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A Field Experience without the Field: A Reflective Self-study of Teaching an Elementary Science Field Experience Online During a Pandemic

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Abstract

Teaching a field experience course during a pandemic resulted in unique challenges because preservice teachers could not visit classrooms like they would in a traditional field experience. This article is a self-study exploration of the tensions experienced by a doctoral student teaching an elementary math and science field experience in a fully online setting during the height of the COVID-19 pandemic. To substitute for a lack of available elementary school children, preservice teacher acted as substitutes for children during lesson rehearsals. Preservice teachers were usually poor substitutes for actual children when evaluating the extent to which the pandemic field experience mimicked traditional field experience. Instructional videos were frequently used in an attempt to provide meaningful opportunities for preservice teachers to engage in classroom practices. The perceived usefulness of instructional videos by preservice videos varied based on the type of video that was used.

Introduction

Field experiences are considered, within teacher education, to be vital parts of the teacher preparation experience as they afford beginning teachers the opportunities to learn about and practice the craft of teaching while still under the guidance of university faculty (Clift & Brady, 2005). The actual structure of field experiences may vary based on the goals and purpose of the teacher preparation program, though they usually include preservice teachers visiting classrooms of actual students and engaging with some form of instructional practice with the students. However, when the COVID-19 pandemic emerged, universities were forced to dramatically change their field experience structures. This study took place during Spring of 2021 at the height of the pandemic. At the time there were five sections of the combined elementary mathematics and science field experience, all taught entirely online. Spencer was the instructor of one section and this study focuses on his experience of trying to develop his preservice teachers' practical skills of teaching, while no longer having his preservice teachers able to work directly with children.

Prior to the pandemic, the combined mathematics and science field experience occurred one half day a week and after two weeks on campus learning about the different components of the field experience, the class then moved to taking place each week in a local school. Once in the schools, for the first four weeks, the preservice

teachers engaged in a series of classroom observations and interviews with children from their host classroom. The interviews are referred to as *formative assessment interviews* and are similar to the teaching experiments described by Steffe and Thompson (2000). The purpose of the formative assessment interviews is to gather information about students' thinking that would inform lesson planning. The preservice teachers did both the formative assessment interviews and lesson planning in teams of 4-6 people depending on the school placement and number of available host classrooms.

> Like clinical interviews, [formative assessment interviews] involve intensive interactions with a pair of children in order to investigate their ways of thinking about a particular topic. Beyond clinical interviews, we expect [preservice teachers] to use successive interviews to refine their models of students' thinking. On the other hand, the [formative assessment interviews] do not reach the level of recursion that Steffe and Thompson (2000) have ascribed to teaching experiments, but do provide the prolonged engagement with a pair of students that is common to teaching experiment methodology (Norton, McCloskey, & Hudson, 2011, p. 311).

For the remaining eight weeks of the semester, the teaching teams participated in an iterative cycle of designing lessons, teaching lessons, and reflecting on lessons using a Lesson Study model (Amador & Galindo, 2021). The first 4-weeks focused on teaching mathematics and the second half on teaching science. The teaching teams remained the same and worked with the same classroom for the entire semester. However, with the pandemic all of this had to change, leaving Spencer to wonder if the changes were still supporting the preservice teachers with thinking about and practicing how to teach mathematics and science to children–the intended purpose of the course.

Relevant Literature

The term "field experience" is frequently described in educational literature and is used in many ways. Here we use the term to refer to the time that preservice teachers spend in schools where they engage in observation and teaching experiences that may or may not include significant prior lesson planning. Teaching experiences may be scheduled and formal or spontaneous and informal. For the sake of this study, we do not consider student teaching and teaching internships to be part of a field experience. The concept of a field experience in teacher education is quite old and dates back to at least John Dewey (1938), who advocated for experiential teacher training. Dewey did not just argue that teacher training should include opportunities to experience teaching, but he believed that quality teaching experiences should be filled with opportunities to practice good teaching, which he described as experiences in which teachers engage students in learning.

Field experience courses have been designed in a wide variety of ways. Because of this, we felt the need to constrain our review of literature to field experiences for preservice teachers. As part of our self-imposed constraints, we focused our review on field experience courses that are designed with the intent to allow preservice teachers to practice the techniques discussed in methods courses. Field experiences are ubiquitous to teacher education programs and for good reason. They are linked to a variety of desired outcomes in teacher education including understanding of inquiry teaching, teacher self-efficacy, and teacher pedagogical content knowledge. For example, in a study of 40 elementary preservice teachers concurrently enrolled in a course on

science methods and in a field experience course, Varma et al. (2009) found that when embedding inquiry activities into their field experiences, preservice teachers developed a better understanding of inquiry teaching and placed greater value on inquiry teaching. When examining the personal agency beliefs (a composite measure of context beliefs and capability beliefs) in elementary preservice teachers participating in a field experience course, Bhattacharyya et al. (2009) found that when preservice teachers used the inquiry-based instruction methods discussed in their methods courses, those preservice teachers showed an increase in the science teaching capability beliefs of the preservice teacher.

Field experiences for preservice teachers have also been shown to contribute to the self-efficacy of preservice teachers. Flores (2015) studied 30 undergraduate elementary preservice teachers who were enrolled in a field experience course concurrent with a science methods course. Flores found that both the preservice teachers' general science teaching self-efficacy and personal science teaching self-efficacy increased during the field experience. Cannon and Scharmann (1996) studied elementary preservice teachers who were concurrently enrolled in both a science methods course and a field experience course. They found that preservice teachers who engaged in a field experience that emphasized cooperative learning in student groups experienced an increased sense of science teaching self-efficacy as compared to their peers who did not implement the cooperative learning methods discussed in their methods courses. When studying the ways that an elementary science preservice teacher engaged with action research during a field experience, Kinskey (2018) observed that the preservice teachers showed overall increases in science teaching self-efficacy.

