Digital tools to promote remote lesson study

Joanna C. Weaver, Gabriel Matney, Allison M. Goedde, Ieremv R. Nadler and Nancy Patterson

School of Teaching and Learning, College of Education and Human Development, Bowling Green State University, Bowling Green, Ohio, USA

Abstract

Purpose – The authors propose that a digital instructional delivery format of lesson study (LS) may have the Accepted 19 December 2020 potential to amplify particular aspects of traditional, face-to-face LS.

Design/methodology/approach – This is a qualitative case study, using data triangulation, member checking and an inductive approach to open-coding utilizing grounded theory to identify codes and themes

Findings – Digital tools promoted LS and learning, allowing for rigorous collaboration, synchronous observations, data collection and feedback, leading to deeper understanding.

Research limitations/implications - Digital tools used in the online LS process changed how instructional planning can be researched, analyzed and written collaboratively and impacted the fluidity of a lesson, the ease of observation and reflection, student engagement and the researchers' and students' ability to share ideas in real time.

Practical implications - LS can be integrated into online teacher education programs to engage students in online learning and promotes engagement, peer interaction and student voice. The use of these digital tools is not restricted just to remote instructional contexts.

Social implications – LS reduces teacher isolation, builds a collaborative community of teachers and increases instructional motivation. Educators across schools, universities or districts can integrate online LS into remote teacher education programs and online courses.

Originality/value – This study is original work that has not been published elsewhere.

Keywords Technology, Collaborative research, Teacher education

Paper type Case study

Introduction

As the pandemic forced many educators online through remote or online teaching, it was imperative that teacher educators studied and understood ways that educational research and theory would apply to these new modes and methods of instruction. Due to COVID-19, attempting to collaborate face-to-face was rendered more complex and extremely challenging. The imperative of online delivery during COVID was particularly salient for teacher educators who traditionally taught their content to teacher candidates face-to-face. Because of the pandemic, teachers were charged with modeling effective remote and online teaching methods and pedagogical approaches they intended teacher candidates to use with their future students. The rapid disruption and shift to remote teaching mid-way through 2020 payed the way for the "new normal," with digital, remote delivery formats that had promise for continued improvement in teacher education practice.



International Journal for Lesson & Learning Studies © Emerald Publishing Limited 2046-8253 DOI 10.1108/IJLLS-09-2020-0072

Huziak-Clark, T., Lavery, M., Weaver, J. C. and Lavenia, K. (2018 Oct). Project Impact: Improving pedagogy, motivation, assessment and collaboration for teachers. The US Department of Education Teacher Quality Program. Funding for this project allowed for purchase of books about lesson study and the GoReact video analysis software. These funds were matched by Bowling Green State University.

study

remote lesson

Digital tools to promote

Received 21 September 2020 Revised 24 November 2020 9 December 2020

17 December 2020

IILLS Purpose of the study

The purpose of this study was to contribute to research and theoretical frameworks for shaping lesson studies that involved remote collaboration to study, plan, conduct, and reflect on teaching and learning. We surmised that conducting lesson study (LS) through a digital format may have the potential to amplify particular aspects of a traditional, face-to-face, high-impact practice.

The institution studied was engaged in an ongoing effort to build a culture of LS in its teacher education programs when the COVID-19 pandemic caused the state leader to issue a stay-at-home order. This prompted an immediate shift to remote teaching, not only for the teacher educators at the institution but also for the teacher candidates who were student teaching in area schools. Many instructors returning to campus-based instruction in the fall of 2020 had to rely on remote instruction, requiring students to engage in synchronous interaction with the instructor and with their classmates during scheduled class meeting times. To continue building a culture of LS in our teacher education programs, we needed to find an avenue for a cohesive and seamless remote LS model. To do this, we reflexively used the process of LS to answer the following research question (RQ): During remote instruction, in what ways do digital tools promote the LS process for teacher educator and teacher candidate learning?

Review of literature

LS is a professional development method involving a group of teachers working collaboratively toward a jointly prepared research lesson focused on student learning. In some research, LS research teams are referred to as "communities of practice" (CoP; Lave and Wenger, 1991; Soto *et al.*, 2019; Wenger *et al.*, 2002) focusing on the community of educators who are sharing learning and instructional practices. Evidence supports the success of LS in building a CoP, stating that it reduces teacher isolation and builds a collaborative community of teachers who strive for positive student outcomes (Chang, 2009; Lewis, 2002; Perry and Lewis, 2008; Lewis and Perry, 2015; Stokes *et al.*, 2019). Furthermore, LS increases instructional motivation among teacher educators (Uchiyama and Radin, 2009).

During the LS process, teachers bring their own professional challenges to the table and seek answers from one another, outside specialists, research and a careful study of students. They use the four steps (study, plan, teach, reflect) that make up the LS process (Lewis and Hurd, 2011). Within the four steps, LS focuses on three salient points, including that educators (1) determine goals of student learning; (2) identify challenges and pressing issues, analyze research and curriculum related to those challenges and plan a research lesson collaboratively with a research team; and (3) teach or conduct the research lesson while the research team gathers data on student learning (Lewis and Hurd, 2011). The process has been shown to present evidence-based contexts for assessing instructional practices (Cordingley *et al.*, 2004; Dudley, 2013; Opfer and Pedder, 2011; Sims and Walsh, 2009).

