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Perceptions of pre-service teachers on breakout room micro-teaching with Zoom

Abstract

Due to the emergence of Covid-19, many educators moved from a face-to-face teaching environment to an online microteaching setting using Zoom. This study explores pre-service teachers' perspectives on microteaching within Zoom's breakout rooms. The authors approached this study from a positivist-postpositivist perspective employing a mixed-methods methodology. The exploratory sequential mixed-method design employed here combines qualitative and quantitative data. Analysis entailed open coding of data from Zoom recordings and statistical analysis of a post-course survey. Convenience sampling of pre-service teachers (PSTs) from a teacher education teaching method course provided the data sets. Findings indicate that microteaching activities within breakout rooms facilitated an environment where pre-service teachers engaged and conversed with peers while developing teaching skills. PSTs valued breakout room interactions, though males and females valued different aspects. Finally, although the findings suggest that microteaching in Zoom's breakout rooms is effective, the findings indicate that the pre-service teachers desired a return to the classroom. This research extends previous research on online microteaching student experiences by providing recommendations regarding microteaching via video conferences.

Keywords: *Breakout rooms; gender; microteaching; online teaching; teacher education; Zoom*

1. Introduction

COVID-19 sparked a wave of online teaching and learning as a quarter of all Canadian post-secondary face-to-face courses were postponed or cancelled (Doreleyers & Knighton, 2020). The pandemic caused a wide range of educational impacts (Karakose, Polat & Papadakist, 2021), including the online transition, where educators demonstrated pedagogical agility (Kidd & Murray, 2020).

All courses at the Canadian university where this study occurred moved online. As a result, a videoconferencing platform distributed the course content for the teacher education course described here, and Zoom's breakout rooms became the site for student microteaching activities. While the migration online is intriguing, the impetus for the current investigation came when the instructor reorganised the breakout room student groups. When the professor

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announced the change, the students instantly objected, saying, “These are our friends!” and “Don’t change our groups!” Had these previously unconnected students developed friendships in a virtual classroom?

Although students forced online because of COVID-19 frequently experienced social isolation (Joia & Lorenzo, 2021), the professor of this course observed what appeared to be friendship formation – the dissonance between the researcher’s expectations and the experiences of the PSTs’ stimulated this study. The authors began speculating about students’ perceptions of education and microteaching via videoconferencing.

Face-to-face teacher education method courses employ microteaching practices to facilitate pre-service teacher pedagogical development. Microteaching requires PSTs to plan, practice, and reflect on their teaching practices. The value of this teaching practice has been long established; microteaching effectively facilitates PSTs’ mastery of several basic teaching skills (Arifmiboy, 2019). During the pandemic, microteaching continued, despite the significant difficulties of moving online (Bodis, Reed & Kharchenko, 2020; Helda & Zaim, 2021).

Previous studies have investigated online learning and microteaching (Bodis *et al*., 2020; Kelleci, Kuaksiz & Pala, 2018; Ledger & Fischetti, 2020; Pham, 2022), and pertinent to this paper, the use of breakout rooms for microteaching has been examined (Ng, 2022; Zalavra & Makri, 2022). Often examined are the challenges and implications of relocating microteaching practices online (Moralista *et al*., 2022; Zalavra & Makri, 2022). The challenges include technology issues (Aboagye, Yawson & Appiah, 2021), technology and class process logistics (Mseleku, 2020), isolation of students (Song, 2022), and the emotional impact of moving online (Aguilera-Hermida, 2020). Post-pandemic educators in general (Ewing, 2021; Xie, Siau & Nah, 2020) and specifically teacher educators (Assunção Flores & Gago, 2020; La Velle *et al*., 2020) are grappling with the long-term impacts of altered teaching practices during the pandemic.

Is COVID-19 a watershed moment in initial teacher education (ITE) and for pre-service teachers? Although the pandemic “shook the very fabric of education” (Harris & Jones, 2020: 243), answering this question largely depends on how ITE reacts post-pandemic. Many education researchers contend that COVID-19 accelerated academic changes (Kaur & Bhatt, 2020; Lee & Han, 2021; Zhu & Liu, 2020), while others view COVID-19 as a short-term crisis (Zhao, 2020) and are working to return to the *status quo* (Kaur & Bhatt, 2020). Although some individuals and educational institutions resist, the majority of research suggests that the face of education has undergone a seismic transformation (United Nations, 2020).

COVID-19 stimulated extremely rapid changes in ITE, the implications of which might persist long beyond the present decade. Despite the speed of the lockdowns, virtualisation occurred quickly in ITE programmes. Educators quickly adopted a rich repertoire of teaching practices (Zalavra & Makri, 2022) that continue to impact ITE programmes post-pandemic (La Velle *et al*., 2020).

Current trends indicate that online transition will continue in many academic domains post-pandemic (Palvia *et al*., 2018; Xie *et al*., 2020). However, ITE faces various institutional, teacher, and student-related issues that block online programmes’ effective introduction and growth. Examples include a lack of understanding of online pedagogy and online learning styles (Kentnor, 2015), faculty resistance to change (Gratz & Looney, 2020), student isolation from peers and professors (Palvia *et al*., 2018), and increased inequality (Gillis & Krull, 2020; Irwin *et al*., 2021).

While there is a growing demand for more online programmes (Irwin *et al*., 2021), given the obstacles, appropriate planning and execution of best practices and innovative solutions are required for post-secondary programmes to launch and grow effectively (Johnston, 2021). If ITE programmes offer courses online, they must leverage new technology to boost student learning beyond face-to-face sessions rather than dilute the content. Therefore, we argue that examining online teaching and learning is critical for quality ITE in the future.