Field experiences have also been shown to influence the pedagogical content knowledge of preservice teachers. Here we are viewing pedagogical content knowledge as described by Magnussen et al. (1999). That is to say that we are considering pedagogical content knowledge to be the combined knowledge bases of (1) knowledge of students' understanding of science, (2) knowledge of science curricula, (3) knowledge of assessment of scientific literacy, and (4) knowledge of instructional strategies. Field experiences that give preservice teachers an opportunity to practice the strategies learned in methods courses have been shown to have positive impacts on pedagogical content knowledge in a variety of ways. For example, Amador and Galindo (2021) examined a group of preservice elementary teachers enrolled in a revised field experience course that combined math and science curriculum. The revised nature of the field experience meant that preservice teachers used teaching experiments and lesson study to implement the ideas discussed in their methods courses. Amador and Galindo (2021) then examined the preservice teachers one year later during student teaching and found that the preservice teachers who had enrolled in the revised field experience showed a greater awareness of student thinking and understanding. Examining the same field experience structure as in Amador and Galindo's study, Carter et al. (2016) examined how the modified lesson study component in the field experience supported elementary preservice teachers' abilities to professionally notice (Mason, 2002). From their in-depth case study of six preservice teachers experience, Carter et al. (2016) concluded the participants' abilities to professionally notice did improve when placed in an authentic context where they are continuously analyzing student thinking from lessons they taught and used to inform practice. However, this leaves one to wonder, if a pandemic interrupts the opportunity to situate learning how to teach in authentic contexts (i.e., the classroom), are there other means to engage preservice teachers in the critical practices associated with professional noticing? The

notion of professional noticing is an importance practice for teachers to develop as part of their pedagogical content knowledge, as the two work hand-in-hand in teachers' everyday practice. For example, when a teacher is asking students questions they use their knowledge of how students learn a particular topic to make a decision about how to proceed in the conversation or with a new task to support the students further. Additionally, a teacher's understanding of topic-specific instructional strategies informs their decision of exactly what types of tasks might best suit students' thinking and advance their thinking to more accurate understandings of the concepts. Thus, developing the skills of professional noticing also helps to further develop teachers' pedagogical content knowledge for future use as they reflect on and assess how their responses are taken up by their students.

Kulgemeyer et al. (2020) examined physics preservice teachers who were engaged in a field experience and attempted to measure their explaining skills. Explaining skills were defined as "the communicative process of proposing explanations and adapting them according to the students' prerequisites and their comprehension" (p. 1560). The researchers argued that the development of pedagogical content knowledge is a prerequisite for developing strong explaining skills. Kulgemeyer et al. found that preservice teachers did develop stronger pedagogical content knowledge during the field experience but that pedagogical content knowledge only increased during field experience if the preservice teachers already possessed a high degree of pedagogical content knowledge. Heineke et al. (2019) conducted a case study of a single science preservice teacher in a teacher education program that included the preservice teachers spending 80% of his time in schools, cultural institutions, and communities. This preservice teacher often focused on language skills and development due to a high portion of emergent bilinguals in his classroom. They found that the preservice teacher was able to better integrate language skills into the existing science curriculum as he progressed through his field experience. This integration of language skills with curriculum necessitated a strong understanding of the curriculum itself, an important aspect of pedagogical content knowledge. In summary, field experiences have been shown to improve a variety of desirable factors in preservice teachers including an understanding of inquiry teaching philosophies, teacher self-efficacy, and aspects of pedagogical content knowledge.

Background: An Alternatively Structured Field Experience

By Spring 2021, the alternative design to the field experience that serves as the context for this study had already undergone one iteration of adapting course assignments to accommodate for the limitations of the pandemic. As previously mentioned, Spencer was an instructor of a section of the field experience during this semester, but he had also taught one section the prior semester (the first iteration of the pandemic structure). Fall 2020 was also Spencer's first semester of this doctoral program, so it was not until after experiencing a semester of the field experience and thinking about his teaching of it in the Spring that he began to question if the alternative design was providing the critical learning experience preservice teachers need.

The biggest difference between the field experience in Fall 2020 and previous semesters was that the field experience was moved to a fully online course starting in Fall 2020 due to the pandemic. This meant that preservice teachers did not visit classrooms as part of their field experience. Since the formative assessment

interviews (described earlier) could no longer be done with a child from the school district, the field experience instructors collectively decided to instruct the preservice teachers to interview each other while playing the role of a child in their respective grade level assignment. Spencer chose to encourage his preservice teachers to interview a child if possible (e.g., a younger cousin or sibling). While a few of Spencer's preservice teachers were able to arrange this, the majority of the preservice teachers in his class resorted to interviewing a peer (e.g., classmate or roommate) or another accessible adult (e.g., a parent). In other words, the formative assessment interviews, initially designed to bring to light how children think about mathematics and science ideas, were now informing preservice teachers mainly about the general public's ideas about science ideas. Additionally, the formative assessment interviews were usually conducted only once (not with multiple people) and recorded using a video conferencing software, although some preservice teachers who interviewed a roommate conducted the interview in person. One result of conducting most of the formative assessment interviews over video conferencing was that most preservice teachers struggled to identify manipulatives for both math and science that could be used to elicit student knowledge. In many cases, preservice teachers did not use manipulatives at all, which was another major divergence from pre-pandemic structure of the formative assessment interviews.

