systematic review of online education research themes, Martin et al. (2020) developed a framework for online learning centering on four levels: learner, instructor, course, and organization. These levels subsume the myriad elements and themes impacting online course design and development (Martin et al., 2020). In a systematic review examining over 600 empirical articles on online teaching and learning, online engagement and learner characteristics were the two themes most examined (Martin et al., 2020). Access, culture, equity, inclusion, and ethics were less frequently studied.

Learners in Online Courses

Access to online learning represents a unique challenge for learners. In some ways, online learning is a vital tool for enhancing access (Sublett, 2020), particularly for students with disabilities (Pearson & Koppi, 2002), though the Covid-19 pandemic presented obstacles to disabled students' online learning (e.g., difficulty accessing existing accommodations; Gin et al., 2021). The flexibility of digital learning can address the varied needs of students with disabilities in ever-adapting ways (Basham et al., 2015). Progressive access is not assured, however, as heavily text-based web materials, complex online course structures, or mobility challenges with a mouse or keyboard may create inequitable struggles for learners (Pearson & Koppi, 2002). Disability status intersects with socio-economic status (SES) as learners may need expensive screen readers, alternative keyboards or mice, or assistive software (Burgstahler, 2015).

Beyond disability status, access to online learning is also complicated by SES and its intersections with race and ethnicity. In some cases, online learning and distance education can offer students access to courses that are otherwise too expensive, as some institutions charge less for courses offered online (Clarida et al., 2016). Online learning's reliance on costly high-speed internet and web-enabled devices, however, can highlight inequities and a digital divide (Cobb, 2020). Online courses tend to disproportionally attract learners who already have access to technological resources, making little impact on issues of access and equity (Hansen & Reich, 2015). Callahan and Sandlin (2007) go so far as to state that "cyber education serves as a mechanism of symbolic violence because it provides the false perception (or creates misrecognition) of increasing access and, in turn, equality while instead maintaining inequalities" (p. 10). Online learning's cost and geographic flexibility may enhance access in some ways, but new difficulties arise, and existing challenges persist for learners from marginalized SES, racial, and ethnic groups.

The inclusion of diverse learners varies in online teaching. Although access inequities exist, students in online spaces are increasingly diverse with respect to race, ethnicity, culture, native language, age, gender, and disability (Burgstahler, 2015; Salvo et al., 2019). Cultural differences and corresponding cross-identity conflicts exist in online spaces for learners in similar ways to traditional classrooms (Tapanes et al., 2009). Students and instructors in online discussions can share problematic perspectives and assumptions about race, class, disabilities, and gender, perpetuating microaggressions and bias incidents (Licona & Gurung, 2011; Ortega et al., 2018). These incidents can lead to marginalized learners performing more poorly in online courses or disengaging altogether (Reich & Ito, 2017). Perceptions of anonymity can potentially increase offensive statements from students in online spaces like discussion boards (Ortega et al., 2018). Furthermore, learners from minoritized groups around language and culture may participate less frequently or report feeling their contributions are of lesser caliber than those of their fellow students (Tapanes et al., 2009). Salvo et al. (2019) reported that financial assistance, technology training, and a non-prejudicial learning environment contributed to online course completion for African American men. That said, effectively facilitated online spaces can present opportunities for learners to interrogate their assumptions and co-construct new meaning around various identities (Grant & Lee, 2014). Online education may open avenues for learners to engage with topics they would otherwise feel uncomfortable exploring (Licona & Gurung, 2011; Madden, 2020).

Instructors of Online Courses

Views on, and comfort with, cultural diversity, identity, and equity vary for instructors in online spaces (Kumi-Yeboah et al., 2020). Sublett (2020) argued that racial equity in online learning cannot be achieved "at a transactional distance" (p. 9), and that "biases, power inequalities, mistrust, and sense of 'otherness' will continue to proliferate in online courses so long as those courses are poorly organized, culturally irrelevant, espouse hegemonic narratives, and not imbued with student supports" (p. 9). Instructors need to be mindful of the inequities that can exist for marginalized groups in online spaces (Tapanes et al., 2009). Facilitating learning around identity and equity requires instructors to have strong foundations in multicultural education, social justice, and critical inquiry (Grant & Lee, 2014). Instructors also need awareness of their own biases and the cultural backgrounds of their students (Tapanes et al., 2009). In online spaces, however, instructors have the dual responsibility of developing knowledge on equity issues and building effective technological competence to teach using online modalities (Montelongo & Eaton, 2020). Mirroring in-person education, instructors in disciplines like education and the social sciences tend to demonstrate more effective understanding of cultural diversity and recognition of its importance in online education than their counterparts in the physical sciences (Kumi-Yeboah et al., 2020).