Remote lesson study and digital technology

Through LS, teachers systematically examine their pedagogical practice with the aim of becoming more effective (Myers, 2012). Although traditional face-to-face professional development (PD) is often preferred by teachers, the current pandemic has created a challenge to provide PD remotely. This remote format promotes increased collaboration and communication across institutions and among colleagues (Earon, 2020; Hoadley, 2014; McDonald and Cater-Steel, 2017). The remote format also calls for workers who are "autonomous, adaptable, and adept at creating their own fluid networks of collaborators...through online tools" (Moore, 2016, p. 233). This change will require teachers to "unhinge" ideas about technology in the classroom and focus on new models that are better suited for the students of today (Mishra and Mehta, 2017).

A report published by the International Society for Technology in Education (ISTE), the Partnership for 21st Century Skills and the State Educational Technology Directors Association (2011) found that employers feel schools fail to prepare students for a technology-based economy (Gordon, 2011). These technology skills surpass the ability to instant message (IM), play online games, download programs and master the bells and whistles of smart phones. According to Gordon (2011), "it's also about turning information into knowledge through Web searching and vetting. It's about developing effective multimedia presentations. It's about seamlessly using digital tools to collaborate and problem-solve" (para. 6).

Given the current culture of teaching and learning in remote formats, teacher educators are in a unique position to leverage technology to model and engage students in a virtual CoP and reflect on instruction. Recent efforts to identify best practices and ideal competencies have advanced the dialogue about the role of teacher educators in technology training (Foulger et al., 2017). The shift to remote context requires technological pedagogical content knowledge (TPACK; Mishra and Koehler, 2006). The notion of TPACK as an approach to transform teaching is strengthened by a number of studies illustrating how different subdomains of TPACK influenced each other to different degrees, with second-level subdomains such as technological content knowledge (TCK) and technological pedagogical knowledge (TPK) (Dong et al., 2015; Koh et al., 2013; Pamuk et al., 2015). In these studies, the lack of direct influences of TCK and TPK suggests that preparing teachers to integrate technology is more than simply developing their isolated technology skills. Furthermore, the teachers' access of technology does not equate to effective teaching, nor does it affirm that teachers will utilize the technology to enhance teacher capacity or support student learning (Voithofer and Nelson, 2020). The integration of technology must be intentional and purposeful, focused on student learning and acquisition of knowledge. LS provides a rich avenue for teachers to intentionally and purposefully integrate technology and examine its effectiveness for impacting student learning.

One intentional and purposeful way to integrate technology into instruction is to use it for collaboration and communication among teachers to study, plan, teach and reflect (Consuegra *et al.*, 2016; Hoadley, 2014; Prestera and Moller, 2001; Shrivastava, 1999). Furthermore, video use deepens reflections and considerations of possible alternative strategies within the lesson (Lyle, 2003). Additionally, effective video collaboration cultivates empathy and streamlines communication (Moore, 2016, p. 233).

In addition to merging videos with reflective dialogue, virtual contexts open up pathways that help overcome obstacles and increase the growth of instructional practice through remote feedback and reflection that challenge and solidify understanding (Cohan and Honigsfeld, 2007; Soto *et al.*, 2019; Vrikki *et al.*, 2017). For example, the use of ZOOM as an online platform allows for research collaboration with the ability to share documents (Earon, 2020). Furthermore, remote classes can take place using ZOOM, and students can engage in group work in real time by utilizing the breakout rooms. "The use of video communications increases productivity...and offers students real-time, immediate access to classes and course materials" (Earon, 2020, p. 6).

According to research, virtual meetings with collaborative documents is an effective platform for teaching and learning (Cohan and Honigsfeld, 2007; Lyle, 2003; Soto *et al.*, 2019). Sharing documents remotely is efficient and less time-consuming than face-to-face collaboration. For example, Google Docs and Google Sheets allow near instantaneous document replication and promote collaboration and learning through shared writing and brainstorming (Oxnevad, 2018).

Another online tool for sharing ideas is Padlet – a collaborative "cork board" that allows students to share research ideas with one another on a shared wall (Halsted, 2014). These digital tools cultivate collaboration, reflection and learning when integrated intentionally and

IJLLS thoughtfully. A remote LS experience could utilize these digital tools to promote rigorous collaboration in a digital learning environment, while creating a rich foundation of reflection on student learning and instructional practice. In order to explore this possibility, we describe our investigation to answer the following RQ: During remote instruction, in what ways do digital tools promote the LS process for teacher educator and teacher candidate learning?

Methodology

This qualitative case study (Stake, 1995; Yin, 2014) uses participatory action research (Kemmis and McTaggart, 2000). The LS cycle being examined took place 100% remotely; therefore, this study extends the research of LS and examines all four steps (study, plan, teach and reflect) of the process as it was implemented in a digital context from beginning to end. The team, consisting of the five authors, focused on the theme of High-Leverage Practices (HLPs), specifically *leading a discussion*, using digital tools in an online environment. We developed the research theme and question, planned and observed the research lesson, reflected and consulted with a *knowledgeable other* (Amador and Weiland, 2015; Fernandez, 2002) all the while using various technologies to enhance learning from the LS process. The research was approved by the Institutional Review Board, and student submissions (e.g. via Padlet) were anonymized.