After the completion of the formative assessment interview, the preservice teachers met to analyze the results of their interviews in their grade-level groups. They identified several timestamps from their recordings to share with their groups that demonstrated the use of talk moves and teaching moves generally to share with their groups and then discussed the effectiveness of the ways that those moves were implemented. We use the definition of talk moves proposed by O'Conner and Michaels (2019), in which talk move are "roughly utterance-sized units of talk, intended (as a "move" in a game) to get the other player(s) to respond in some way, to bring something particular to the table" (p, 168). We consider "teaching moves" to be different from talk moves only in that they may be larger than single utterances and require a pedagogical decision by the teacher. Talk moves can occur between teacher and students, as well as between student and student; whereas a teaching move is determined by a teacher as they draw on their pedagogical content knowledge. These group reflections were integral in helping them to individually write reflection papers on the experience for their math and science methods courses. The reflection prompts in the group discussion provided a basis from which to organize their thoughts for these papers. After the formative assessment interview phase of the course was complete, the preservice teachers began to collaboratively plan lessons in their assigned grade level teams. This occurred for several weeks as the teams prepared both math and science lessons that they would then teach to another preservice teacher team in the final four weeks of the semester. Thus, the teaching component of the field experience was alternatively designed to mirror more of a peer teaching rehearsal experience (Lampert et al., 2013) than a real classroom teaching experience, as before.

For the teaching rehearsals, group members acted as students while one member taught. Two lessons took place each week, one in math and one in science. This meant that if all group members were present, a preservice teacher taught a lesson to three preservice teachers on their team who pretended to be elementary children. After a preservice teacher completed their lesson, they completed a short reflection on their teaching in the form of a video recording. In some configurations, a preservice teacher might have gone for several weeks without teaching a lesson rehearsal if their teaching schedule within the group aligned in a certain way. In summary, the

preservice teachers completed four main tasks in the alternatively designed field experience: (1) one math formative assessment interview and one science formative assessment interview that may or may not have actually informed them of a child's thinking about the math and science concepts identified for the lessons, (2) a group analysis of each of their formative assessment interviews, (3) the collaborative development of three math lessons and three science lessons, with one from each subject to be used for a lesson rehearsal, and (4) individually teaching one math and one science lesson to peers who were pretending to be elementary students. An overview of major course assignments and timeline is included in Table 1.

Table 1. Overview and Timeline of Major Assignments for the Field Experience Course

Week in Semester	Title of Assignment	Description
Week 3-4	Write formative assessment interview questions	The preservice teachers worked collaboratively in online breakout rooms to write questions for their upcoming math and science formative assessment interview.
Week 5	Conduct and record math formative assessment interview	The preservice teachers met during class to record math formative assessment interviews. Some preservice teachers who interviewed classmates recorded the math formative assessment interview at that time and others recorded it later due to scheduling needs with their interviewee.
Week 6	Analyze math formative assessment interview	The preservice teachers met in breakout rooms to analyze the use of selected talk moves used in their math formative assessment interviews.
Week 7	Conduct and record science formative assessment interview	The preservice teachers met during class to record science formative assessment interviews. Some preservice teachers who interviewed classmates recorded the science formative assessment interview at that time and others recorded it later due to scheduling needs with their interviewee.
Week 8	Analyze science formative assessment interview	The preservice teachers met in breakout rooms to analyze the use of selected talk moves used in their science formative assessment interviews.
Week 9-10	Write lesson plans	The preservice teachers met in class to write and refine lesson plans for their assigned math and science standards.
Week 11-14	Teaching lesson rehearsals	The preservice teachers taught their lesson rehearsals in breakout groups. Each group had four preservice teachers. Each class period included two lessons per group (one math and one science). Preservice teachers taught their rehearsals on a rotating schedule. If they were not teaching during a given week, they acted as pretend school children.

The changes in the field experience were significant from how it was designed pre-pandemic. The very limited interaction with actual children in order to understand their thinking of mathematics and science worried Spencer. However, Spencer's early concerns were relatively ambiguous and he was not always certain whether they originated from something that he had the power to change or if they were a result of the external pressures brought on by the realities of teacher education during a pandemic. Because of the personal nature of this problem of practice, self-study represented a valuable mode of investigation for Spencer to examine his concerns and the ways in which they were manifest in students' own perceptions. The primary goal of this self-study was to better understand the reasons for Spencer's concerns about the value of teaching a field experience course during a pandemic that does not allow preservice teachers to have experiences in the field. We also hoped to better understand a video-based intervention Spencer made in the course that he believed would add value for preservice teachers within the classroom experience limitations of the pandemic. Considering this purpose, the guiding research question for this study was:

> 1) How does Spencer grapple with what he values as important (e.g., classroom teaching experience) when the limitations of the pandemic result in no real teaching occurring, and so he is left to find alternative approximations to practice?
>
> 2) Considering Spencer's video intervention, as a form of approximation to practice, what does Spencer learn from his students with respect to what they felt the videos offered them in learning to become elementary teachers?

Methodology

While teaching the field experience class, Spencer became concerned that the modified assignments were not sufficiently supporting preservice teacher development. At times he also felt that his approach to the planning for the course was arbitrary and not helpful to the preservice teachers. These concerns represented a problem of practice in his teaching—a struggle that takes place in the practice and contexts of teaching. Self-study, as a qualitative-based methodology for research offers teacher educators a pathway to learn about one's own beliefs, actions, and the tensions that might exist in one's pedagogy for teaching.