Instructors not only come to online educational spaces as facilitators, course designers, and curriculum developers, but also as individuals who hold marginalized and privileged social identities. Instructors' gender, race, and age impact interactions with students online, echoing marginalization that can occur for educators in traditional classroom settings (Yao & Boss, 2020). Although research focuses on the effectiveness of online learning for students, Glass (2017) contends that the quality of teaching experiences must be considered, particularly in relation to instructors' social identities. Faculty of marginalized identities are often tasked with educating others about those identities, which can force difficult decisions on self-presentation and vulnerability (Yao & Boss, 2020). Although lessons can be gleaned from research on how women of color (e.g., Yao & Boss, 2020), queer (e.g., Branfam, 2017), or disabled (e.g., Abram, 2003) instructors are marginalized in in-person classrooms, research is limited on minoritized instructors in online settings.

Online Course Design and Delivery

Researchers have outlined several strategies for designing effective online courses that are accessible to diverse learners. Instructors and course developers should maintain a learner-centered approach, aiming to meet divergent needs while anticipating gaps where exclusion may occur (Pearson & Koppi, 2002). The principles of disability studies highlight the need for courses to adapt to the learner rather than the other way around (Madden, 2020). Research suggests that flexibility in online spaces supports diversity by empowering students to select learning activities that meet their needs (Kumi-Yeboah et al., 2020). Although Universal Design (UD) principles are most frequently touted as supporting learners with disabilities, implementing a UD approach to online education can also help address challenges around language, race, ethnicity, gender, and other identities (Burgstahler, 2015).

Key to the access and inclusion of diverse learners are the online modalities selected and implemented. Instructors should be cautious of an over-reliance on written materials in online spaces, which can exclude some learners; alternatively, instructors can diversify activities and assignments to incorporate visual mediums, audio platforms, and learner-to-learner collaborations (Madden, 2020). When engaging complex topics like identity, equity, and social justice, researchers suggest that synchronous modalities are most effective, allowing for important interpersonal connections (Grant & Lee, 2014; Licona & Gurung, 2011; Montelongo & Eaton, 2020; Williams, 2021). Technological tools like video reflections, web-enabled dialogue spaces, and discussion forums can help learners explore their own identities and those of others (Licona & Gurung, 2011; Montelongo & Eaton, 2020). Online relationship building can potentially develop a community of inquiry, a characteristic of social justice learning spaces

(Grant & Lee, 2014). Additionally, these collaborations help foster the types of connections that students report missing from in-person learning experiences (Means et al., 2020). Whether an online class is explicitly about identity and social justice or not, intentionally incorporating cultural awareness in the curriculum is key (Kumi-Yeboah et al., 2020).

Beyond course modalities, a high level of support from instructors is necessary to enhance inclusion and equity in online spaces. Messages from instructors can help diverse learners anticipate engagement around identity differences (Tapanes et al., 2009). Building on these messages about course content is research supporting the importance of frequent engagement and communication throughout online course experiences (Means et al., 2020). The demands of social justice education require consistent feedback and engagement (Montelongo & Eaton, 2020). Holistic student support in online spaces, including a validation of marginalized identities and challenges beyond academics, is core to a feminist pedagogy (Koseoglu, 2020). Online education can create challenges for learners, particularly those from marginalized groups, but consistent check-ins and support by instructors can help (Means et al., 2020).

Organizational Support for Online Courses

Organizations have the potential to enhance equitable experiences for learners and instructors in online spaces. Research points to faculty perceptions that their institutions can do more to improve infrastructure, policy, and practices related to online education (Williams, 2021). Institutional administrators should be collaborators in the delivery of online education, supporting the diversity of faculty members who are instructing courses (Glass, 2017; Koseoglu, 2020). Part of this support may be organizational backing for affinity spaces for marginalized instructor groups, like women of color, to process and reflect on online teaching experiences (Yao & Boss, 2020). Institutional administrators should also carefully consider the workloads of faculty members and graduate assistants tasked with implementing online education, particularly instructors from marginalized groups (Callahan & Sandlin, 2007; Glass, 2017; Licona & Gurung, 2011).

Institutions can ensure that instructors receive training and resources to deliver equitable and accessible online education (Grant & Lee, 2014; Williams, 2021). Organizations can help foster collaborations between instructors and resources like multicultural centers, writing centers, and centers for teaching and learning (Glass, 2017; Ortega et al., 2018). Additionally, equity-minded curriculum and instruction can only go so far when software is exclusionary, so organizations must select or build online learning platforms that are accessible across identities (Burgstahler, 2015; Pearson & Koppi, 2002). Higher education institutions have a unique positionality to bring technology developers, instructors, and learners together to strategize and implement positive changes to online learning (Reich & Ito, 2017). The organization has a far-reaching role in developing equitable online learning environments by fostering collaborations, facilitating training, and providing resources.