Remote lesson study context

We began by meeting virtually to discuss the process of LS, using the four steps. Because Gabriel had facilitated more than 100 lesson studies and conducted professional development involving orchestrating productive discussions, he functioned as our facilitator and knowledgeable other. He offered suggested readings focused on the steps of the LS process and trained us via ZOOM while creating a Google folder to upload Google Docs and resources for the team to access remotely for collaboration meetings and for individualized team member constructivism. Our plan of action for LS was as follows (see Figure 1):

- (1) Create the research theme and question together via video chat
- (2) Divide research and inquire about HLP
- (3) Come together to share research findings on ZOOM
- (4) Develop the plan together via ZOOM functions and using Google collaborative technology
- (5) Develop research lesson framework for distribution of materials using Canvas LMS
- (6) One team member will facilitate instruction in a remote setting initiated through Canvas course shell; use breakout rooms in Zoom for small groups to discuss the topic of the research lesson.
- (7) Students engage with digital tools and templates to record important elements of discussion
- (8) Each breakout room is observed by a member of the LS team and uses online templates to take notes
- (9) Team of TEs reconvenes and reflects on lesson
- (10) Team of TEs revises lesson
- (11) Team of TEs reflects on what was learned from the LS endeavor



We chose the HLP *leading a discussion* because the theme aligned with all of our teacher education courses.

After selecting the theme, we divided up the topics that needed to be studied for Step 1 of LS: Jeremy studied the HLP *leading a discussion*, while Nancy, Joanna and Gabriel inquired about strategies of leading a discussion and best practices across our content areas. Allison, our technology expert, studied how to lead discussions effectively using remote platforms. At the second meeting, we shared our research via Google Docs and collaborated on ZOOM to create the following research focus and question: How can we facilitate the high leverage practice of *leading a discussion* in our newly online courses?

Collaboratively, we suggested ideas based on the research collected and created the lesson plan that would be conducted in Nancy's social studies virtual classroom. A Canvas course shell assigned to the students of the social studies class facilitated access to course materials as the foundation for the lesson. After conferring with the LS team, Nancy and Allison collaborated via ZOOM to design the workflow of the lesson being studied and then prepared a digital scheme for students to follow in a specified Canvas module when prompted during the remote class meeting. The lesson module consisted of discussion templates including images of historical protests and current protests in the USA related to racial unrest. The LS team members remotely connected with the class using a ZOOM link for the research lesson event. While connected, we reviewed the interactive nature of the lesson as silent observers and collected data on Google Sheets during student discussions in whole-class and breakout-group settings. In the breakout rooms, students were provided a Google link to a source analysis tool that included images for discussion and comparison. Students were instructed to make a copy of the template for use in the breakout rooms, discuss images and their significance in history and compare and contrast the images using text, context, subtext analysis. The template provided a scaffold for groups and had space for group members to take notes in a real-time, collaborative format. The breakout rooms were recorded by research team observers using various recording devices (Camtasia, iPhones, Screencastify). Following the eight small group discussions, the students posted group discussion highlights on a pre-constructed outline using Padlet.

As students collaborated with online documents via platforms such as Google Slides, Google Docs and Padlet, LS team members integrated technology tools such as Google Sheets to compile research notes and reflections. After the lesson, the LS team met via Zoom to reflect on observational notes for the lesson debriefing.

During each stage of LS, we utilized numerous technology mediums to facilitate the LS process that allowed for remote collaboration. Technology mediums included:

- (1) ZOOM—a remote platform that allows a group of any size to meet remotely with the option of collaborating in smaller breakout rooms and sharing documents.
- (2) Padlet—an online virtual "bulletin board," allowing for collaboration, reflection and sharing of multiple media and mediums. As others add to it, the page updates in real time (see Figure 2).
- (3) Google Docs and Sheets—web-based, real-time collaboration and authoring tools, allowing multiple users to edit at the same time while instantaneously seeing each other's edits.
- (4) Canvas—a web-based learning management system (LMS) used by learning institutions, educators and students to access and manage courses, learning materials, skill development and learning achievement through a variety of customizable management tools, course and user analytics and statistics, and internal communication tools.



Figure 2. Student Padlet posts

Participants

The five authors of the manuscript participated in LS research and designed this study as a qualitative look at the required use of digital tools in a remote LS process. We are from a Midwest university in the United States of America (USA) and are teacher educators (TEs) with different content expertise who came together as a CoP to support one another in the development of HLPs in the new online virtual setting, specifically looking at the HLP *leading a discussion* in a social studies lesson for a methods class.

We have different backgrounds, come from different areas of the USA and teach different content areas that include integrated language arts, mathematics, technology education, career tech workforce education and integrated social studies (listed to align with author order). We all teach in the same college and department, and our teacher education class sizes range from 18 to 38 and consist of students who are 77% white, 8% black, 1% Asian and 14% other. We see our diversity and expertise as beneficial for the professional development of one another regarding the difficult notion of implementing HLPs in a remote teaching context.