Self-Study Research

As stated previously, Spencer taught the field experience class during the Spring 2021 semester as well as the Fall 2020 semester. This study focuses on the second semester (Spring 2021). Early in the Spring 2021 semester, Spencer felt a desire to better understand his reasons for feeling uneasy about the nature and structure of the field experience course during the pandemic. He did not feel that the course assignments as modified for the pandemic were supporting preservice teacher development as well as they could and he wanted to try to meet some of the preservice teachers' critical teaching experience needs through additional online field experience work. Spencer also wanted to become more analytical and intentional about the ways that he addressed these concerns. We selected self-study as a methodology to address these concerns because of the ways in which Spencer's concerns about the online field experience course structure intersect with his professional practice as a teacher educator (Berry & Hamilton, 2013).

LaBoskey (2004) identified five main characteristics of self-study. Self-study should (1) be self-initiated and self-focused, (2) be improvement-aimed, (3) be interactive, (4) make use of multiple (usually primary) qualitative methods, and (5) include exemplar-based validation. Spencer voluntarily elected to complete this self-study in an effort to improve his teaching and the preparation of the preservice teachers in his class. This self-study is also interactive in that Spencer collaborated with critical friends and co-authors, Meredith and Kraig, who helped him to collect and analyze several key sources of data. That data included journal data and student responses, which helped us to point to specific examples in Spencer's experience or his students' experiences that support our conclusions.

Research Design

Context of Study

One of the major adjustments Spencer made during the Spring 2021 semester was to change the use of instructional videos during the online field experience course sessions. The modified field experience course was designed to utilized a number of instructional videos beginning with the first week of the semester, but Spencer felt little control over when those videos should be shown or what content they should include. This perceived lack of control was largely a result of Spencer's relatively poor understanding of policies and procedures surrounding the department and field experience course from the perspective of a new graduate student. However, Spencer had two previous experiences with educational technology that were particularly impactful in the way that he viewed instructional video and led him to seek opportunities to be more impactful in his use of instructional video.

The first experience upon which Spencer reflected was when he first learned about how some videos are fundamentally better for learning than others as an undergraduate, Spencer became interested in the research by Derek Muller (2008), who identified differences in physics students' achievement after viewing instructional videos that were expository or dialogue centric. Muller found that physics students who viewed dialogue centric instructional videos performed significantly better on posttests than their peers who viewed the expository videos. Somewhat paradoxically, the students who viewed the expository videos tended to describe the videos as "clear," "concise," and "easy to understand" (p. 199) but the students who viewed the dialogue centric videos (and scored higher on the posttest) frequently described the dialogue centric videos as "confusing" and "hard to understand" (p. 199). Reflecting on his earlier readings of Muller's (2008) research led Spencer to think about ways that instructional videos might better support preservice teachers as they engaged in a virtual field experience.

The second experience upon which Spencer reflected was learning about technology integration models during his Master's degree in Instructional Psychology and Technology. While several technology integration models exist to describe how technology can be effectively integrated into instruction, the one to which Spencer most closely gravitated is called PICRAT (Kimmons et al., 2020). According to the PICRAT framework, a student engages with technology in the classroom in a way that is passive, interactive, or creative. These categories form the "PIC" part of the framework title. Examples might include passively watching an internet video in class,

interacting with a web simulation, or using video cameras to produce video reviews of a piece of literature. Similarly, PICRAT describes the ways that a teacher interacts with technology in the classroom as replacing, amplifying, or transforming the status quo. These categories form the "RAT" part of the framework title. Examples might include a video recorded lecture, which simply replaces the teacher; a web-based simulation that allows students to conduct otherwise unsafe science experiments (amplifying); or a video conference with subject matter experts, something that would otherwise be impossible without the technology (transforming). Taken together, the "PIC" and the "RAT" form the PICRAT framework to describe the way that instructional technologies interact with teachers and students. Importantly, the ways in which individual technologies are categorized are almost always open to some degree of interpretation.

Spencer views the most impactful technology uses as those in the intersection of "Creative" and "Transforming" categories and the least impactful intersection to be that of "Passive" and "Replacing." He frequently felt that the videos he used fell into this latter intersection, but struggled to think of how to improve their use in a meaningful way. The videos Spencer used in Spring 2021 varied in their theme and use. In the first weeks of the semester, he showed videos that were prescribed in the course design and were the same videos shown by the other field experience instructors. These videos were mainly used to illustrate the concepts discussed in class on that day or to help students prepare to conduct their formative assessment interview (action-oriented). However, based on some his journaling and conversations with his co-authors (critical friends) approximately mid-semester he decided that other types of videos should be included. For example, Spencer noticed that his preservice teachers were less engaged with the start of class time prior to breaking out into groups to work on assignments, so he decided to start including videos about educational theory to provide opportunities for more meaningful discussion at the start of class. Later, after discussing the use of these videos with critical friends, Spencer began to use videos that gave the preservice teachers opportunities to practice aspects of teaching while in a virtual field experience class. However, these usage categories were not clearly identified by Spencer until late in the semester.

Near the end of the semester, Spencer reviewed all of the videos to sort them into categories based on how they were used. These usage categories were (a) educational theory; (b) concept illustration; and (c) videos that were action-oriented or involving teaching analysis. The educational theory videos focused on basic ideas of learning science such as *This will revolutionize education* (Muller, 2014), which overviews a brief history of educational innovations and the ways in which they did and did not change education. The concept illustration videos were meant to help illustrate the concept or task that was under discussion for that class. One example of a concept illustration video is *No more snow days? School leaders believe tools learned during the pandemic could help come winter* (Crash, 2020), which was used to illustrate the ways in which the field experience instructors still viewed an online field experience as valuable despite its unusual structure. The videos that were focused on teacher action or teaching analysis were meant to support some instructional activity or allow preservice teachers to analyze the teaching shown in the videos. For example, *Sawyer's shapes* (Ginsburg & Rau, n.d.) showed an example of the type of formative assessment interview discussed in class. The preservice teachers identified the elements of a formative assessment interview from the video in preparation to conduct their own

formative assessment interview. An overview of the videos that were shown, when they were shown, the instructional goals of each video, and the video usage category is shown in Table 2.