Zhao (2020: 1) makes an audacious proposal for schools to "reimagine and recreate human institutions". COVID-19 provided a critical opportunity for education scholars to pause, analyse, and envision disruptive innovation in education (Kaur & Bhatt, 2020). In this space, Zhao and Watterston (2021) suggest rethinking teaching and learning in education. Examining all aspects of education goes beyond the scope of this paper. This project focuses on how microteaching via videoconferencing can impact teacher education.

Traditionally, ITE occurs face-to-face in a classroom, but teacher education became open to new perspectives, including videoconferencing, when forced online during the pandemic. As online courses continue to increase, ITE must ensure the quality of these courses meets the needs of PSTs. This study is unique, because it used a mixed-methods research design to investigate microteaching in Zoom's breakout rooms within a Canadian context. We chose this design to broaden and deepen our investigation and improve the study's potential to inform ITE of positive pedagogical options.

In what follows, the literature review examines online learning before, during, and after the COVID-19 pandemic. A methodology section describes the mixed-methods research design, followed by the data analysis sections and the findings regarding PSTs' interaction and perception of microteaching in Zoom's breakout rooms. Finally, the discussion examines how COVID-19 has presented an opportunity to change initial teacher education in response to PSTs' perceptions and the changing educational environment.

2. Literature Review

Online learning pre-COVID-19 pandemic

Distance learning has a documented history of almost 300 years; however, in the late 1990s, distance learning proliferated along with the development of online technology (Kentnor, 2015). Clark and Mayer (2016) define online learning as education offered on a digital device designed to aid learning. Despite the early conviction that the internet would displace conventional in-person education (O'Donoghue *et al*., 2001; Platt, Amber & Yu, 2014), online courses have not replaced in-person education. Instead, the acceptance that physical and online courses can coexist evolved (Fuller, 2021). However, online courses are frequently structured to mirror in-person courses (Gierdowski, 2019; Hodges *et al*., 2020; Pomerantz & Brooks, 2020).

Under the banner of blended learning, several forms of teaching developed (Horn & Staker, 2014). Blended learning systems merge face-to-face classroom learning experiences with computer-mediated (online) learning experiences (Garrison & Kanuka, 2004; Graham, 2006). Self-paced learning activities and customised learning paths for individual students are two benefits offered online, supporting out-of-class activities and individualised feedback (Castro, 2019). Significantly, Müller and Mildenberger's (2021) meta-analysis suggests that only minor differences appear in learning outcomes between blended and traditional classroom learning.

The well-established practices of blended teaching and learning have acted as a guide for many virtual learning instructional delivery combinations (Alammary *et al*., 2014). Yet, during the COVID-19 pandemic, a new form of blended learning arose (Fuller, 2021). This form of blended learning is entirely online and combines online synchronous (real-time interactions) and online asynchronous (independent self-paced) activities using videoconferencing and learning management systems.

Videoconferencing is a synchronous technology that has expanded inside and outside education during the last fifteen years due to increased online visual and nonverbal communication (Pearl, 1992). Videoconferencing supports various settings, ranging from large-audience live video lectures to point-to-point individual-to-individual discussions (Coventry, 1995).

Online learning during the COVID-19 pandemic

Prior to COVID-19, online teaching and learning were integral to higher education (Rahayu, 2020); yet the pandemic triggered an outbreak of distance teaching and learning. Schools quickly adopted diverse educational delivery methods, including television, radio, internet, and traditional postal office services (Schleicher, 2020). Teachers and students' routines were disrupted, causing them to flock to online learning platforms and instant messaging apps (Grooms & Childs, 2021). This move put students in new territory, especially those consistently avoiding independent and self-directed learning (Kaur & Bhatt, 2020). The idea of attending courses through videoconferencing and completing work without the physical supervision of lecturers did not appeal to many pupils (Goldstein, Popescu & Hannah-Jones, 2020). Nevertheless, some students were ready for virtual learning (Hung *et al*., 2010).

Many educational scholars use the phrase emergency remote teaching (Buttler, George & Bruggemann, 2021; Cheng, Fu & Druckenmiller, 2016; Ferri, Grifoni & Guzzo, 2020) to capture the nature of change in the early phases of the pandemic. Unsurprisingly, the emergency shift in education delivery produced challenges – teaching online during the pandemic was not a panacea. Studies addressed the technical obstacles, particularly in the context of students who experienced network instability and constraints (Xie *et al*., 2020) or lacked the technological aptitude for navigating the online world (Aboagye *et al*., 2021; Eun, Shim & Lee, 2020; Gillis & Krull, 2020; Mseleku, 2020; Trust & Whalen, 2020). Students from remote areas and low-income households experienced significant difficulties (Mseleku, 2020), while those with strong technical skills benefited substantially in an online environment (Aguilera-Hermida, 2020). Regardless of the barriers created due to COVID-19, online learning allowed for teaching and learning to continue (Ferri *et al*., 2020).

In light of the COVID-19 outbreak and possible future crises, many educational institutions are investigating replacing part or all of their in-person courses with online alternatives (Peters *et al*., 2022). For example, during the pandemic, the United Nations Educational Scientific and Cultural Organization (UNESCO) worked to aid educational systems with a forward-looking focus. By looking to the future, "actions now being taken to ensure the effectiveness of distance learning will lay a solid foundation for more technology-enhanced pedagogical innovations, more open and flexible learning environments, and a more vibrant education system" (UNESCO, 2020: 6). Thus, the emergency shift online provided a path for continued online education post-pandemic (Fuller, 2021).