Data collection and analysis

The researchers collected textual data from each facet of the remote LS process. Data sources consisted of transcripts from recorded videos, meeting notes shared during the study and planning phases, student digital products and lesson observation notes from the teaching phase and participant reflections from the debriefing phase. The digital observation notes were taken in real time during classroom discussions and breakout sessions. Reflective notes were taken via Google Docs following the observation of the lesson.

While coding data, members used a systematic inductive analysis (Hatch, 2002), modified for this study.

- (1) Researchers independently read all of the data then co-identified frames of analysis related to the research question.
- (2) Themes were created based on semantic relationships within the frames of analysis.
- (3) Notable themes were identified and assigned a code.
- (4) Researchers reread the data clarifying notable themes.
- (5) Researchers agreed upon which themes were supported by data and identified examples of non-fit or counter arguments.

Data triangulation was used to verify the findings through the use of multiple data sources (Jonsen and Jehn, 2009). Member checking (Doyle, 2007) by each team member occurred to verify the interpretation of the data. Each member cross-checked the themes and patterns from the data collected and used the inductive approach to open-coding utilizing grounded theory (Kolb, 2012; Strauss and Corbin, 2008).

Findings

Four themes emerged from the data collected, and the findings were organized around these. These four themes include (1) digital tools promote learning, (2) digital tools promote discussion, (3) digital tools limit instruction and (4) digital tools expedite debriefing.

Digital tools promote learning

The digital tools used during instruction promoted student learning and helped students to focus on the content being presented. For example, Nancy, the remote lesson instructor and research member stated, "[The students were] thinking about race and racism not

technology—it is the technology that facilitated breakthroughs, and the discussion format and documents showed students how long [racism] was going on." Furthermore, Nancy observed that the source analysis tool crafted by Allison and her was used effectively by most of the teacher candidates. She described it as an effective tool for collaboratively building and sharing knowledge. She noted that the digital format was something they had used together in numerous courses in the past, and they are native technology users. According to Nancy, the teacher candidates also learned how to use a Google Doc template to structure individual and/or group notes. When she initially misunderstood the implementation process, they seamlessly adopted the practice, and Nancy and Allison stated that the learning experience supported the elements of the TPACK model.

According to Nancy, another example of facilitating an experience with TPACK was integration and teacher candidate engagement through ZOOM chat. Students were encouraged to post comments and questions during instruction, enabling student voice. In addition to empowering teacher candidates through ZOOM, Nancy learned how to use Padlet and said, "Padlet was seamless, and the number of students in each breakout room gave opportunity for individuals to contribute to the discussion." She continued, "Through this process, I learned we did not have the right essential questions to create critical discussions focusing on the main topic. This is a positive because without the LS process through a digital platform, I would not have discovered that." Nancy noted that because of the Padlet postings, the reflection on the questions could be evaluated quickly and across groups. Such an overarching view of co-construction of knowledge can be more limited and difficult to access in a face-to-face context.

Allison stated that she was able to use a Google Sheet effectively to identify and mark off the elements of HLP *leading a discussion* that were covered during class. Jeremy, Gabriel and Joanna concurred with her comment. The Google Sheet was shared with LS team members and provided a mechanism for the observers to recognize and remind themselves of HLP practices that were potentially being observed by the team. These Google sheets were shared and referenced during the lesson delivery. As a result, we learned how to use the online observation tools to provide focused observation data and more thorough, reflective feedback about the remote lesson.

Digital tools promote discussion

According to the four observers, the digital tools used during remote LS promoted learning and discussion among teacher candidates. Padlet was a platform that enabled them to record and share discussion highlights, as well as provided evidence of their analysis and productive discussions. All four observers mentioned the effective use of Padlet to report the highlights of group discussions. Joanna stated, "There was a student recorder in each group who noted key content and thoughts using the Google Doc template structured with the images to compare and contrast for discussion." Gabriel, Allison and Jeremy confirmed this, and Allison continued, "At the end of class, candidates were asked to submit a value statement in the Zoom chat space prior to leaving the session, and the recording and representing of key content of discussion was through the use of notes on a templated document preserved for post-class review by Nancy."

Jeremy and Gabriel did an analysis and said, "They [teacher candidates] couldn't stop talking and the images sparked conversation. The majority of the content being discussed was on task, and they kept noticing things [in the images], and the recorder typed and talked simultaneously." One researcher commented that of the groups they observed, "every single person contributed and what was discussed was in-depth and meaningful."

There were observable instances of technology sparking critical conversation. For example, Allison stated that "conversation has changed because of technology. In contrast,

IJLLS

the students were able to enlarge the images, and they could look up the picture and know the context. If they had been face-to-face, they would not have zoomed in on the picture."

Gabriel responded to Allison's comment with, "Well, that assumes that being face-to-face would not have involved the use of digital technology. Since being face-to-face does not preclude the use of digital technology, did you actually mean, if the students had used physical and non-digital versions of the materials, they would not have been able to zoom in? Because then that would be true." Nancy and Joanna also mentioned the students closely examining the pictures and finding policemen in the pictures as well mentioning the organization and disorganization of the protesting groups. Joanna stated, "This close analysis provided evidence of the candidates' deeper understanding and learning that was taking place."