Methods

The research question for this qualitative case study is: How do online instructors across disciplines experience and approach equity issues within their online teaching? As a qualitative case study, this research is designed to understand the experiences of faculty members' experience with IDEA issues in online courses within the bounded system of one Southern urban research university in the United States (Stake, 2006). The university under consideration generally supported the implementation of online and hybrid teaching, even prior to the COVID-

19 pandemic. This is evidenced by numerous workshops offered through the teaching and learning center, a distance education program that supports online programs, and backing for faculty pursuing national Quality Matters designation of their online courses. The university's center for teaching and learning also provides instructional consultation, support for creating instructional videos, opportunities to review exemplar online courses, and an online teaching certificate. As an instrumental case study (Stake, 2006), we are concerned less with the particulars of the research site than how instructors view and experience equity issues in online teaching, yielding insights that may inform future research, teaching, and practice.

To answer our research question, we sought participation from online instructors at the institution across disciplines and experience levels with online teaching. We sought and received IRB approval before commencing the research. Participant criteria included: serving as a faculty member/instructor at the institution under study with any title or tenure status, and teaching (currently or previously) at least one undergraduate or graduate course that is 100% online (synchronous or asynchronous) for a full semester. Specific expertise or training in online teaching and/or equity issues was not required, as we sought to recruit course instructors with a range of experiences. The researchers conducted 21 semi-structured, one-on-one interviews with instructors teaching online courses regarding their preparation, experience with, and recommendations for fully infusing IDEA issues in online teaching. Forty instructors volunteered to participate based on a recruitment message sent to all faculty members, and we employed a maximum variation selection process based on responses to a background questionnaire to maximize the diversity of the sample in terms of: online teaching experience (average of 5 years, range of 0.5 years to 15), undergraduate vs. graduate courses taught (one-third of instructors taught at the graduate level), field/discipline of teaching, and demographics. While we were able to recruit a diverse final sample (see Table 1) in terms of race/ethnicity (14% Asian/Pacific Islander, 29% Black/African American, 14% Latinx, 5% multiracial, 43% white) and gender (67% women, 33% men), we did not have participation from any faculty member who self-identified as trans* or non-binary.

Table 1
Participant Overview

Pseudonym	***Discipline***	***Primary position***	***Racial/ethnic identity***	***Gender/gender identity***
Abigail	Public health	Full-time non-tenure track faculty	African American/Black, Multiracial	Cisgender woman
Amelia	Nursing	Full-time non-tenure track faculty	White	Woman
Aria	Biology	Full-time non-tenure track faculty	White	Woman
Ariana	English	Tenured faculty	African American/Black	Cisgender woman
Ava	Criminal justice	Tenure-track faculty	African American/Black	Woman

Bella	Engineering	Full-time non-tenure track faculty	Latinx	Woman
Claire	Public health	Tenure-track faculty	White	Cisgender woman
Elias	Computing	Tenured faculty	Latinx	Man
Elijah	Business	Part-time non-tenure track faculty	White	Cisgender man
Ella	Student success	Administrator	African American/Black	Woman
Emma	Engineering	Full-time non-tenure track faculty	African American/Black	Woman
Evelyn	Engineering	Tenure-track faculty	White	Woman
Ivy	Sociology	Tenure-track faculty	African American/Black	Woman
James	Languages	Tenure-track faculty	Latinx	Cisgender man
Liam	Education	Tenured faculty	Native Pacific Islander	Man
Mia	Dance	Tenure-track faculty	Asian/Pacific Islander	Cisgender woman
Noah	Languages	Administrator	White	Man
Nova	Public health	Tenure-track faculty	Asian/Pacific Islander	Woman
Oliver	Chemistry	Full-time non-tenure track faculty	White	Cisgender man
Sophia	Anthropology	Part-time non-tenure track faculty	White	Woman
William	Education	Tenured faculty	White	Man

Participants were interviewed by a member of the research team via Zoom video conference for an average of one hour; interviews ranged from 45 to 90 minutes. Informed by the research questions guiding this study, the interview protocol included open-ended questions (see Appendix A) that addressed faculty members' perceptions of IDEA issues in online teaching at the organizational, course, instructor, and student levels (Martin et al., 2020).

After reading all transcripts and memos written by researchers during interviews, we met as a team to discuss potential themes across participant transcripts that were relevant to our research question. We then constructed a matrix as a visual method of analyzing data (Miles et al., 2014). In the table, rows identified participants and information about their discipline, courses, online teaching experience, and demographics. Columns represented a primary area of interest for this study, including instructors' views on relationships between IDEA and online teaching, IDEA definitions and priorities, and enactments of IDEA concepts at the learner, instructor, course, and organization levels. In each cell, we identified relevant transcript portions and transformed the content to a mix of relevant direct quotes and paraphrases. Finally, we met as a team multiple times to look across the dataset—particularly to look vertically across columns highlighting areas of interest—to draft findings.

