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Video-based teaching playgrounds: Designing online learning opportunities to foster professional noticing of teaching practices

Authors

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Abstract

In this article, we share design guidelines for the development and use of online, video-based *teaching playgrounds*, which provide opportunities for prospective teachers to engage in professional noticing of teaching practices. Through teaching playgrounds, we provide an instantiation of the Presence+Experience framework, which combines the Community of Inquiry model with Kolb's experiential learning cycle. Teaching playgrounds offer a viable mechanism for instructors and designers to incorporate *high touch* learning experiences into *high tech* online teacher preparation courses. Using quantitative methods, we demonstrate the efficacy of online content methods courses incorporating teaching playgrounds. We address implications for the incorporation of online content methods courses in mathematics and science teacher education programs.

Keywords

Mathematics Teacher Education; Online Learning; Science Teacher Education; Teacher Preparation; Teacher Noticing

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Introduction

Online education offers new possibilities for communication and interaction, and interfacing with these new possibilities can present challenges and opportunities for teacher education programs (Borba & Llinares, 2012; Borba, Askar, Engelbrecht, Gadanidis, Llinares, & Aguilar, 2016; Keengwe & Kang, 2012). Although researchers have more thoroughly investigated the use of online learning in higher education, in teacher education programs such study is still just emerging (e.g., Keengwe & Kang, 2012; Means, Toyama, Murphy, Bakia, & Jones, 2009). In fact, it was not until the early 2000s that online mathematics and science teacher education began to surface as a research area (e.g., Borba & Llinares, 2012; González-Espada, 2009; Sánchez, 2011). There remains a need for designers and researchers to investigate the use of innovative online learning environments to prepare future teachers (Goos & Geiger, 2012). We provide design guidelines for the development and use of teaching playgrounds—multidimensional, video-based, online learning experiences for professional preparation. Using quantitative methods, we demonstrate the efficacy of the use of an online delivery format in our content methods courses in which we incorporated teaching playgrounds.

Researchers have made distinctions between *high tech* courses which are typically fully online, and *high touch* courses involving extensive human interaction (e.g., Council of Independent Colleges, 2016). Typically, prospective teachers develop knowledge, pedagogy, and strategies for teaching in high touch, content methods courses. Designers and instructors can view high touch, teacher education courses as challenging or even undesirable to deliver through high tech, fully online methods (Sobel, Sands, & Dunlap, 2009). Researchers have proposed that blended learning environments, which involve both online and face to face components, may be

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more suitable for teacher education courses than fully online environments (e.g., Collopy & Arnold, 2009; Keengwe & Kang, 2012). We argue that high tech courses can be viable environments to deliver high touch, teacher education courses. Rather than viewing online learning as being best suited for courses or programs fitting a particular type, we suggest a paradigm shift, involving a reconception of the nature of learning experiences within courses and programs.

Instructional designers can create online courses that are both high tech and high touch (see also Shnaikat & Ahmed, 2015). We offer teaching playgrounds as an example of a design component that teacher educators can use to leverage high tech learning environments for high touch courses. Specifically, we address the viability of teaching playgrounds for use in online content methods courses for prospective mathematics and science teachers (pMSTs). We designed teaching playgrounds to foster pMSTs' professional teacher noticing (van Es & Sherin, 2002), including video as a central component. Although we focus our use of teaching playgrounds for pMSTs, the innovative use of technology to promote teachers' learning extends to the broader field of teacher education (e.g., Borko, Whitcomb, & Liston, 2008).

To develop teaching playgrounds, we drew on the the Presence+Experience (P+E) framework (Dunlap, Verma, & Johnson, 2016), which combines the Community of Inquiry (CoI) Model (Garrison, Anderson, & Archer, 2000; Garrison & Arbaugh, 2007) with Kolb's experiential learning cycle (Kolb, 1984; Kolb, Boyatzis, & Mainemelis, 2000). We used the P+E to guide our design of these high touch, high tech online learning experiences. To address the viability of our approach, we provide quantitative data analysis to demonstrate the efficacy of

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online mathematics and science teaching methods courses incorporating teaching playgrounds for students' attainment of course outcomes.