In addition to observing teacher candidates' analysis of the organization of the protest groups, Joanna mentioned the media platforms that were used by students that promoted discussion. She stated:

A variety of media platforms were provided to the students to respond to the essential question and compare and contrast images in lesson 2 and 3. Candidates were able to discuss how the images were in response to limited rights or supporting rights. The candidates went into their breakout groups and responded to each other with prompts candidates needed to address and then put it on the Padlet template. During this time, they could enlarge the photos and notice the nuances within the images and ask questions to each other for clarification.

Jeremy confirmed Joanna's statement: "ZOOM (remotely) was used for all aspects of the discussion, and the Canvas modules were accessed throughout the morning. An open-ended question was posed prior to each of the two breakout sessions, and posted in the chat, effectively framing the discussions." Although we share some limitations of the digital tools and remote environment in the next section, overall, we found that the careful use of digital tools can help promote student discussion and analysis during remote LS. This is important since learning from students during remote LS requires the teacher-researchers to elicit and observe student thinking and ideas.

Digital tools limit instruction

According to Joanna and Gabriel, time used to figure out technology was an issue during the lesson. Joanna stated, "Initially it took about 6 min to get the technology all set up and then someone kept getting kicked out, so there was another minute and half gone. Once the group got going, it was amazing. But it took at least 10 min to get going." Gabriel agreed, saying, "Some of the time was lost in setting up as both the teacher and students had to facilitate technology to get to the material and begin thinking and analyzing the images." According to the four observers, the issues the teacher candidates were facing here were technology-related, and the LS team agreed that in a face-to-face setting with print materials, the groups would have engaged in the work more quickly.

All four observers stated that even if some groups were on task with the content of the discussion, it was difficult for some of them to achieve a deeper level, possibly because of their comfort level in their group or the remote context. Allison mentioned: "Getting them to a deeper level was not observed. I do not know if we should structure subgroups to break it out timewise; they just looked at the images–comparing and contrasting the demographics of demonstrators and maybe we needed to prompt them to go deeper–high school level you would have to prompt them." Gabriel added, "The students were also asked to comment about them, but that fell really flat at times," and Joanna responded, "In my second group, the female student remained silent until the end while the males dominated the discussion. She clearly did not seem comfortable responding in this group. My first group had a different

female student who could not get into the group due to technology issues which prevented her from contributing to the group discussion."

While the members reflected on the discussions, Allison observed, "Candidates struggled with image context, identifying details of historical significance that related to time period, and they struggled with connecting past image/present image with emotions of today's protests. They did not appear to be able to discuss how they felt. They had an off-task discussion of COVID spread among the student population. Concerns that peers are not taking responsibility to quarantine and communicate about health concerns." Jeremy added, "Group six struggled to engage in meaningful discussion, evident by long periods of silence. If not for direct engagement from the recorder [a teacher candidate in their group] by posing questions and probing responses, little if any discussion likely would've occurred."

Therefore, some of the discussions were hindered by technology issues. Jeremy stated, "Some students did not have the ability to zoom in–some couldn't see the images. We could have a conversation about equity and equality because they do not have the same technology." Joanna reiterated his point:

The areas of struggle included a candidate who kept getting thrown out of the ZOOM meeting and couldn't engage in the discussion until the end of the group session. That did detract from the group conversation as the candidates shared their condolences with the student.

Digital tools expedite debriefing

According to the research team, the data collected online through observation notes, checklists, reflections and the debriefing created an expedited analysis because all researchers had access to all the materials immediately upon completion of the lesson. In addition, a deeper analysis of the lesson, instruction and student learning took place because researchers could revisit the lesson and breakout room discussions through the use of recorded videos. Furthermore, Allison noted that the online format expedited the debriefing because the researchers could connect synchronously via ZOOM and asynchronously analyze versus having to find a time and place to meet in person to discuss and reflect in a more traditional setting.

During step 4 of the LS, Gabriel led the debriefing session that resulted in a collaborative analysis regarding revisions on the lesson. Gabriel described the process of the debriefing. "The reflection of our LS team was pre-organized through reflection on four questions related to the LS research question we created in Google Docs. Following individual reflection in this template, we discussed our reflections together. Next, through ZOOM, we allowed authentic sharing through a stream of consciousness with deep analysis of the LS process, what we were experiencing and observing during the lesson." The team considered additional questions. For example, Jeremy asked the following question: "Based on the students who had the presence of mind to do so, how do we facilitate all student application of the necessary technology skills to access the images central to the discussion, with the expectation that they will zoom in on the details?"

After reflecting on the question, the team followed with possible solutions and responded that we need to be sure that all students can manipulate the pictures to make them larger and that the links are more accessible instead of having to locate them. Nancy stated that one possible solution might be to collate the images into one digital asset that may be acquired from within the Canvas course shell. Students need to be able to see all the images and the analysis in one place in order to corroborate. Allison added that by doing this, we can encourage more students to engage in the use of technology, which will further promote discussion and learning. This modification may also help students focus on discussing their individual thoughts on the topic rather than recording what they perceived to be the "right answer" or "what the instructor wants." Jeremy added that perhaps selecting and sequencing some groups to share thoughts about particular images would help to facilitate a larger group discussion. Additional suggestions were shared. Allison noted that including that in the preparation portion of the unit, we could tell students to use empathy, that all have a voice, all should feel safe and that there are no right or wrong answers.