We took several steps to ensure quality of data collected and results presented. These steps included member checking (sharing each transcript with participants to verify their comments). A team approach enabled use of investigator triangulation, and all results presented in the paper are the product of consensus among the research team, all of whom were involved in analysis and writing. We aimed to provide a rich account of instructors' views and examples of dilemmas they faced to ensure transferability to other contexts. One participant in the study, Noah, shared with us: "This is a valuable conversation for me. To have the opportunity to be asked these questions, and to reflect, and to think about my behavior, and my beliefs. So, the whole conversation is important and valuable to me."

Throughout analysis, we held research team meetings to discuss insights and possible patterns across the interviews while also considering our own disciplinary, teaching modality, and identity-based reflections relevant to the study. Collectively, our team included a variety of perspectives and identities that we believe strengthened the study and results presented. Our team included a mix of faculty members, higher education practitioners, and doctoral students; online teaching experience and knowledge ranging from novice to expert; a variety of social identities around race, ethnicity, gender, and sexual orientation; and backgrounds in K-12 teaching, higher education administration, instructional technology, and student affairs.

Findings

Our analysis leads us to present these findings: (1) faculty conceptualized online teaching and IDEA issues as distinct, and (2) faculty emphasized access and inclusion over equity and diversity.

Online Teaching and IDEA Conceptualized as Distinct

Across disciplines and faculty roles represented in the study, participants had difficulty applying IDEA issues to the online teaching context. In essence, expertise and competence around online teaching were viewed as distinct from IDEA-related competence, with few instances of participants identifying overlaps or connections between the domains. Given this gap, participants described applying strategies from face-to-face teaching to online instruction. Instructors first teaching online during the pandemic simply wanted to make their courses accessible and survive the semester, without necessarily integrating IDEA issues consistently. They struggled with asynchronous course delivery as it related to inclusion, diversity, equity issues, and relationship building.

Online Teaching and IDEA Viewed as Stand-alone Areas of Expertise

Participants noted that knowledge and professional development opportunities around IDEA issues did not always attend to course delivery (including a notable absence of discussion around online teaching), and conversely, that workshops related to online teaching often did not address IDEA issues explicitly. For instance, James described attending a diversity symposium on teaching before the pandemic that did not address course delivery:

> The diversity summer symposium was mainly to address what those issues are, not related to how you would teach them. And then I don't see a lot of like programs with the center for teaching and learning in terms of how to teach [diversity content]. I do see a disconnection between…you have people talking about diversity and [people] talking about online teaching, but they are not necessarily working together.

In this quote, James describes various resources on campus on different “sides” of the issue: diversity resources that do not focus on online teaching, and online teaching resources that do not focus on diversity. This is also reflected in Evelyn’s description of a lack of professional development opportunities related to IDEA in online teaching: “I haven't seen a lot of opportunities come across for things that are very specific and in dealing with equity and that type of training and maybe it's just that I haven't noticed them and they're there, I'm not sure.” Mia described the content of her course as

> deeply embedded in diversity and inclusion and equity. So those questions are dealt with in the content. But in terms of the delivery and the online pedagogy, I would say I'm still struggling with how to make my course more equitable. I have attended a few webinars on these and I wouldn't say that they have been super helpful in terms of strategizing online teaching and equitable strategies.

Mia’s course content focused on equity and diversity in both online and face-to-face courses, but she did not find significant resources to support making online courses specifically more equitable.

Tensions in Applying Face-to-face IDEA Strategies to Online Courses

Participants disagreed about whether face-to-face teaching strategies for applying IDEA issues would translate to the online teaching context. Many instructors, both novice and experienced, noted their starting point for integrating IDEA issues into online courses drew upon their knowledge of strategies for face-to-face instruction. James described the common practice of applying face-to-face teaching strategies to online courses: “Most of the things that I described, I was doing it face-to-face and then I brought them to the online teaching, and it works well as well.” While James felt these strategies generally worked, he also thought discussion of equity and diversity issues worked more successfully in face-to-face classes:

> The other issue is sometimes when we're discussing, especially on the synchronous format, when we're discussing issues such as race and ableism and concepts like that, I can really see the reaction of the students, and I think the face-to-face environment allows me to see how they are reacting to these readings.

A few participants, like Ivy, did not view online teaching strategies as especially different from face-to-face teaching practices:

> [When] you say online teaching, I just think about it as teaching. So, I'm not sure if that's a disconnect or not. But I'm a scholar of inequality and race, gender, and class…. And so, it's really an all-encompassing approach when it comes to teaching in that way.

Some participants, especially those newer to online teaching during the pandemic, noted that the nature of emergency remote teaching demanded that they translate strategies from the classroom to the computer. Elias described the “improvisation” this demanded:

> We switch[ed] online and I was already planning things in the classroom, and then I had no clue what that meant for online. So, I had to really improvise, and I probably covered, I don't know, 80% of what I normally would have covered in a semester, which I was okay with that, given the pandemic and all that. It was an interesting experiment, but it wasn't something that I would use as an example of anything other than, “How quickly can you react to an emergency?”