Fostering teacher professional noticing in online learning environments

Teacher professional noticing, a well established construct in teacher education, refers to the interpretation of a teaching situation for a particular purpose (Sherin, 2002; Sherin & Han, 2004; Sherin, Jacobs, & Philip, 2011; van Es & Sherin, 2002). Researchers investigating prospective and practicing secondary mathematics and science teachers' noticing have applied different lenses to study professional noticing. These lenses include noticing students' mathematical thinking (e.g., Fernández, Llinares, & Valls, 2012), noticing teaching practice (e.g., Sherin & Han, 2004; van Es & Sherin, 2002), and examining differences in teachers' noticing of their own teaching versus their noticing of another's teaching (e.g., Blomberg, Stürmer, & Seidel, 2011; Seidel, Stürmer, Blomberg, Kobarg, & Schwindt, 2011). Furthermore, researchers have identified interpretive components to teachers' professional noticing of teaching practice (e.g., Sherin & Han, 2004), in which teachers move beyond describing what they notice to interpreting what they notice. Yet, interpretive analysis remains an area of difficulty related to teachers' noticing (e.g., Barnhart & van Es, 2015).

Despite the corpus of research focused on teacher noticing, the use of online environments to promote teacher noticing remains an area ripe for further study (Fernández et al., 2012). Researchers have investigated how prospective primary (Llinares & Valls, 2010) and secondary (Fernández et al., 2012) mathematics teachers engage in professional noticing when interacting with online learning components as part of a blended learning environment. Results

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from the studies of Fernández et al. (2012) and Llinares & Valls (2010) demonstrate the promise of online learning experiences for engendering prospective teachers' professional noticing.

Educators have made extensive use of video in teacher education programs (e.g., Arya, Christ, & Chiu, 2016; Santagata, & Guarino, 2011). Teacher educators have used video to provide opportunities for teachers to engage in professional noticing (e.g., Star & Strickland, 2008). Video use spans both face to face environments, in which teachers viewed videos together in real time (e.g., Van Es & Sherin, 2008) and online environments, in which teachers viewed videos asynchronously (e.g., Llinares, & Valls, 2010). High tech courses offer opportunities for teacher educators to leverage innovative video technologies to promote teachers' noticing (e.g., Borko et al., 2008; Rich & Hannafin, 2008). Yet, researchers engaging in empirical studies frequently report few details to shed light on design guidelines underlying the video use (Blomberg, Renkl, Sherin, Borko, & Seidel, 2013).

Arguing for the utility of video use for focusing prospective teachers on teaching practice, Blomberg et al. (2013) offered five research based heuristics. We view the first and second heuristics—identifying learning goals and selecting appropriate learning activities to align with those goals—as being applicable not only for the use of video, but also for a range of other activities relevant to teacher education. The third, fourth, and fifth heuristics involve selecting particular video to embed within activities to meet the learning goals, weighing the affordances and constraints of the video selections, and implementing assessment methods that align with the video use. Throughout their exposition, Blomberg et al. (2013) remain tacit about the environment in which prospective teachers would interact with video. We argue that these heuristics can apply to the use of video in online, as well as face to face learning environments.

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Theoretical background: Using the Presence+Experience (P+E) framework to design Teaching Playgrounds

Combining the Community of Inquiry (CoI) model (Garrison et al., 2000; Garrison & Arbaugh, 2007) with Kolb's experiential learning cycle (Kolb, 1984; Kolb, Boyatzis, & Mainemelis, 2000), Dunlap, Verma, and Johnson (2016) created the P+E framework. We drew on the P+E framework to guide our design of teaching playgrounds—multidimensional, video-based, online learning experiences for professional preparation. Figure 1 shows how the P+E framework integrates Kolb's cycle and the CoI model.