Conversely, Nancy added that maybe we cannot expect students to be discussion makers but expect them to dig deeper at another time. Another possibility offered by Gabriel was that maybe we needed to provide more time for analysis, but that created another question: How much time do we give students in total to accomplish the analysis? What is clear is that students need additional time to think about and grapple with the images. Through this debriefing and analysis, we processed our next steps and continued revising the lesson.

Implications

The findings and debriefing provided an answer to the following RQ: During remote instruction, in what ways do digital tools promote the LS process for teacher educator and teacher candidate learning? Digital tools used to implement the online LS process were effective and changed how online instructional planning can be researched, analyzed and written collaboratively with LS research team focused on student learning. Furthermore, the findings suggest that the technology used during this online LS experience impacted the fluidity of a lesson, the ease of observation and reflection, student engagement and the researchers' and students' ability to share ideas in real time. Furthermore, remote LS supports the elements of the TPACK model: pedagogical content, technological delivery and content knowledge. It was clear that there were times when the technology was not seamless and deep discussions were sometimes lost due to technology issues, but, overall, the digital tools promoted collaborative LS and learning. The study affirmed the research that stated that LS builds a collaborative community of teachers who strive for positive student outcomes (Chang, 2009; Lewis and Perry, 2015; Perry and Lewis, 2008; Stokes et al., 2019), and it also increased instructional motivation for the research team to continue participating in LS (Uchivama and Radin, 2009).

This study suggests that no matter the distance, educators across schools, universities or districts have the promise of integrating remote LS into teacher education programs and online courses. They can do so while engaging students in learning using digital tools that promote engagement, peer interaction and student voice. While there were technical and timing issues along the way, the remote observation process was effective. Specific to the findings here when offering fully remote instruction, digital tools can be used effectively to enact the LS process and critically analyze the student learning and engagement that occurs during the lessons. Furthermore, the use of these digital tools is not restricted just to remote instructional contexts. In future research, we plan to study their effectiveness in both in-person LS and remote LS.

Conclusion

When face-to-face encounters were limited due to COVID-19, the integration of digital tools promoted collaboration and a more robust reflection on our students' learning. Video conferencing through ZOOM allowed for rigorous collaboration among the research team and the student learners taking part in the research lesson. Google Docs, Google Sheets, Canvas and Padlet allowed for document sharing among students and researchers. Remote feedback about the lesson and learning was shared immediately, and the analysis demonstrated an overall deeper understanding of the complexity of the lesson that included the breakout room discussions. Ultimately, evidence gathered in this study supports the notion that through the integration of digital tools in the remote LS process, there is a high degree of rigor and relevance at a period in time when our face-to-face interactions are limited

IJLLS due to the COVID-19 pandemic. When moving LS to a virtual format, the examination of instruction is effective and promotes instructional growth through reflection, collaboration and analysis of student learning.

References

- Amador, J. and Weiland, I. (2015), "What preservice teachers and knowledgeable others professionally notice during lesson study", *The Teacher Educator*, Vol. 50, pp. 109-126.
- Chang, M.L. (2009), "An appraisal perspective of teacher burnout: examining the emotional work of teachers", *Educational Psychology Review*, Vol. 21 No. 3, pp. 193-218.
- Cohan, A. and Honigsfeld, A. (2007), "Incorporating 'lesson study' in teacher preparation", The Educational Forum, Vol. 71 No. 1, pp. 81-92.
- Consuegra, E., Engels, N. and Willegems, V. (2016), "Using video-stimulated recall to investigate teacher awareness of explicit and implicit gendered thoughts on classroom interactions", *Teachers and Teaching*, Vol. 22 No. 6, pp. 683-699.
- Cordingley, P., Bell, M., Rundell, B., Evans, D. and Curtis, A. (2004), How Do Collaborative and Sustained CPD and Sustained but Not Collaborative CPD Affect Teaching and Learning, EPPI-Centre, Institute of Education, London.
- Dong, Y., Chai, C.S., Sang, G.-Y., Koh, J.H.L. and Tsai, C.C. (2015), "Exploring the profiles and interplays of pre-service and in-service teachers' technological pedagogical content knowledge (TPACK) in China", *Educational Technology and Society*, Vol. 18 No. 1, pp. 158-169.
- Doyle, S. (2007), "Member checking with older women: a framework for negotiating meaning", *Health Care for Women International*, Vol. 8, pp. 888-908.
- Dudley, P. (2013), "Teacher learning in lesson study: what interaction level discourse analysis revealed about how teachers utilized imagination, tacit knowledge of teaching and fresh evidence of pupils learning, to Develop practice knowledge and so enhance their pupils' learning", *Teaching* and *Teacher Education*, Vol. 3, pp. 107-121.
- Earon, S.A. (2020), "The value of video communications in education", pp. 1-6, available at: https://zoom. us/docs/doc/The%20Value%20of%20Video%20Communications%20in%20Education.pdf.
- Fernandez, C. (2002), "Learning from Japanese approaches to professional development: the case of lesson study", *Journal of Teacher Education*, Vol. 53, pp. 393-405.
- Foulger, T.S., Graziano, K.J., Schmidt-Crawford, D. and Slykhuis, D.A. (2017), "Teacher educator technology competencies", *Journal of Technology and Teacher Education*, Vol. 24 No. 4, pp. 413-448.
- Gordon, D. (2011), "Return to sender", The Journal, March 7, available at: https://thejournal.com/ articles/2011/03/07/return-to-sender.aspx.
- Halsted, E.A. (2014), Why Padlet Is an Important Tool in Your Classroom, EdTechReview, available at: https://edtechreview.in/trends-insights/insights/1468-why-padlet-is-an-important-tool-for-yourclassroom.
- Hatch, J.A. (2002), Doing Qualitative Research in Educational Settings, State University of New York Press, Albany.
- Hoadley, C. (2014), "What is a community of practice and how can we support it?", in Jonassen, D. and Land, S. (Eds), *Theoretical Foundations of Learning Environments*, Routledge, New York, pp. 287-300.
- Jonsen, K. and Jehn, K.A. (2009), "Utilizing triangulation to validate themes in qualitative studies", *Qualitative Research in Organizations and Management: An International Journal*, Vol. 4 No. 2, pp. 123-150.
- Kemmis, S. and McTaggert, R. (2000), "Participatory action research", in Denzin, N.K. and Lincoln, Y.S. (Eds), *Handbook of Qualitative Research*, 2nd ed., Sage, Thousand Oaks, CA, pp. 567-605.