Thus, the lessons learned during emergency remote teaching may not be the best practices to carry as online instructors into the future.

While instructors did their best to apply face-to-face teaching strategies to incorporate IDEA into online instruction, several participants in this study held strong beliefs that online teaching should be approached as a distinct skillset and domain, and it could be inappropriate and even harmful to simply apply face-to-face strategies to online courses. Noah, a veteran online instructor, captured this belief:

> Maybe there is the assumption that the existing policies that target IDEA for face-to-face teaching are transferred to online courses…. I think that's a very weak argument. The logic there is very faulty and dangerous because it is analogous, I think, to what happens with teaching in the general sense. That we think that [Noah] is an excellent face-to-face teacher, ergo he's going to be an excellent online teacher. And we know that that is not necessarily the case. We're talking about a different skill set here.

Difficulty Applying IDEA issues in Asynchronous Teaching

Though instructors generally found asynchronous course delivery was the most accessible to students, they struggled most with applying IDEA issues in asynchronous teaching, noting it was depersonalized and less relational. Some instructors were uncomfortable with incorporating IDEA issues too deeply in asynchronous courses and questioned how they could build relationships with students in that mode. While even experienced instructors struggled with relationship building, newer instructors were highly concerned about how students could access course content above all else.

Some instructors, including Claire, noted the benefits of asynchronous teaching, sharing that in synchronous teaching, she “had a lot of requests from students who couldn't make it to class, how could they get the materials afterwards and that was always a little bit difficult because I really valued our in-class face-to-face time.” For Claire, increased flexibility was a benefit of asynchronous teaching. Similarly, Aria found asynchronous more accessible, but synchronous more engaging:

> Part of [the course is] asynchronous and part synchronous, [and] that was on purpose because I was trying to figure out how to still keep them engaged. And for me, the synchronous really helps with that, to keep them moving with the course. But I also know that these students some have full-time jobs, some of them really have issues being there at a specific time. And so over half of the course is asynchronous to allow for flexibility.

Most commonly, instructors acknowledged the benefits of access and flexibility that accompanied asynchronous teaching but did not feel comfortable or know how to build deeper relationships or broach sensitive IDEA issues in asynchronous courses. Amelia lamented, “I can't possibly know about all of my students in my online courses and know their life experiences and their viewpoints and their perspectives.” Similarly, Oliver expressed discomfort with what he framed as “prying” into students’ lives: “I'm uncomfortable, personally, trying to pry into what I feel is my students’ private life and I know I wouldn't have responded well to that as a student, so I have difficulty prompting students for that.”

Some instructors who routinely focused on equity and diversity content in their courses noted the limitations of the asynchronous format. Ivy sometimes avoided contentious conversations that she would have facilitated in live teaching, whether synchronous or face-to-face:

> If I was asynchronous, I wouldn't trust to say like, “Let me show you this image and then you can put it into the discussion board and then I'm going to come back later and see what it means.” No. To me, it's too critical of a moment to not help them process immediately on the way. And I also want to be there to facilitate the discussion of it as people lay out ideas because it's just one of those things where in real time.

Abigail described getting to know her students and focusing on IDEA issues, but being unhappy with asynchronous course delivery to do so:

> So, equity and inclusion are my bread and butter because of public health. And so that spills into like, “Who are my students? What are their resources? What are they are not able to do? How can I help them along when there is a problem?” I was unhappy about having to take it into an asynchronous space. Well, a student who only has a Chromebook cannot really use Kaltura but can't even really use Canvas that well.

Abigail summed up her learning: “You don't have to be an expert; you just have to be willing to bring yourself and your ideas and be open to what students have to say.”

Instructors Prioritized Access and Inclusion over Equity and Diversity

Inclusion and access were frequently considered by the instructor when it impacted the students in the course. Many of these issues were linked to concerns regarding COVID-19. Those instructors who first taught online during the pandemic emphasized operating in survival mode (including listening to students’ needs and educating themselves) and focused primarily on making their courses accessible rather than attempting to become advanced or expert online teachers who consistently incorporated IDEA issues in a short period of time. Regardless of online teaching experience, two-thirds of instructors named access as the starting point for incorporating IDEA issues into their online teaching. The remaining third of participants named equity and/or diversity first, in line with their course content which focused primarily on equity and diversity issues in their disciplines.

Focus on Access as a Baseline Expectation

Of the IDEA issues addressed in the study, faculty participants generally exhibited much focus on issues of access (conceptualized variously as internet/WiFi access, equipment/software access, technical skills, and/or accessibility for students with disabilities) and, to a lesser extent, inclusion (conceptualized most frequently as actively including/reaching all students in online courses, generally not focused on specific inequities or identity-based groups). Oliver shared the importance of access in his teaching:

> I know a lot of my students and I know a lot of them don't have reliable broadband Internet connections or have access to the resources that we would have on campus you know so they don't they don't have time to try to do a Zoom tutoring session, whereas the same student may be quite active and going to tutoring on campus.