Post-pandemic education

As noted earlier, teachers altered their pedagogy during the pandemic to some degree. One change of note is how they assessed student progress; removing assignments, changing evaluation procedures, providing flexibility in assessment (Johnston, 2021), extending assignment completion deadlines (Vaughan, Cleveland-Innes & Garrison, 2013), and creating alternative assessment methods (Almossa, 2021). Many educators provided increased student choice in learning assessments while delivering experiences involving meaningful application of newly learned skills and knowledge (Conrad & Openo, 2018). Some of these pedagogical adjustments will outlive the pandemic.

As a result of the pandemic, numerous distribution technologies will continue to be employed in education (Lockee, 2020); for example, videoconferencing. With these new technologies, a new suite of issues has entered education (Oducado *et al*., 2022), including videoconferencing exhaustion, which some have termed Zoom fatigue (Fauville *et al*., 2021; Nadler, 2020). Nevertheless, mindful of future educational crises, many institutions have investigated replacing part or all of their classroom education with an online learning environment (Peters *et al*., 2022; Saichaie, 2020).

While many pandemic education changes were forced, Luthra and Mackenzie (2020) contend that as a result, a worldwide fundamental cascading shift in how teaching and learning are performed is occurring. In this space, this paper responds to Zhao's (2020) challenge to reimagine education by investigating moving microteaching in ITE online.

Zoom and breakout rooms

During the pandemic, educators quickly accepted Zoom as an online educational tool of choice, for it is simple and trustworthy. Zoom's internet software links and engages individuals through videoconferencing technology. Among the features and services available via Zoom are audio and video recording, annotation, closed caption, polling, private rooms, and screen sharing.

The ITE programme where this research occurred chose to use a videoconferencing service that facilitates students' and instructors' real-time online communication. Zoom met this need. This decision was critical, as synchronous interactions improve human exchanges during online learning (Rahayu, 2020). Zoom frees time to focus on forming relationships with students, devising novel ways to illustrate the subject's relevance, and inspiring students to produce their best work (Sutterlin, 2018).

Breakout rooms are a critical aspect of the Zoom software platform. These virtual spaces enable instructors to place students in private rooms where they may engage in distinct group interactions before returning to the primary classroom. Some educators found that breakout rooms encouraged students to participate in "more in-depth conversations than they had before [using breakout rooms]" (Álvarez, 2020: 113). Zalavra (2022) concludes that breakout rooms supported standard teaching practices (lectures and assessments) while supporting pedagogy such as cooperation and collaboration.

In this research, PSTs populated seven breakout rooms (three to four per room), where each student conducted 10-minute lessons utilising teaching approaches explored earlier in the semester. In addition to pedagogical development, the designers of this course hoped that the use of breakout rooms would encourage positive interactions.

Online microteaching

Microteaching, a well-established ITE practice, combines situated learning (Lave & Wenger, 1991) and reflective practice (Schön, 1983). Microteaching requires PSTs to plan, "practise, rehearse and reflect on action…often delivered within a role-play context for real-time feedback and reflection" (Ledger & Fischetti, 2020: 37).

While some education scholars lament that "the forced online transition heavily compromised the vividness of microteaching – a technique inherently connected to face-to-face interaction" (Zalavra & Makri, 2022: 270), many researchers identified positive aspects of online microteaching (Bodis *et al*., 2020; Kelleci *et al*., 2018; Ledger & Fischetti, 2020; Pham, 2022). For example, the essential features of microteaching, self-reflective and critical thinking, are facilitated online (Kusmawan, 2017). Also, other educators found that relocating the course "online did not influence the 'essence' of the course and its main goal, which was to immerse in microteaching, under the strong effect of roleplay" (Zalavra & Makri 2022: 281).

Microteaching in breakout rooms

While multiple researchers assert that online microteaching is effective (Zalavra & Makri, 2022), others examine using Zoom for microteaching activities (Maguire, 2021; Roza, 2021), yet few explore the impact of microteaching in breakout rooms. Literature on breakout room microteaching includes the challenges faced (Hodges *et al*., 2020; Zalavra & Makri, 2022), PSTs' successful use of breakout rooms (Ng, 2022), and specific learning contexts, including an English communication course (Lee, 2021) and peer mentoring (Tutyandari, Anandari & Ardi, 2022). Significantly, Budin *et al*. (2021) assert that breakout room microteaching is a high-leverage practice.

The current literature examining microteaching in breakout rooms suggests that PSTs are satisfied with learning to teach in this learning environment. This study aims to add depth to understanding this positive perception in PSTs.

Theoretical perspective and framework

The authors of this study employed a positivist-interpretivism perspective, combining qualitative and quantitative approaches. The interpretivist paradigm facilitates depth development through seeking experiences and perceptions of a particular social context. In contrast, the positivist paradigm focuses on the search for facts and causes, developing general findings through statistical analysis.

Research focused on either qualitative or quantitative approaches has strengths and weaknesses. A third option, a mixed-methods methodology, aims to take advantage of the strengths of both methods. Choy (2014) argues that complementary studies may provide superior results than either research methodology. This multifaceted research approach is reflected in Creswell and Plano-Clark's (2017) description of mixed-methods approaches, which generally favour using multiple paradigms. Nevertheless, pragmatism is the most commonly reflected paradigmatic stance in mixed-methods literature (Alise & Teddlie, 2010). A pragmatic perspective is also evident in this paper, as the concluding sections suggest the practical application of the findings.