- Koh, J., Chai, C. and Tsai, C.C. (2013), "Examining practicing teachers' perceptions technological pedagogical content knowledge (TPACK) pathways: a structural equation modeling approach", *Instructional Science*, Vol. 41 No. 4, pp. 793-809, doi: 10.1007/s11251-012-9249-y.
- Kolb, S. (2012), "Grounded theory and the constant comparative method: valid research strategies for educators", *Journal of Emerging Trends in Educational Research and Policy Studies*, Vol. 3 No. 1, pp. 83-86.
- Lave, J. and Wenger, E. (1991), Situated Learning: Legitimate Peripheral Participation, University Press, Cambridge.
- Lewis, C. (2002), Lesson Study: A Handbook of Teacher-Led Instructional Change, Research for Better Schools, Philadelphia.
- Lewis, C. and Hurd, J. (2011), Lesson Study Step by Step: How Teacher Learning Communities Improve Instruction, Heinemann, Portsmouth, NH.
- Lewis, C. and Perry, R. (2015), "A randomized trial of lesson study with mathematical resource kits: analysis of impact on teachers' beliefs and learning community", in Cai, E. and Middleton (Eds), *Design, Results, and Implications of Large-Scale Studies in Mathematics Education*), Springer, pp. 133-155.
- Lyle, J. (2003), "Stimulated recall: a report on its use in naturalistic research", British Educational Research Journal, Vol. 29 No. 6, pp. 861-878.
- McDonald, J. and Cater-Steel, A. (Eds) (2017), Implementing Communities of Practice in Higher Education: Dreamers and Schemers, Springer, Singapore.
- Mishra, P. and Koehler, M. (2006), "Technological pedagogical content knowledge: a framework for teacher knowledge", *Teachers College Record*, Vol. 108 No. 6, pp. 1017-1054, doi: 10.1111/j.1467-9620.2006.00684.x.
- Mishra, P. and Mehta, R. (2017), "What we educators get wrong about 21st-century learning: results of a survey", *Journal of Digital Learning in Teacher Education*, Vol. 33 No. 1, pp. 6-19.
- Moore, C. (2016), "The future of work: what Google shows us about the present and future of online collaboration", *TechTrends: Linking Research and Practice to Improve Learning*, Vol. 60 No. 3, pp. 233-244.
- Myers, J. (2012), "Lesson study as a means for facilitating preservice teacher reflectivity", *International Journal for the Scholarship of Teaching and Learning*, Vol. 6 No. 1, Article 15, doi: 10.20429/ ijsotl.2012.060115.
- Opfer, V.D. and Pedder, D. (2011), "Conceptualizing teacher professional learning", *Review of Educational Research*, Vol. 81 No. 3, pp. 376-407.
- Oxnivad, S. (2018), 5 Simple Ways to Use Google Docs in the Classroom, Teach Thought We Grow Teachers, available at: https://www.teachthought.com/technology/5-simple-ways-to-use-google-docs-in-the-classroom/.
- Pamuk, S., Ergun, M., Cakir, R., Yilmaz, H.B. and Ayas, C. (2015), "Exploring relationships among TPACK components and development of the TPACK instrument", *Education and Information Technologies*, Vol. 20 No. 2, pp. 241-263, doi: 10.1007/s10639-013-9278-4.
- Perry, R. and Lewis, C. (2008), "What is successful adaptation of lesson study in the US?", Journal of Educational Change, Vol. 10 No. 4, pp. 365-391.
- Prestera, G.E. and Moller, L.A. (2001), "Exploiting opportunities for knowledge-building in asynchronous distance learning environments", *Quarterly Review of Distance Education*, Vol. 2 No. 2, pp. 93-104.
- Shrivastava, P. (1999), "Management classes as online learning communities", *Journal of Management Education*, Vol. 23 No. 3, pp. 691-702.
- Sims, L. and Walsh, D. (2009), "Lesson study with preservice teachers: lessons from lessons", *Teaching and Teacher Education*, Vol. 25 No. 5, pp. 724-733.