Oliver cared about his students' circumstances and whether they would have access to the course, but also to supplemental resources that they might otherwise engage with if they were physically present. Ivy highlighted the university's support for technical issues related to faculty competence and access:

> The university supports us very well in the technical aspects of online learning… but I really think it's important to acknowledge how being technically sound and your course delivery matters a lot for diversity and inclusion…. You have so many professors who are teaching online, for the first time they're forced into doing it, they don't like doing it, they don't know how to do it and don't do it well.

Ivy positioned access as an initial hurdle to clear so that instructors could then provide equitable learning opportunities for all students.

Access was viewed as a baseline for online teaching. Some participants discussed access in terms of devices in addition to connections. For instance, Elijah states, "I had students who were going to places where they were able to access the Wi-Fi from the parking lot, and they were doing their online discussion course on their phones, or wherever they could reach a Wi-Fi signal."

Relationship Building as a Challenge to Inclusion

As for the inclusion aspect of IDEA, faculty members pointed out the importance and challenges of relationship building in the online setting, particularly but not exclusively in asynchronous courses, as noted previously. Aria emphasized the importance of empathy in building relationships. "I try to keep an open mind, and I try to put myself in other people's perspectives, how they might have different limitations that I don't have, as a student, I never had." Some participants provided recommendations to help build relationships such as including an icebreaker every week, unrelated to content, to get to know students, to set a positive welcoming tone in the online environment by using conversational language and incorporate flexible grading practices.

To provide more inclusive online experiences, participants highlighted the importance of quality course design and training as teaching online is a different skill set. Ivy summarized the need for training by stating, "Students are having issues and were having bad experiences not because there were incompetent students, but the instructors were not ready to teach online. Rapport building and trust and intimacy is eliminated online." This also speaks to the importance of relationship building for inclusion. Noah stated,

> I think just being cognizant of all of the decisions that we make, in terms of instructional design, and then instruction…. So, I think that it's important for us, even those of us who consider ourselves seasoned educators, to continue to have conversations and to revisit these important constructs.

Emma offered this advice on course design: “I like to give students choice in as many ways as possible while still maintaining authority.” Emma’s advice is consistent with many instructor perspectives, focusing on the students’ experiences.

Equity and Diversity Translated (or Not) from Face-to-Face Teaching

While faculty members seemed to have a strong grasp on access and inclusion, particularly during the COVID-19 pandemic, equity and diversity did not as frequently or directly translate into the online space. Equity and diversity were discussed from several perspectives, including student enrollment demographics, issues impacting students, and curricular integration of equity and diversity, or lack thereof.

It should be noted that instructors who were thrust into online teaching had not put as much thought into integrating diversity and equity into their online teaching and courses unless it was already a large part of their discipline or curriculum. Admittedly, there were difficulties in inclusion of diversity from face-to-face to online formats. For example, Liam, a faculty member with experience teaching online, discussed how “diversity and online teaching is something that I struggled with” in transitioning some course content online, especially as it related to accessibility concerns. A similar experience was shared by Oliver, a faculty member with no online teaching experience prior to COVID-19, who lamented that his “teaching online is much more generic than it would be in person.” He explained that students “rarely speak up in class, [and] they rarely ask questions. I'm basically just guessing at a generic audience.” It is important to note that Oliver was not an outlier within his science discipline in teaching online. He commented that faculty members within his department had very limited experience. Oliver focused on the incorporation of “active learning techniques” that he learned to address “equity and diversity issues in the classroom.”

Faculty members readily identified the complexities of teaching online in relation to IDEA concepts. Dimensions that stood out in terms of understanding how faculty were inclusive in their online pedagogy were identity-conscious practices, diversity in engagement, and the use of videos. The cultural importance of faculty acknowledgement and intentionality of including space within online courses of student voice and identity was exemplified in various ways. For example, as William described, “I have [included] a few more chapters…articles, [and] …assignments related to just their own identity as well as their views on equity in math.” Such identity-bearing inclusivity in assignments allows students, particularly women, to have a voice, explained by Evelyn as “their willingness to step up and participate in things like the competition and to speak up.” This thoughtful consideration of identity projection matters in online discourse and subject matter.