Our pragmatic stance brought the authors to Northrup's (2009) framework. Northrup identified four attributes of online learning that students perceive to be essential. These attributes are "content interaction, conversation and collaboration, intrapersonal/metacognitive skills, and

need for support" (Northrup, 2009: 465). Northrup defines the attribute of content interaction as a mixture of individualised activities, guided activities, and learning from presentations. The conversations and collaborations attribute includes peer discussions, sharing ideas with peers, and teaming with partners. The third attribute, intrapersonal/metacognitive, includes students monitoring their progress, structuring online time, employing advanced organisers, and using notetaking guides. The final attribute, support, includes timeliness of response, corresponding with the instructor, and peer advice.

Northrup (2009) suggests that further studies should investigate learners' perceptions of the online learning environment and instructional strategies. Our study responds to this guidance by examining the learning environment of Zoom's breakout rooms and the instructional strategy of microteaching.

3. Research question

Against the COVID-19 pandemic backdrop, this study seeks to answer the question: What are pre-service teachers' perceptions of microteaching in Zoom's breakout rooms?

4. Research design and methodology

The setting for this research is an education course that introduces PSTs to the curriculum and teaching methods of primary mathematics. This course examines and applies pedagogical concepts and strategies for effective mathematics education. During and after this course, qualitative and quantitative data for the current project were collected and analysed using a mixed-methods exploratory sequential design (Creswell, 2012; Creswell & Creswell, 2017; Harrison, Reilly & Creswell, 2020).

The collection and analysis of qualitative data initiate this style of mixed-method research. The data collected during the qualitative phase inform the development and analysis of data from a quantitative instrument (Creswell, 2012). This two-phase design enhances and deepens the understanding of the researcher. Typically, this form of mixed-methods research concludes with interpreting the quantitative data. Additional data collection occurred in this study as three PSTs consented to interviews following the university semester. Convenience sampling of these students occurred; these three remained on campus after their final examinations. This accessory step deepened our study by allowing the participants to validate the findings through a "member checking process" (Creswell, 2012: 259). The PTSs confirmed the results of our study and added comments during a non-structured interview.

Following the above description, Figure 1 illustrates the methodology employed.

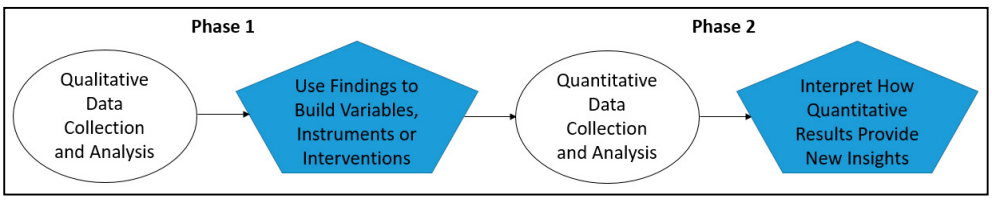

Figure 1: Exploratory sequential mixed-methods design (Modified from sources: Creswell, 2012; Harrison *et al*., 2020)

Human interactions are complex; thus, researchers are frequently compelled to analyse interactions in breadth and depth, a problem to which mixed-methods research is well suited (Creswell, 2012). One advantage of the exploratory sequential design is that the survey is based on the information gathered from PSTs. Instead of addressing the research questions with pre-set survey items, this study observed the microteaching activities and then designed a questionnaire to better understand breakout room efficiency during a crisis.

Research setting and participants

This study was conducted at a small Western Canadian university using convenience sampling of third-year PSTs in a curriculum and instruction mathematics course. The course comprised one semester, 26 virtual sessions (23 involving breakout rooms) of 80 minutes. All Zoom video recordings were analysed. Interactions of students who did not consent to the study were ignored, and pseudonyms were used for participants throughout the research process. Of the 26 PSTs in this course, 93% participated in the research. The PSTs varied in age from 19 to 40 years old.

Data collection and analysis process

First, all Zoom recordings for this course were collected and reviewed. The 80-minute class periods were recorded, as well as 15 minutes prior to and after the class period. Identifying and categorising interactions became the focus of the qualitative data analysis. Additionally, representative and meaningful participant quotes were recorded at this time. Next, the categorisations and quotes facilitated the creation of a 30-item questionnaire (Twenty-eight closed-response, Likert-like items, and two open-response items). Survey Monkey® distributed the questionnaire and collected the responses. The survey of participants was designed to examine PSTs' perceptions of their online experience.

Qualitative data collection and analysis process

The first phase of this study included gathering and interpreting data from Zoom digital recordings (observed interactions). The analysis established the types and frequencies of PSTs interactions. Each interaction's length and frequency were recorded (rounded to the minute). Both authors completed the coding process, analysed the inconsistencies, and reached a consensus.

Northrup's (2009) components of online student interactions became the initial lens for data analysis. After reviewing three recordings, the authors agreed on the codes used to analyse all Zoom recordings. The codes included casual conversation (non-content discussion), support requests (between peers or between PSTs and the professor), collaboration (peer and instructor discussion and feedback), and content interaction (e.g. microteaching).

Bogdan and Biklen's (2007) coding methodologies were used for data analysis and interpretation. Their guidance helped construct the preassigned coding categories from Northup's (2009) critical online interactions. Table 1 shows one example for each code. Student questions and peer and/or instructor responses were also identified. Nonetheless, only significant interactions (those lasting more than 30 seconds) were examined.