Table 2. Titles, Goals, and Categories for Videos Shown in the Field Experience Course

Video Title	Week in Semester	Instructional Goal for Video	Usage Category
No more snow days? School leaders believe tools learned during the pandemic could help come winter (Crash, 2020)	1	Provide context for the meaning and value of a field experience that takes place in an entirely online setting. Help the preservice teachers understand that, in the future, they may be asked to teach online instead of having snow days.	Concept Illustration
Take a tour of a unit (Grade 2, Unit 5) (Center for Curriculum and Professional Development, 2017)	1	Introduce preservice teachers to the parts of a math unit and identify those same parts of their assigned math unit.	Concept Illustration
Ambitious science teaching, developing model-based explanations: A sound unit example (Windschitl, 2013)	1	Introduced preservice teachers to the parts of a science unit while they analyzed the video to identify those parts of the unit in the video.	Concept Illustration
Sawyer's shapes (Ginsburg & Rau, n.d.)	2	Provide preservice teachers with an example of math formative assessment interview concepts and analyze the things learned through the formative assessment interview.	Action-Oriented
Alec's interview (Norton, 2010)	3	Provide preservice teachers with an example of science formative assessment interview concepts and analyze the things learned through the formative assessment interview.	Action-Oriented
Wringing out Water on the ISS – For Science! (Canadian Space Agency, 2013)	3	Introduce preservice teachers to the difference between a guess and a prediction in preparation for writing science formative assessment interviews.	Concept Illustration
Misconceptions about temperature (Muller, 2012).	3	Introduce preservice teachers to the difference between a guess and a prediction in preparation for writing science formative assessment interviews.	Concept Illustration
The science of thinking (Muller, 2017)	7	Spencer expected class time to be very short and generated a list of videos that could be used to illicit student discussion about teaching and learning. This video was arbitrarily selected from that list.	Educational Theory
Innovations in education:	8	Whole group class time would be very short and	Educational

Adam Johnston at TEDxWeberStateUniversity (Johnston, 2014).		Spencer wanted a whole-group activity to open class. He generated a list of videos that could be used to illicit student discussion about teaching and learning. This video was arbitrarily selected from that list.	Theory
This will revolutionize education (Muller, 2014)	9	Spencer expected class time to be very short and generated a list of videos that could be used to illicit student discussion about teaching and learning. This video was arbitrarily selected from that list.	Educational Theory
Building scientific ideas (Windschitl, 2020)	10	Spencer expected class time to be very short and generated a list of videos that could be used to illicit student discussion about teaching and learning. This video was selected from that list.	Action-Oriented
Teaching math: Wheel problem (Roche & Barzyk, 1995)	11	Whole group class time would be very short and Spencer wanted a whole-group activity to open class. He generated a list of videos that could be used to illicit student discussion about teaching and learning. This video was selected from that list.	Action-Oriented
Your brain on storytelling (Ramirez, 2020)	12	Whole group class time would be very short and Spencer wanted a whole-group activity to open class. This video was selected to connote the value of using narratives to teach science concepts and illicit a class discussion on the topic.	Concept Illustration
Sesame Street: Water conservation (Sesame Street, 2010)	12	Whole group class time would be very short and Spencer wanted a whole-group activity to open class. This video was selected to connote the value of using narratives to teach science concepts and illicit a class discussion on the topic.	Concept Illustration
Gallery walk to critique models and explanations (Windschitl, 2015)	13	Students would replicate the building a model and conducting a gallery walk to critique the video as shown in the video. This was completed using an online tool that simulated potential and kinetic energy a skateboarder in a half-pipe.	Action-Oriented
The myth of average: Todd Rose at TEDxSonoma County (Rose, 2013)	14	Whole group class time would be very short and Spencer wanted a whole-group activity to open class. He generated a list of videos that could be used to illicit student discussion about teaching and learning. This video was arbitrarily selected from that list.	Educational Theory

Participants

The field experience course described in this study took place at a large Midwestern university. Although Spencer taught the course both semesters, this study focuses on his teaching the second semester because the specific tensions that we examined were still forming and becoming apparent as the school year progressed. Prior to starting his doctoral program, Spencer had experience teaching high school science and preparing secondary science teachers, but little experience with elementary science teacher preparation. During this second semester of teaching in the elementary teacher preparation program, Spencer taught both an elementary science methods course and the associated field experience section (n=18 preservice teachers). Meaning, he taught the same 18 preservice teachers for two courses in this one semester. The field experience was held synchronously online, just as it was the semester prior, and the science methods class was taught hybrid, with half the class meeting in-person for one 75-minute period the week, while the other half worked on a task asynchronously online. For the second 75-minute period in the week the two groups of students (or halves of the class) switched their learning context.