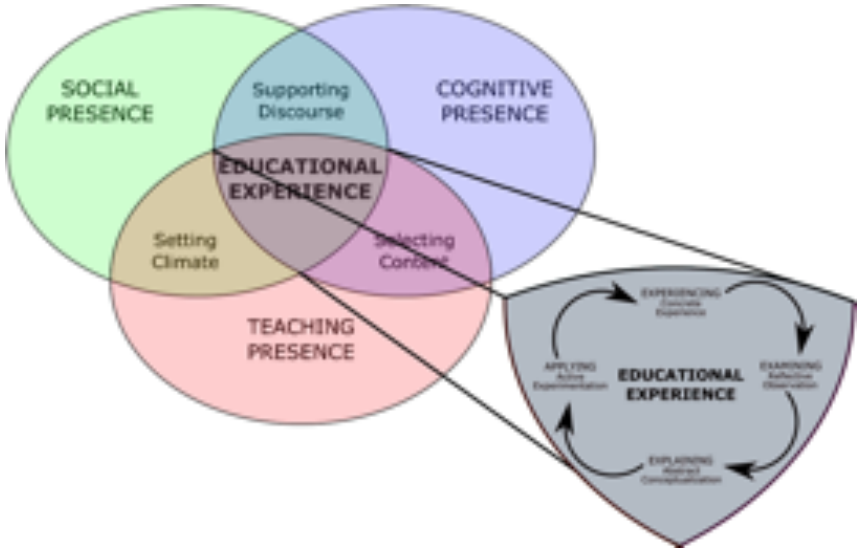

Figure 1. The Presence+Experience (P+E) framework (Dunlap et al., 2016)

Teaching playgrounds consist of three key dimensions: Investigation, Reflection, and Response. The dimensions align to the first three phases of Kolb's cycle: Experiencing (Concrete Experience), Examining (Reflective Observation), and Explaining (Abstract Conceptualization). In each of the dimensions, we designed for intersections of two presences in the CoI model: Cognitive and Teaching (Selecting Content), Social and Teaching (Setting Climate), and Social and Cognitive (Supporting Discourse), respectively. To address the fourth phase of Kolb's cycle

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(Active Experimentation), pMSTs complete performance based tasks requiring them to enact teaching practices (e.g., formative assessment, teaching for inquiry), which were a focus of activity in the teaching playgrounds. Table 1 illustrates how the investigation, reflection, and response dimensions of the teaching playgrounds align to the P+E framework.

Table 1. Links between the dimensions of the teaching playground and the P+E framework

	Investigation	**Reflection**	**Response**
Kolb's experiential learning cycle	Experiencing (Concrete Experience)	Examining (Reflective Observation)	Explaining (Abstract Conceptualization)
The Community of Inquiry Model	Cognitive and Teaching (Selecting Content)	Social and Teaching (Setting Climate)	Social and Cognitive (Supporting Discourse)

The Presence+Experience (P+E) Framework in Action: Teaching Playgrounds

We designed each teaching playground as a stand alone learning experience, while providing opportunities for pMSTs to make connections between different teaching playgrounds throughout the course. To provide a foundation for the pMSTs' interaction with a teaching playground, we provide students with a three to five minute instructor video framing the learning experience, as well as selected course readings to provide background. Figure 2 provides a storyboard layout for a teaching playground, including examples from our mathematics methods course. In the sections that follow, we elaborate on the investigation, reflection, and response dimensions.

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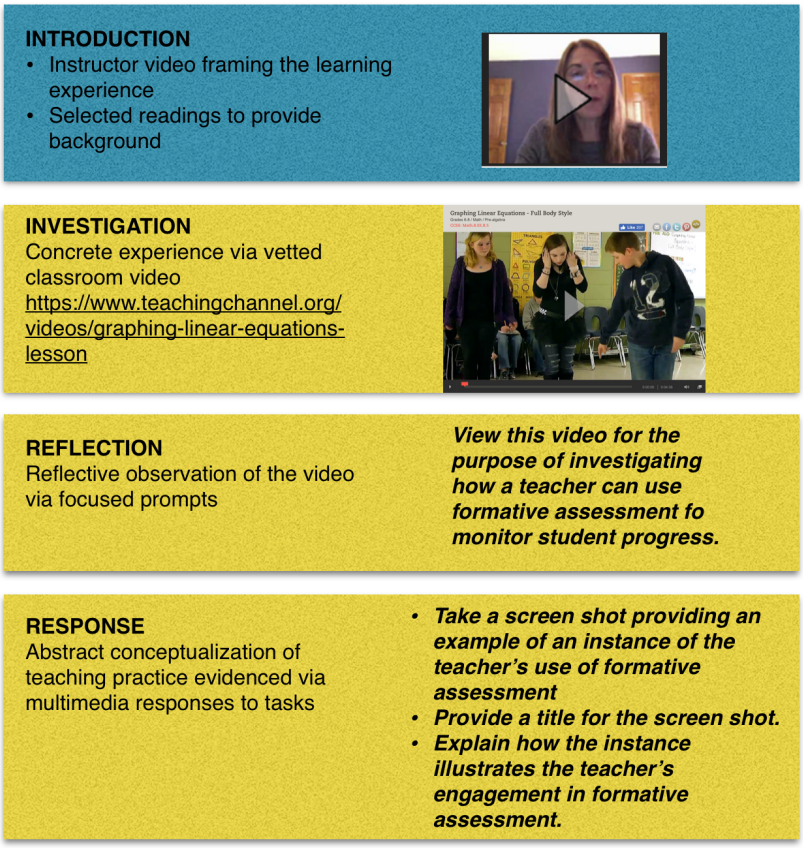