Table 1: Coding examples of observational data from video recordings

Date & time of recording	Code	Description of interaction
2-2-2021 0:00 – 2:55 minutes	Casual Conversation	Conversations between the instructor and the PSTs began before class and continued into the class session.
2-2-2021 2:55 – 6:35 minutes	Request for Support	Multiple PSTs asked for assistance regarding lesson plan requirements.
2-2-2021 6:35 – 9:55 minutes	Collaboration	PST collaborated to select the materials and organise the presentation style for their upcoming microteaching assignments.
2-2-2021 25:25 – 37:20 minutes	Content interaction	Microteaching. A PSTs instructed their small group (counting to 10 with visual representations)

Quantitative data collection and analysis process

The second phase of this study addressed the research question by collecting data via an online survey. Although the microteaching occurred in the breakout rooms, aligning qualitative and quantitative data required questionnaire items that addressed the general interactions within Zoom. These questions examining interactions outside the breakout rooms added to the richness of the data collected. Thus, the survey questions probe students' perceptions of 1) interaction within Zoom between PSTs and the professor (Table 4), 2) general interaction among PSTs (Table 5), and 3) microteaching interactions within breakout rooms (Table 6). In addition, PSTs' perceptions regarding face-to-face vs Zoom interactions were collected. Table 2 contains the questionnaire items that probed the PSTs' perceptions of their interactions in breakout rooms. For the complete questionnaire, see Buttler and Scheurer (2022).

The first part of the quantitative analysis examined the percentage of respondents who agreed or disagreed with each survey item statement. Further analysis involved IBM's Statistical Package for the Social Sciences (SPSS) software. Two analyses were conducted; Cronbach's alpha measured the internal consistency of the breakout room survey items, and Pearson correlations (measurement of the covariance) examined the correlation between PSTs' breakout room items responses and all other survey items.

Member check of findings

The final step of data collection occurred post-course. Three PSTs consented to interviews regarding their microteaching experiences via Zoom. The primary purpose of these interviews was to check the validity of our findings. The findings were presented to the PSTs, and non-structured questions were asked, encouraging the PSTs to evaluate the study's findings. The 10-15 minute interviews occurred in the student lounge, a room for casual student interactions within this university's School of Education building.

5. Findings

The current work focuses on PSTs' perceptions of microteaching via Zoom's breakout rooms. What follows is a summary of qualitative data (video recordings and PTSs interviews) organised by the codes developed from Northrup's (2009) components of online interactions, followed by an account of quantitative data (questionnaire results).

A significant portion of the video data and transcripts of video recordings occurred in the general Zoom meeting area. Overall, PSTs passively interacted in the general area. That is, they watched what occurred on the main Zoom screen. In contrast, breakout room interactions revealed active, engaged PSTs. Each recorded session revealed PSTs participating in casual conversations and collaboration before and after microteaching activities. Nevertheless, the PSTs spent the most time conducting microteaching and providing feedback to peers (81% of the recorded time).

Casual conversations

At the beginning of the term, the professor predominately initiated non-content, casual conversations. The first pre-service teacher interviewed (PST1) summarises their reluctance, "In a classroom, we can move around and talk to different groups. This [freedom to move] is not the case with virtual meetings, especially in terms of breakout rooms where people are virtually separated" (PST1, spring 2021). Nevertheless, PST1 described a change in interactions halfway through the semester, "later on, there was a desire to communicate… and we even managed to form bonds that we were reluctant to part with once new [breakout room] groups were assigned" (PST1, spring 2021).

Requests for support

Requests for support were the least common interaction. Students rarely sought assistance with a problem that would take more than a minute to resolve. Almost two-thirds of these conversations involved the clarification of class topics, while the remaining third dealt with technological concerns. Nevertheless, several PSTs reported internet outages and bandwidth issues, especially those who lived in rural areas or households where multiple individuals participated in online education.

Collaborations

The video recordings showed collaboration occurring following each microteaching session lasting an average of five minutes. PST3 reported that online collaboration reflected in-person collaboration, stating, "[in-person] collaboration normally only happens in the classroom, or in allotted times groups decide to meet outside of class to get work done together. Very little has changed between face-to-face meetings and Zoom in that regard" (PST3, Spring 2021). Nevertheless, PST3 pointed out that the breakout room groups often became silent once the assigned tasks and collaboration were completed; the "dead time" was awkward.

Content interactions

Two types of content interaction occurred in the breakout rooms: professor-led and student-led. The professor-led interactions involved discussion-based activities that probed PSTs' opinions and reasoning. The time-intensive microteaching lessons dominated the student-led PSTs content interactions revealing prepared, passionate presenters. Although the video data showed compliant presenters and "students," PST2 described a unique issue experienced in breakout rooms during microteaching. "Speaking from personal experience … engagement can be far more difficult in an online-only setting than a face-to-face one. There are potentially far fewer distractions in a classroom, and the 'teacher' can usually clearly see what their 'students" attention is focused on. This is not the case in an online-only environment" (PST2, Spring 2021). PST2 admitted to surfing the web while their peers presented a microteaching lesson.

As noted earlier, the questionnaire contains items examining video conferencing aspects beyond microteaching. Table 1 includes the questionnaire items specific to the current research.

Table 2: Questionnaire data on interactions in Zoom's breakout room

Item	Questionnaire item	SD/D	SA/A
19	In BoRs, I could easily converse with my classmates.	5%	84%
20	I was comfortable meeting with my peers in BoRs.	16%	84%
21	I regularly engaged with my peers in our BoRs.	5%	90%
22	I believe the time spent with my peers using BoRs was valuable.	0%	100%
25	I collaborated with my classmates by doing group work in BoRs.	16%	84%
26	I participated in lessons [in BoRs] that used Zoom's whiteboard/ shared screen.	5%	79%
27	During the BoR conversations, my classmates and I discussed aspects of teaching practices.	0%	100%
28	I became effective using Zoom's BoRs.	11%	84%

Note. **Table 1 data are rounded to the nearest whole number (BoRs = breakout rooms, SD/D = aggregate percent of strongly disagree and disagree responses, and SA/A = aggregate percent of strongly agree and agree responses. Neutral responses are not noted.**

Overall, PSTs perceived breakout rooms positively; 84% of respondents felt comfortable and could easily communicate with peers in breakout rooms. In addition, 90% of the PSTs engaged with their peers in breakout rooms regularly, while 84% collaborated with classmates during group work. Finally, 100% of the respondents discussed their teaching practices and believed the time spent with peers in breakout rooms was valuable.