Spencer spent substantial time talking to Meredith (Author 2), who was the administrator of previous iterations of the field experience course but at the time of this study was not in this role. Meredith is an experienced elementary level teacher and teacher educator. Throughout the course of this study, Meredith served as a source of expertise in self-study methodology and in helping to view the self-study through the lens of a researcher. Meredith helped Spencer to maintain rigor and intentionality throughout this self-study. Spencer also spent significant time over the course of the year meeting with Kraig (Author 3), who was also a first-year doctoral student and teaching a section of the field experience course and a section of the elementary science methods course. Both of Kraig's classes were taught fully online with the methods course taught in an asynchronous format. Kraig was a former high school teacher and spent time working in industry as a lab scientist. As Kraig served the role of critical friend, many of his thoughts and ideas were filtered through his concurrent experience of teaching these two courses in an online setting

Data Sources and Analysis

The first data source was a *reflective teaching journal* written by Spencer and formed the bulk of the data collected. These journal entries played a pivotal role in helping to understand the tensions Spencer was experiencing while teaching the field experience. The second source of data was *reflections on video usefulness* completed by his preservice teachers where they reflected on the value of different videos used over the course of the second semester. This data source was built into part of the course as a means of formative assessment for Spencer to understand the effectiveness of the videos he was choosing to compliment the course, and perhaps fill in some of the gaps he felt existed in the alternative design of the course. The information gathered from this reflection helped him to make decisions about the use of possible future videos.

There was a total of 15 second-semester reflective teaching journal entries. Most were written immediately after teaching the field experience class. They focused mostly on the instructional activities of the class session, the

ways in which Spencer felt these activities achieved his teaching goals, and how he felt the activities were received by students. Journal writing was a collaborative effort between Spencer and his critical friend (Kraig). After writing several entries, Spencer would share the journal with Kraig and they would discuss entries and the themes that Kraig identified. Kraig would often ask why Spencer made the pedagogical decisions that he did and how those strategies did or did not achieve Spencer's goals. These journal discussions often helped tease out new pedagogical approaches for Spencer's field experience class when the discussion revealed a discrepancy between Spencer's instructional intention and the actual outcomes.

With respect to the videos, Spencer showed at least one video during most sessions of the field experience course. The intended purpose of these videos shifted throughout the semester as will be discussed later in the findings of this study. Spencer showed videos in the class because he thought they would be helpful, but we were interested to know how useful the preservice teachers thought the videos were to them as future teachers. Meredith recommended that to gain insight into student perceptions about the videos, students be given a brief reflection assignment in which they were presented with screenshots of the video and links to watch the video if needed to better remember them. The preservice teachers responded to an anonymous five-point Likert scale question (very useful, somewhat useful, not especially useful, not at all useful, I did not see or do not remember this video) about their perceived usefulness of each video from the perspective of a future teacher, and these served as the second data source for the study. After all the videos had all been shown, Spencer reviewed all of the videos to sort them into categories based on how they were used (educational theory, concept illustration and videos that were action-oriented or involving teaching analysis) as described earlier.

Findings

As previously stated, the primary goal of this self-study was to better understand the reasons for Spencer's concerns about the value of teaching a field experience course during a pandemic that does not allow preservice teachers to have experiences in the field. We aimed to better understand the intervention of incorporating video that Spencer made in the course to add value for preservice teachers within the context and limitations of pandemic teaching and to better inform readers who may be in similar teaching situations. With respect to this goal, we identified tensions relative to Spencer's perceptions about control over the realities of pandemic teaching. We also identified patterns in the ways that Spencer's students saw value in the inclusion of the video as a means of informing or approximating some aspect of teaching.

Realities of Control

It was a simple fact that the field experience course was not permitted into schools to teach actual children. The reality of this led to periodic frustration for Spencer and his students. One preservice teacher noted, "It's super hard to do this without real fourth-graders" (Reflective Journal, 2 March 2021). It was clear to us that the many issues associated with the pandemic had created frustrations for both Spencer and his students. Some of this problem was a result of institutional issues external to Spencer's control, such as the inability to visit schools. However, other elements that contributed to his reasons for concern were more within his control than he

initially thought. It was not until the end of the semester was nearing that Spencer started to realize he had more control over how well the preservice teachers were able to authentically act like children than he had previously thought.

> I was thinking just now about the ways that our actors for [another research project] act like children. A few weeks ago, we discussed this in our research meeting [for the other project. We reflected on] how well the [actors in the other project] were acting like children [when they received intentional training on how to act/respond like 5th grade students]. For [this other project], we had recruited students from the theater department to act as children in our online teaching simulator and many of them had some pretty convincing voices….The more we talked about their performance, the more we reached a collective conclusion that their voices sounded like children, but the things that they said did not….I left the meeting wondering if the actors from the theater department would really be able to extemporaneously approximate a convincing nine-year-old when being asked complex questions by a teacher.
>
> But it's not as if we didn't try to train them to act like children. In fact, we spent around 8-10 hours of training time with the actors trying to help them act like authentic nine-year-olds. Similarly, I have been concerned all year about how poorly my students in [the field experience course] represent elementary children. I realized as I was thinking about the training that went into the [other research project] actors' skills that I didn't do any training with my [field experience] preservice teachers that was remotely approaching that kind of intensity…. I often found myself saying something like, 'Do your best to act like an elementary student,' but I didn't always do a great job of helping them understand what that means. So, I guess a big lesson here is that I had more ability to influence the acting skills of my preservice teachers than I gave myself credit for during the past year. (Reflective Journal, 23 April 2021).

This notion that Spencer was in more control than he initially thought is echoed in the words of Kraig from one of their joint community of practice meetings, "We're missing out on the practice piece, but that doesn't mean that we can't create things that they will benefit to take with them into their jobs" (Community of Practice Meeting, 11 March 2021). This statement of optimism from Kraig represented one of the turning points for Spencer as he began to adjust the field experience course based on student needs and opportunities for learning.