Soto, I	A., Gupta,	D., Dick, L	. and Appelg	ate, M. (2019)), "Bridging	distances	: professional	deve	lopment
	for higher	education	faculty throu	gh technolog	y facilitated	l lesson st	udy", <i>Journal</i>	of U_i	niversity
	Teaching	and Learni	ing Practice, V	Vol. 16 No. 3	, pp. 1-19.				

Stake, R.E. (1995), The Art of Case Study Research, Sage, Thousand Oaks, CA.

- Stokes, L.R.E., Suh, J.M. and Curby, T.W. (2019), Examining the Nature of Teacher Support during Different Iterations and Modalities of Lesson Study Implementation, Professional Development in Education and Techniques, 3rd ed., Sage, doi: 10.1080/19415257.2019.1634623.
- Strauss, A. and Corbin, J. (2008), Basics of Qualitative Research: Grounded Theory Procedures and Techniques, 3rd ed., Sage, Newbury Park, CA.
- Uchiyama, K.P. and Radin, J.L. (2009), "Curriculum mapping in higher education: a vehicle for collaboration", *Innovative Higher Education*, Vol. 33 No. 4, pp. 271-280.
- Voithofer, R. and Nelson, M.J. (2020), "Teacher educator technology integration preparation practices around TPACK in the United States", *Journal of Teacher Education*, Vol. 00 No. 0, pp. 1-15.
- Vrikki, M., Warwick, P., Vermunt, J.D., Mercer, N. and Van Halem, N. (2017), "Teacher learning in the context of lesson study: a video-based analysis of teacher discussions", *Teaching and Teacher Education*, Vol. 61, pp. 211-224.
- Wenger, E., McDermott, R.A. and Snyder, W. (2002), Cultivating Communities of Practice: A Guide to Managing Knowledge, Harvard Business Press, Boston, MA.

Yin, R.K. (2014), Case Study Tesearch, 5th ed., Sage, Thousand Oaks, CA.

Further reading

- Clark, C.M. (1988), "Asking the right questions about teacher preparation: contributions of research on teacher thinking", *Educational Researcher*, Vol. 17 No. 2, pp. 5-12.
- Cooper, S., Wilkerson, T., Eddy, C., Kamen, M., Marble, S., Junk, D. and Sawyer, C. (2011), "Lesson study among Mathematics educators: professional collaboration enabled through a virtual faculty learning community", *Learning Communities Journal*, Vol. 3, pp. 21-40.
- Henning, J.E. (2005), "Leading discussions: opening up the conversation", *College Teaching*, Vol. 53 No. 3, pp. 90-94, doi: 10.3200/CTCH.53.3.90-94.

About the authors

Dr. Joanna C. Weaver is an assistant professor in the School of Teaching and Learning at BGSU. She is the content coordinator of Adolescent to Young Adult Integrated Language Arts. The overarching framework of Dr. Joanna C. Weaver's scholarship is literacy across the curriculum and teaching continuum. The foundational nature of literacy allows it to be embedded across all content areas at every grade level. The teaching continuum includes those whom she serves: pre-service teachers, in-service teachers and the community; therefore, LS fits directly into her research framework and those whom she serves. Her goals are to improve instructional practice to strengthen student learning through reflection and collaboration. Joanna C. Weaver is the corresponding author and can be contacted at: weavej@bgsu.edu

Dr. Gabriel Matney is a professor in the School of Teaching and Learning at BGSU. He is the vice-president for Publications of the Research Council on Mathematics Learning and the AERA Lesson Study SIG Program Chair. Dr. Gabriel Matney's scholarship focuses on authenticity in learning, for students through making sense of ideas and developing practices that foster authentic learning and for professional educators seeking to foster pedagogies most apt for student's authentic learning. As an authentic avenue for professional development, LS was a natural fit for Dr. Gabriel Matney's line of inquiry.

Dr. Allison M. Goedde is a teaching professor of technology. She also serves as program coordinator and is the advisor for the classroom technology master's degree program. Her areas of research interest include lesson study online practices, engaging pre-service educators in active learning with technology and mentorship of action research initiatives for classroom technology master's degree students. Jeremy R. Nadler is a teaching professor of career tech workforce education. Jeremy's research interests include lesson study online practices, high-impact practices in career technical education programming, career technical education teacher preparation and methodology and career technical education policy.

Digital tools to

remote lesson

promote

study

Dr. Nancy Patterson is a professor of social studies education and is the content coordinator of Adolescent to Young Adult Social Studies. Her research focus includes social justice education, leveraging literacy across content areas, universal design for learning and online lesson study practices.

For instructions on how to order reprints of this article, please visit our website: www.emeraldgrouppublishing.com/licensing/reprints.htm Or contact us for further details: permissions@emeraldinsight.com