The subsequent data analysis used IBM's SPSS software. First, the reliability of the breakout room items was determined. Cronbach's alpha (α) measures the internal consistency of parallel instrument items developed to measure a target. Cronbach's alpha is regarded as a scale dependability metric. A generally accepted rule is that an α of 0.6–0.7 indicates an acceptable level of reliability, and 0.8 or greater is very good. Cronbach's alpha for the breakout room interaction items (#19, #20, #21, #22, #25, #26, #27, and #28) is .789. Questionnaire items #23 and #24 did not examine breakout room interactions.

An α of .789 suggests that the eight questionnaire items measure the same thing—in this case, PSTs breakout room perceptions. Table 2 illustrates that these items demonstrate internal consistency and that removing an item does not improve the alpha significantly.

Table 3: Reliability analysis

	Item 19	Item 20	Item 21	Item 22	Item 25	Item 26	Item 27	Item 28
Alpha, if this item is deleted	.743	.757	.759	.782	.795	.839	.839	.783

Further analysis of the questionnaire data was conducted using SPSS to explore the correlation between PSTs' breakout room responses and their perceptions of online interaction. Table 3 shows the eight breakout room item correlations with ten professor communication items.

Table 4: PSTs' Breakout room perceptions and professor interactions

		Professor interaction									
		Item 1	**Item 2**	**Item 3**	**Item 4**	**Item 5**	**Item 6**	**Item 7**	**Item 8**	**Item 9**	**Item 10**
PSTs breakout room perceptions	**Item 19**	.292	.510*	.222	.671**	.529*	-.440	.701**	-.287	.300	.388
	Item 20	.386	.504*	.224	.613**	.522*	-.349	.650**	-.282	.408	.327
	Item 21	.183	.292	.101	.423	.388	-.487*	.494*	-.096	.530*	.281
	Item 22	.217	.416	-.182	.254	.306	-.098	.213	.151	.201	.236
	Item 25	.219	.348	.056	.151	.127	-.564*	-.068	.390	.207	.339
	Item 26	.270	-.039	.269	-.068	.102	.130	.183	.031	-.116	.513*
	Item 27	.338	.410	.542*	.257	.383	-.565*	.015	.036	.084	.269
	Item 28	.497*	.450	.190	.513*	.480*	-.107	.615**	-.147	.156	.691**

Note: Table 3 contains Pearson Correlation data, **Correlation is significant at the 0.01 level (2-tailed), and *Correlation is significant at the 0.05 level (2-tailed).

All but one PSTs breakout room perception items correlate with one or multiple professor interaction items (Table 3), suggesting the professor's interaction with the PSTs impacted breakout room perceptions. Three professor interaction items (4, 7 & 10) demonstrate highly significant positive correlations with three breakout room items (19, 20 & 28). PSTs felt at ease meeting and conversing with their peers in breakout rooms (Items 19 and 20), highly correlated with comprehension of lessons, and feely corresponded with the professor via text (Items 4 and 7). Item 28 (My use of breakout rooms was effective) also demonstrated a highly significant correlation with Item 7 and Item 9 (I readily communicated with the professor via written correspondence, and technical difficulties did not impede my understanding of the material or the professor).

Item 6 (In face-to-face lessons, access to course material is more manageable than via Zoom) negatively correlated with three items (21, 25, & 27). These breakout room items examined comfortable peer interactions, peer collaborations, and peer discussion of teaching practices.

Item 8 (Face-to-face meetings facilitated more efficient and effective student-professor interactions compared to online meetings) is the one non-significant professor interaction item. This lack of correlation suggests that the PSTs found breakout room interactions with peers more impactful than interactions with their professors.

Table 5: PSTs' perceptions and general peer interactions in Zoom

		Zoom peer interactions							
		Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	Item 17	Item 18
PSTs breakout room perception	Item 19	.341	.561*	.396	-.332	.277	.299	.019	-.533*
	Item 20	.267	.362	.341	-.334	.313	.350	.142	-.520*
	Item 21	.499*	.485*	.232	-.184	.508*	.460*	.113	-.402
	Item 22	.413	.416	-.038	.396	.319	.321	.149	-.352
	Item 25	.212	.421	-.066	.459*	.392	.307	.174	-.248
	Item 26	-.532*	-.082	.067	.067	.144	-.004	.283	-.209
	Item 27	.070	.429	.368	-.043	.281	.365	.218	-.421
	Item 28	-.240	.656**	.149	.000	.222	.139	.198	-.394

Note: Table 4 contains Pearson Correlation data, **Correlation is significant at the 0.01 level (2-tailed), and *Correlation is significant at the 0.05 level (2-tailed).

PSTs' perception of general Zoom interactions with their peers (Table 4) impacted their perception of breakout rooms. Highly significant positive correlations suggest that Zoom interactions allowed them to develop teaching skills, connect with peers, and build friendships.