Changes Made While Teaching

Among the things Spencer learned from journaling and talking to Kraig was that students were often choosing not to do classwork during class time dedicated for video recording assignments. The class was organized so that Spencer typically met with his whole group of students online for a few minutes to review some announcements and tasks for the day. Then they were dismissed to breakout rooms or could even schedule a time to video conference to work on course assignments at a later date, such as creating video recordings of their formative assessment interviews, writing lesson plans, or recording lesson rehearsals. However, Spencer quickly found that although time was provided to his students during class time to complete these assignments, they often did not stay on task to complete them and then rushed to complete them on another day just before the due

date. Therefore, he wondered how class time could be better used or be perceived as more valuable for his preservice teachers. It was from this wondering that Spencer started showing videos at the beginning of the field experience class sessions as an opening activity for class – with the intention of extending the time together online and the discussion around practice.

These videos that were shown early in the semester focused more on educational theory. While discussing the use of these videos with Kraig and Meredith, the idea came up that the use of videos might be used to better approximate the practices of teaching in the field experience course. Kraig emphasized using the best videos to make incremental changes to improve the course. Meredith suggested several sources of videos that could be used to analyze teaching practices. Since the discussion that led to the use of video as opportunities to better approximate a traditional field experience did not come until late in the semester, there were only a few instances of this type of video use. One example is when Spencer showed a video from the Ambitious Science Teaching series (Windschitl, 2015) about gallery walks as a model of critiquing student explanations. While showing the video, Spencer paused the video at predetermined times, engaged the class in a discussion about the video content, and modeled the process of setting up and executing a gallery walk with the students as they built digital whiteboard models of a skateboarder in a half-pipe. The preservice teachers moved from virtual whiteboard to virtual whiteboard, provided feedback on explanations and models, and then revised models based on feedback. Spencer designed this activity for the field experience class in this way because he felt it was representative of something the preservice teachers might actually do during their teaching careers and because an effort to approximate the actual practice of teaching as closely as possible led him to do so.

Perceived Usefulness of Video Intervention

As a teacher educator, Spencer valued receiving feedback from his students, and as such elicited feedback from them about their ideas as to the value of the videos that were shown over the course of the semester. He analyzed the reflection assignment about the videos by assigning a numerical value to the responses (very useful=4, somewhat useful=3, not especially useful=2, not at all useful=1, I did not see or do not remember this video=0) and calculating mean responses for each video and for all videos within each of the three categories (concept illustration, theory, and action-oriented). An overview of the preservice teachers' responses to the usefulness of videos is shown in Table 3. One finding he identified when analyzing the preservice teachers' reflections was that the videos that were marked as "Not at all helpful" were videos that merely illustrated concepts they were discussing in class on the day the video was shown.

The second interesting finding associated with the preservice teachers' perception of the usefulness of the videos was the educational theory videos were perceived as no more helpful than the concept illustration videos. The action-oriented videos were identified as the most helpful by the preservice teachers. However, the mean difference between the action-oriented videos and the other video types was small. One possible explanation is that on the four-point scale, all of the videos scored a mean value of 3.0 or higher. This concentration of scores between two integers on the scale makes resolving meaningful differences between video types difficult with such a small sample size. It is possible that a larger sample of student responses would show significant

differences between video types through rigorous statistical methods. It is also possible that the data are a result of statistical noise and are the student perceptions of the usefulness of video types are not significantly different from each other.

Table 3. Usefulness Ratings by Preservice Teachers for each Video Shown

Video Type and Video Names	Mean Rating by Preservice Teachers
Type: Concept Illustration	Mean of Video Type = 3.23
Ambitious science teaching, developing model-based explanations (Windschitl, 2015)	3.53
Wringing out water on the ISS (Canadian Space Agency, 2013)	3.31
Your brain on storytelling (Ramirez, 2020)	3.19
Take a tour of a unit (Center for Curriculum and Professional Development, 2017)	3.14
Sesame Street (Sesame Street, 2010)	3.13
No more snow days? (Crash, 2020)	3.07
Type: Theory	Mean of Video Type = 3.26
The myth of average (Rose, 2013)	3.56
This will revolutionize education (Muller, 2014)	3.27
The science of thinking (Muller, 2017)	3.14
Innovations in education (Johnston, 2014)	3.07
Type: Action-Oriented	Mean of Video Type = 3.58
Sawyer's Shapes (Ginsburg & Rau, n.d.)	3.81
Alec's Interview (Norton, 2010)	3.56
Gallery walks to critique models and explanations (Windschitl, 2015)	3.56
Teaching math: Wheel problem (Roche & Barzyk, 1995)	3.53
Building scientific ideas (Windschitl, 2020)	3.43

However, while this differences in student responses were small, we still find the difference to be interesting because it may show that the use of a particular type of instructional video in an online field experience course may be advantageous—a finding that would corroborate the work of Muller (2008). One of the action-oriented videos, the video previously mentioned about gallery walks (Windschitl, 2015), was of particular interest because it represented a pedagogical shift on the part of Spencer as an instructor when he began to use videos as a way to approximate teaching practices in a more deliberate way by replicating the instructional strategies demonstrated in the video rather than using the video to merely elicit discussion. The gallery walks video was also one of the highest rated videos from the semester (3.56). In Spencer's journal entry immediately after this class session, he described how he designed a learning activity to replace an activity that was originally planned.