Diversity in engagement was seen as a hallmark of online instruction regardless of the format delivery. Aria described her course as “asynchronous and part synchronous” because that helps with the continuity of the course. The ability to offer “over half of the course …asynchronous[ly]…allow[s] for flexibility.” Engagement was somewhat prioritized in the intentionality given toward recognizing course participant optics. For example, there was an awareness of demographics and the efforts toward optimizing the addressing of diverse issues such as “migration, disability, language discrimination, accessibility to language, accessibility and respect to our language rights," as described by James. There was awareness that the online classes were diversified with students by race, gender, and identity and the importance of addressing issues that were salient to differing student populations. Faculty members discussed the application of diversity at micro levels that allowed for students to bring forth their personal identities in terms to their preferred pronouns while understanding that the scope of engagement extended into macro levels of "diversity of thoughts and opinions, and some of those are related to their lived experiences," according to Elijah. Branching out to engage in differing thoughts was pronounced in findings related to diversity as faculty members attempted to interact with students on key content specific to their discipline. The challenge seemed to be related to the baseline understanding of diversity. The meso level was more complicated; faculty members discussed diversity as if they taught it, but really it was about the diversity of students or diverse faculty identities that gave a quasi-platform of being engaged in intentional diversity pedagogy.

Diversity juxtaposed with current events, including the COVID-19 pandemic and social uprisings. Faculty members commented that there was an awareness of the increased importance of issues of diversity due to the upsurge of online instruction. Claire explained how online instruction was able to provide instruction and "flex around different students' needs in many ways." This was particularly important in considering how the pandemic "differentially impacts people, some of that isn't really clear cut. It's muddy in terms of how coming into a fall semester, off of the social uprisings that were happening all summer long [in 2020]." She referenced how there was essentially "reduced bandwidth for a lot of students, like BIPOC students…due to the extra noise that was happening in their lives." She explained that instruction must be more than "just raising the awareness that this isn't just about race and ethnicity" so that faculty members "aren't perpetuating different systematic exclusion or oppression." These statements underscore both the variety of impacts the pandemic exerted on minority groups and faculty interest in providing additional support to those students.

Discussion and Implications

This study explores online instructors' experiences and perceptions of inclusion, diversity, equity, and access (IDEA) issues within online teaching and learning. Through interviews with 21 instructors across disciplines teaching online courses, we uncovered a disconnect between competencies and experience related to online teaching and IDEA issues. Among these 21 instructors, 52% of participants indicated that they began teaching online in direct response to the global health pandemic and the necessity of moving courses online, so it may be that they did not have sufficient time or long-term investment in online teaching to use or seek out resources that would increase their competence related to IDEA in online teaching. About half of the interviewees had online teaching expertise but not IDEA expertise, and the other half of the interviewees had IDEA expertise and not online teaching expertise. Some of them participated in the interviews as they were teaching IDEA as the course content. This lack of knowledge and comfort with both areas among participants demonstrates the need for integration of IDEA in online teaching. Montelongo and Eaton (2020) reinforce the importance of instructors to have the dual responsibility in online spaces to develop knowledge on equity issues and build effective technological competence. Consistent with existing scholarship, developing IDEA competence demands that online instructors have strong foundations in multicultural education, social justice, and critical inquiry (Grant & Lee, 2014; Sublett, 2020). Consciousness of self and others is also vital, as instructors must unpack their own biases and the cultural backgrounds of their students (Salvo et al., 2019; Tapanes et al., 2009). Developing dynamic online courses requires instructors to effectively design, facilitate, and assess courses (Martin et al., 2020) without simply imposing face-to-face content onto online courses.

Several participants mentioned their comfort in exploring IDEA issues in face-to-face courses but not in online courses. This shows a need for instructors to identify strategies that can be used to integrate IDEA in asynchronous and synchronous online courses. Instructors were generally more comfortable discussing IDEA elements in synchronous online courses than asynchronous online courses. This finding is consistent with the literature, suggesting that synchronous modalities are most effective in exploring IDEA topics (Grant & Lee, 2014; Licona & Gurung, 2011; Montelongo & Eaton, 2020; Sublett, 2020; Williams, 2021), allowing students and instructors to develop important interpersonal connections that are the core of equity-centered dialogue. Teaching in asynchronous formats will require instructors to creatively consider infusing IDEA focused activities and assignments by incorporating visual mediums, audio platforms, and learner-to-learner collaborations while mitigating an over-reliance on written components which can exclude some learners (Madden, 2020).

Findings indicate that instructors placed importance on students' access and inclusion in online courses, but that attention to access should not preclude sufficiently attending to diversity and equity issues through course design and facilitation. This is consistent with literature that focuses heavily on issues of student access (Clarida et al., 2016; Gin et al., 2021) and inclusion (Salvo et al., 2019) in online learning, but less on diversity and equity in course design and content (Grant & Lee, 2014; Sublett, 2020). Instructors' focus on access could be due to a recognition of the need for high-speed internet and web-enabled devices, potentially highlighting inequities and a digital divide (Cobb, 2020). It is important for instructors to check with their students to make sure they have the hardware, software, internet, and infrastructure access to successfully participate in their online courses. That said, instructors should note that online courses tend to disproportionately attract learners who already have access to technological resources (Hansen & Reich, 2015), showcasing a different sort of access and equity issue. Although online learning is thought to widely expand access to higher education, courses must be designed with disabled students (Gin et al., 2021), students of color (Sublett, 2020), and other minoritized populations in mind, to address all learners' unique needs and equity issues.