The significant negative correlations reflected technical aspects of Zoom: the digital whiteboard and chat format. The data suggest that many PSTs did not perceive Zoom's digital whiteboard as practical. This perception may have resulted from the timing of when instruction was provided. Halfway through the course, the professor demonstrated Zoom's digital whiteboard. The second negative correlation occurred with PSTs' chat preference (text chat is more comfortable than video chat) and comfortable, accessible peer communication. These respondents perceived video chat as the preferred communication medium over text chat.

Table 6: PSTs' perceptions – Peer interactions within breakout rooms

		Breakout room peer interaction								
		Item 19	Item 20	Item 21	Item 22	Item 23	Item 25	Item 26	Item 27	Item 28
PSTs breakout room perception	Item 19	1	.856**	.661**	.527*	.533*	.343	-.095	.340	.467*
	Item 20	.856**	1	.597**	.413	.404	.172	.138	.398	.325
	Item 21	.661**	.597**	1	.460*	.453	.423	-.034	.404	.240
	Item 22	.527*	.413	.460*	1	.483*	.491*	-.214	.108	.418
	Item 25	.343	.172	.423	.491*	.304	1	-.127	.349	.126
	Item 26	-.095	.138	-.034	-.214	-.085	-.127	1	.182	.288
	Item 27	.340	.398	.404	.108	.167	.349	.182	1	.264
	Item 28	.467*	.325	.240	.418	.459*	.126	.288	.264	1

Note: Table 5 contains Pearson Correlation data, **Correlation is significant at the 0.01 level (2-tailed), and *Correlation is significant at the 0.05 level (2-tailed).

The PSTs' perception of interactions between peers within breakout rooms (Table 5) significantly impacted their perceptions of microteaching in breakout rooms. The highly significant correlated items suggest that PSTs regularly engaged with peers in breakout rooms, could easily converse with classmates, were comfortable meeting peers, and became effective using breakout rooms.

Two breakout room peer interaction items did not correlate with any other breakout room interaction item. The data suggest that Zoom's whiteboard/shared screen did not impact PSTs' breakout room experiences. Also, peer conversations that specifically focused on aspects of teaching practices did not affect any interaction items. This response is interesting because 100% of the PSTs indicated that they discussed aspects of teaching within breakout rooms.

Breakout rooms vs in-person setting

The questionnaire data suggest that PSTs prefer in-person classes to lessons delivered via Zoom. Five questionnaire items investigate this perception (#6, #8, #14, #17, and #24). Delving deeper, an aggregate of the results for these questions was created, allowing for the investigation of the factors influencing PSTs' perceptions of course delivery. SPSS identified significant correlations between this aggregated variable and the remaining questionnaire items. Table 6 displays these correlations separated by male and female responses (gender identified via course registration).

Table 7: Course delivery impact (online vs in-person)

	Item 2	Item 4	Item 7	Item 9	Item 10	Item 11	Item 12	Item 19	Item 20	Item 21	Item 22	Item 25	Item 28
Female	.624*	.459	.585*	.118	.887**	-.140	.673*	.777**	.777**	.777**	.653*	.644*	.767*
Male	.461	.971**	.504	.903*	-.733	.893*	.542	.971**	.885*	.872	.807	.721	.677

Note: Table 6 contains Pearson Correlation data, **Correlation is significant at the 0.01 level (2-tailed), and *Correlation is significant at the 0.05 level (2-tailed).

For female PSTs, multiple items significantly correlate with the course delivery aggregate. Although these include effective communication with the professor and minor technical issues, most items involve peer interaction. The course delivery aggregate correlates strongly with five interaction items for male PSTs. The significant correlations included understanding the course content, a sense that their efforts were valued, brief conversations prior to class, and comfortable interactions in breakout rooms. The male response suggests the desire for agency, or as Trede and Jackson (2021) explain, a desire for self-efficacy or the belief that one can do something and make a difference.

6. Discussion

Distance learning (Kentnor, 2015), online education (Soon, 2011), and blended learning (Fuller, 2021) have a significant documented history. Prior to the COVID-19 pandemic, literature described blended learning as a combination of computer-mediated (often online) and in-person education (Graham, 2006). The new form of blended learning examined in this research occurred entirely online. PSTs used an asynchronous learning management system to access learning materials and submit assignments while interacting synchronously during microteaching activities.

Recent technological innovations made online educational delivery available for blended learning within this study. Nevertheless, various technologies have enabled schools to provide online education for quite some time, resulting in a continual increase in students enrolled in online courses (Palvia *et al*., 2018). This increased demand for online education has impacted ITE in several ways, including increased course offerings (Irwin *et al*., 2021) and increased challenges relating to meeting PSTs' needs (Zalavra & Makri, 2022). As a result of the increased online presence in ITE, we argue that examining multiple online education experiences will provide a deeper understanding and enhance future ITE programmes. For example, Moorhouse and Wong (2022) suggest that ITE programmes should provide opportunities for PSTs to develop online teaching practices to prepare future teachers for online teaching.

The course reported on here facilitated asynchronous and synchronous online experiences. Some literature suggests synchronous classes cause students distress and reduce student-teacher time (Dorn *et al*., 2020). Nevertheless, each participant in this study reported that time spent in Zoom's breakout rooms was valuable, and most reported that they were happy with their interactions with the professor. Additionally, PSTs in this study reported developing teaching practices as they collaborated with classmates and formed personal connections. These positive results also seem at odds with other literature which report significant dropout numbers in online courses (Bañeres *et al*., 2023); all PSTs who began the course reported here completed the course.