> "Since we couldn't do "Sheep in a Jeep," I watched a video on gallery walks from Ambitious Science Teaching. It started out a little rocky but eventually got to be really good. We watched the video in

> segments and then modeled what was happening in the video buy building models of a skateboarder in a half pipe. As we went on, we actually used the Energy Skate Park PhET sim [to test our models]. Today is one of the few days of online teaching that I feel like I did a good job when considering the lesson and my master's degree [in instructional technology] (Reflective Journal, 13 April, 2021).

In summary, the ways that Spencer used videos as part of his field experience class changed as the semester progressed so that they better supported learning as an approximation of a traditional field experience. The videos that afforded the preservice teachers' opportunities to think about and practice the things that teachers actually do appear to have been better received by preservice teachers as more useful towards their preparation for teaching than videos that merely illustrated discussion concepts and educational philosophy. While this difference in student perception is small, we are still interested in the potential implications those differences might have for Spencer's practice in teacher education and online teacher education generally.

Conclusion

The primary goal of this self-study was to better understand the reasons for Spencer's concerns about the value of teaching a field experience course during a pandemic that does not afford preservice teachers to have authentic learning experiences in the classroom. Additionally, we aimed to better understand the interventions Spencer made in the course to try to add value for his preservice teachers given the limitations of the pandemic. Our analysis of Spencer's journal in combination with the students' responses to the video reflection assignment of their perceived value of the videos supports these goals. The journal reflections show that Spencer became more content with the way class time was spent and as in-class actives better helped the preservice teachers to engage in teaching practices such as participating in virtual gallery walks. The preservice teacher video reflection assignments show that the preservice teachers perceived the action-oriented videos (shown mostly later in the semester) as the most valuable.

From our results, we also identified two insights into Spencer's concerns about teaching a field experience course during a pandemic that we believe have implications for other teacher educators facing similar 'authenticity' issues. The first insight is that the complexity of teaching in a field experience was usually not well-preserved with the adjustments made to the course due to the COVID-19 pandemic. When preservice teachers pretended to be elementary-aged children, they did a poor job of reproducing the actions and thoughts of a child. Early in this study, the problem of authentic behavior by college-aged students attempting to act like elementary-aged children seemed like it was a problem completely out of the control of the people teaching the field experience course. However, after deeper reflection and because of his involvement in a research project on elementary teacher preparation in online contexts approximating classroom practice, Spencer realized he had more control over the quality of acting in his field experience course—or at least more than zero control. If teacher educators are faced with needing their preservice teachers to act like children by giving extemporaneously authentic responses during teaching scenarios, their preservice teachers may benefit from focused and deliberate training on how to act like children, common misunderstandings children may have or patterns in their thinking, and how children may describe or show their thinking. These are things that adults

may have experienced as a child, but few if any may remember accurately how to exhibit those characteristics. This also helps the preservice teachers to build connections between what they are teaching (the content) and how they are teaching it (the pedagogy), as they need to consider how students might be holding certain ideas about the science content and develop productive questions that can help to draw out these ideas in discussion.

The second big insight that we gained from this study is about the ways that video was used to approximate traditional field experiences and the ways that the preservice teachers perceive the usefulness of their time watching those videos. The videos that the preservice teachers found the most valuable were not the most entertaining or those with the greatest production value. Instead, the preservice teachers placed the greatest value on videos that showed teachers engaging in the acts of teaching math and science, as well as videos that were associated with the practicing of specific teaching skills. It is not lost on us that the videos that the preservice teachers thought would be most useful to them as future teachers were the ones that allowed them to begin to engage in the practices that comprised the original structure of the course. For example, Sawyer's Shapes (Ginsburg & Rau, n.d.) and Alec's Interview (Norton, 2010) both showed a teacher in the act of teaching and gave the preservice teachers an opportunity to observe authentic teaching and to practice the skills modeled in the video. Like all teaching practices, the use of video exists on a continuum of approximation. Some videos represent relatively authentic replacements for observations in a field experience course and others are poor replacements. The study shows some extent of the value of considering the degree of approximation in videos that are used for online field experience courses.

The significance of this study is the contribution it makes to understanding tensions and challenges faced by teacher educators who are faced with the complex task of teaching a science field experience course in a fully online setting, and thus removed from the authenticity of classroom practice. While this study took place in the context of the COVID-19 pandemic, other teacher educators may face a similar context when teaching field experience courses as some institutions may shift whole programs, or continue to offer some courses, in an online format. This study also illustrates the power of self-study for reflection on how to address complex problems of practice for teacher educators. In Spencer's case, this was illustrated by the way that his understanding of his own tensions with the field experience course needed to be uncovered and understood before we were able to make meaningful attempts at addressing those tensions. We hope this self-study encourages other teacher educators to not only consider engaging in self-study research when thrown into unexpected circumstances (like a pandemic), but also for continued renewal and improvement of their own practice. Self-study helped Spencer to make a continual and cognizant effort at improving his own online teaching even though it would have been easy to make pedagogical choices based on ease of teaching alone in order to simply get through the semester. It is important to question the pedagogical decisions we make as educators of teachers, not only when our teaching is challenged during a pandemic, but as models of reflective practice for our students.

For teacher educators that are currently teaching or anticipate teaching a field experience course in an online setting, we recommend a cognizant approach to the use of instructional videos. Some types of instructional videos better situate students to engage in the practices of teaching and may be perceived differently from

videos that do not afford this type of engagement. We also recommend that instructors without a meaningful background in instructional technology seek out a working knowledge of technology integration principles and frameworks. Two starting points may be the technology integration frameworks, PICRAT (Kimmons, 2012; Kimmons et al., 2020) or SAMR (Puentedura, 2014). The creators of both of these frameworks have produced a substantial amount of writing and commentary that is intended to be understandable for audiences without an expertise in educational technology.

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