Limitations

In this qualitative study, instructors were from a single university. Also, about half of the interviewees taught online for the first time during the pandemic. Potentially, they were under pressure to transfer their face-to-face courses online and may not have had sufficient time to intentionally design and facilitate dynamic online courses. Even in courses that had IDEA focused content, shifting online was hectic for many instructors.

Implications for Practice and Research

These findings have implications for faculty, course managers, and institutional administrators related to online teaching support. Our findings point to a need for dynamic, intentional training for instructors on competencies related to online instruction, IDEA issues broadly, and a combination of the two. Research supports a need for collaborative approaches to instructor development that incorporates academic units, multicultural centers, writing centers, and centers for teaching and learning (Glass, 2017; Ortega et al., 2018). Our findings also suggest a need for instructors to have space to develop their own knowledge, awareness, and skills around IDEA issues, both intra- and interpersonally. Instructors need to be prepared to be uncomfortable with their own learning, role modeling the discomfort in learning that is often asked of students. We would advocate for instructor communities of practice (e.g., faculty learning communities as conceptualized by Cox [2004]), dialogue groups, or workshops that offer opportunities for critical engagement (Yao & Boss, 2020). Importantly, organizations should support this type of instructor development as central, rather than peripheral, incorporating IDEA engagement into staff evaluations and tenure and promotion processes. Similarly, organizations can spotlight IDEA issues as central to all academic curricula, helping bridge the divide that can exist between social sciences and physical sciences (Kumi-Yeboah et al., 2020) and ensuring an IDEA emphasis whether classes are taught online or in-person.

There is a need for more research on IDEA issues in online learning broadly. Future research can seek to understand the perspectives of novice online instructors compared with more experienced online instructors. Also, research with students will develop understanding on student perspectives on IDEA elements that can be integrated to meet their needs more effectively. Observational methods could also be used to understand how a faculty member infuses IDEA issues into a synchronous or asynchronous online course. Perspectives of instructional designers would assist in understanding effective ways to include IDEA in online courses. A study centering instructional technologies could help showcase the successes and areas of improvement of various media, course management software, and emerging technologies in infusing IDEA concepts, as well as how instructors navigate students' access issues such as slow internet connections or completing coursework from a phone. Lastly, future studies could also spotlight identities and issues such as race, gender, disability, or sexual orientation to understand in a more nuanced way how these specific issues are addressed in online coursework.

Conclusion

Focusing on inclusion, diversity, equity, and access is vital for student learning and belonging in college courses. Bringing these IDEA issues intentionally to the fore is critical in online modalities, which have expanded during the COVID-19 pandemic and amidst financial challenges faced by many higher education institutions. Participants in our study highlighted the differentiation in the skills and knowledge needed for effective online teaching and IDEA facilitation. Likewise, instructors tended to emphasize access and inclusion more than diversity and equity in their development of online courses. These findings point to important implications for research and practice, emphasizing knowledge and skill development, connecting IDEA and online education more directly, creating space for critical intra- and interpersonal development, prioritizing IDEA throughout curricula.

Declarations
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Appendix A
Interview Guide

Background
1. Tell me about your experience with online teaching.
2. How do you define inclusion, diversity, access, and equity (IDEA)? How do these inform your online teaching?
3. Tell me about your experience with inclusion, diversity, access, and equity (IDEA) issues, as they relate to your field/discipline and/or your course(s).

Organization
4. How are you supported by the university, college, and/or program in your online teaching and IDEA? How could you be better supported?
5. How does the university, college, and/or program support students in their online learning and IDEA? How could they be better supported?
6. Are there university, college, and/or program policies that support online teaching and learning and IDEA? What might such policies include?

Course
7. What do you see as major IDEA issues within your discipline/field/course(s)?
8. How much freedom and autonomy do you have in designing and facilitating your online courses?
9. In what ways do you address IDEA issues in your online course design and facilitation?
10. How do you assess and evaluate your online courses, in general and with respect to IDEA issues?

Instructor
11. How do aspects of your own identity, background, and social contexts (i.e., IDEA issues) affect your online teaching?
12. How do you seek to develop your knowledge on an ongoing basis as it relates to: online teaching, IDEA issues specific to your field/discipline and/or course(s), IDEA issues within online teaching?

Learners
13. Who are the learners in your online courses—what are their identities, backgrounds, social contexts? How do you know?
14. In your view, what are the major IDEA issues affecting learners in your online courses?

Conclusion
15. How do technical/technology issues affect your online teaching and the learners in your courses?
16. In what ways would you like to address IDEA issues in your online course design and facilitation in the future?
17. What advice would you give to other instructors teaching online courses who wish to promote IDEA?