When examining relationship building, the participant responses in this study reflect the findings in the literature, i.e. relationship building is vital to successful online education experiences (Jenney, Straka & Walsh, 2021). These results confirm the importance ITE programmes should place on building positive instructor-student and student-student relationships within an online course. This study's use of Zoom's breakout rooms appeared to encourage positive interactions, perhaps because the virtual rooms facilitated instructor-student interactions not present in the general Zoom room where the entire class met (Vyas *et al*., 2022). Peer relationships also developed while PSTs worked together in breakout rooms. "As we became comfortable in breakout rooms, we began to open up to each other ... It is natural in human interaction, regardless of whether it is virtual or not" (PST3, Spring 2021).

Breakout rooms also provided a space where PSTs reported they conducted necessary activities, including preparing lessons, practising teaching, conducting self-reflection, and engaging in peer feedback. It is possible that the positive feedback from the PSTs occurred because the breakout rooms provided a more personal student-teacher and student-student interaction. After all, the professor interacted with groups of four students instead of the entire class. Rather than passively experiencing a lecture and listening to general comments

regarding projects, the PSTs received customised counsel, advice, and assistance within a small-group setting.

The breakout rooms also encouraged PSTs to participate actively in making decisions about their education process. Within this study, the data revealed that the PSTs appreciated the opportunities to make pedagogical decisions. PSTs valued the freedom to engage in microteaching and design their own collaboration processes inside breakout rooms. Although this was important for both genders, this aspect was especially significant for the males in this study. Overall, they appreciated the agency provided within the breakout room environment. This response is consistent with Billett's (2011) assertion that student agency is necessary for effective learning experiences. PSTs used their agency as the breakout room microteaching experience began. They were given a general framework for guidance, yet each group developed group-specific processes and procedures. The decisions made by the PSTs reflect those required by in-service teachers, thus promoting the development of tacit teaching knowledge (Bodis *et al*., 2020; Boz & Belge-Can, 2020).

Although the participants received the breakout microteaching positively, the PSTs' desire to return to in-person education settings should not be overlooked. Was this a response to the pandemic and forced isolation, or was it a response to the medium, a form of Zoom fatigue (Nadler, 2020)? Examining microteaching using this new form of blended learning without the influence of COVID-19 would be enlightening.

Will ITE make use of this delivery option in the future? The teacher certification body where this research occurred allowed for online curriculum and instruction (lived curriculum) courses during the COVID-19 pandemic. However, currently, purely online teacher education degrees are not accredited.

7. Conclusion

The final data analysis reveals positive and significant correlations between breakout room items and PSTs' interaction with their professor and peers. Highly significant positive correlations suggest that Zoom interactions allowed PSTs to develop teaching skills, connect with peers, and build friendships despite interacting only online. Within breakout rooms, where microteaching activities occurred, PSTs regularly engaged with peers, easily conversed with classmates, were comfortable meeting peers, and became effective using breakout rooms.

Gender impacted the perception of microteaching in Zoom. Both genders were comfortable meeting peers and could easily converse in breakout rooms. Nevertheless, females prioritised connections with the professor and peers, whereas males focused more on course content and a desire to contribute during lessons. These findings suggest a significant distinction in perception between the genders.

While the data reflect positively on microteaching in Zoom's breakout rooms, individuals designing online courses should note that our findings suggest that the PSTs desired to return to the classroom. For example, although PSTs viewed online interactions with the professor positively, they found it more manageable and effective to access lesson materials and resources in face-to-face learning settings. Furthermore, although most PSTs indicated that they formed friendships while taking this course, a third of the PSTs indicated that they could not form strong friendships.

In a rapidly evolving educational environment, COVID-19 has accelerated change and will continue to impact the next decade of online course delivery. As online education continues to increase, the quality of online courses must be enhanced. As a result of the COVID-19 pandemic experiences, a fruitful model of a blend of online and face-to-face learning alternatives (Zhao & Watterston, 2021) has developed. Based on the findings above, Zoom breakout rooms provide an effective site for microteaching activities.

Online education presents challenges yet to be overcome (Palvia *et al*., 2018). On the other hand, innovative solutions have evolved to give students and families the facilities and resources required to participate in and complete a curriculum when education is inaccessible (Darling-Hammond, Schachner & Edgerton, 2020). Concerning the focus of this paper, Zoom's synchronous meeting platform increased accessibility to microteaching.

The pandemic was the impetus; will we use this as a catalyst for lasting change? The ability to serve learners online has increased, and ITE programmes and teacher educators have an opportunity to listen to PSTs to incorporate relationship-building opportunities, facilitate student agency, and adjust for online gender preferences. Students will benefit from ITE programmes that reflect these online needs.

Although this group of PSTs expressed a desire for in-person education, the financial benefits to post-secondary institutions and the increased demand for online courses revealed in education literature suggest that a complete return to the *status quo* is improbable. While online ITE is unlikely to become the norm soon, online ITE courses must continue to improve. As the movement toward online teacher education classrooms continues to grow, so should the knowledge base that supports the development of such courses and programmes. Given the challenges, effective online post-secondary programme launch and growth require significant planning and implementation of best practices and new solutions. Continued research is required to understand how online teacher education methods courses might effectively prepare PSTs to enter the profession. Many questions remain unanswered and significant research must occur before the impact of online teacher education programmes is fully understood.

8. Study limitation

Response bias may have occurred during the data collection and analysis process. Self-report questions, such as those found in our surveys and non-structured interview questions, are especially vulnerable to this type of bias. The sample size of this study also limits the generalisations of the findings. Adding data from further iterations of this course would add statistical power.

Declaration of interest statement

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Ethical statement

This research received approval from the University's Ethics Board.

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