Figure 2. Storyboard layout of a teaching playground

Investigation: Concrete experience

To select content (Garrison et al., 2000), we drew on vetted classroom video, videos of experts discussing classroom pedagogy, and/or related lesson materials. We incorporated reputable web resources with freely available classroom video. We balanced the use of shorter videos showing lesson clips with longer videos showing entire lessons. By structuring pMSTs' experience with reputable web resources, we intended to provide examples of productive ways of using resources that could extend beyond the bounds of a course into their teaching practice.

We intended pMSTs to experience connections across different teaching playgrounds in a course. We developed connections by including different videos relating to the same topic, and

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drawing on the same videos for different reflective purposes. For example, we highlight the investigation dimension of a teaching playground from the mathematics methods course, entitled *Monitoring Students' Progress* (shown in storyboard layout in Figure 2). In this teaching playground, prospective mathematics teachers (pMTs) viewed a video of the Teaching Channel's "Graphing Linear Equations: Full Body Style" lesson (https://www.teachingchannel.org/videos/graphing-linear-equations-lesson) for the purpose of noticing a teacher's practice of formative assessment. In the investigation dimension of a subsequent teaching playground, pMTs viewed another classroom video demonstrating a different "full body" approach to graphing linear equations: the Teaching Channel's "Linear Graphs: Life-Size Coordinate Pairs" lesson (https://www.teachingchannel.org/videos/linear-graph-lesson-plan). In both lessons, students had opportunities to graph linear equations by positioning themselves on a coordinate plane on the floor of their classroom. By comparing these two lessons, pMTs had opportunities to notice how teachers can use tasks, appearing similar on the surface (e.g., both using a full body approach), for different instructional purposes.

Reflection: Reflective observation

To set climate (Garrison et al., 2000), we include specific prompts designed to focus pMSTs' identification and interpretation of particular teaching practices represented in the videos. We drew on course objectives (see *Our online content methods courses* section) to identify key teaching practices (e.g., formative assessment, teaching for inquiry) on which to focus different teaching playgrounds. We use the introductory instructor videos (see Figure 2), in part, to provide pMSTs with a rationale for our choices of focused prompts included in a teaching playground; in making this design decision, we intended to address pMSTs' social

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presence, by fostering connections between students and the instructor in ways that extend beyond a page of text on a screen. Furthermore, we revise the instructor videos on a regular basis, so that new instructors can develop social presence with students.

In addition to particular tasks, we used common lesson videos to make connections across different teaching playgrounds. In the reflection dimension of two teaching playgrounds from the mathematics methods course, pMTs had opportunities to engage in professional noticing of the same lesson for different purposes. pMTs viewed a video of the Teaching Channel's "Discovering the Surface Area of a Cylinder" lesson (https://www.teachingchannel.org/videos/surface-area-lesson), first for the purpose of noticing a teacher's use of different types of scaffolding, and subsequently for the purpose of noticing a teacher's use of different types of questioning. With a longer video clip, pMTs could identify and interpret a teacher's scaffolding and questioning throughout different parts of a lesson. We designed teaching playgrounds incorporating the same lesson for different instructional purposes to provide opportunities for pMSTs to reflect on how changing their interpretive lens can impact what they notice in a classroom lesson.

Response: Abstract conceptualization

To support discourse (Garrison et al., 2000), we include tasks in which pMSTs demonstrate evidence of their professional noticing of teaching practices represented in the videos. We incorporated tasks requiring pMSTs to provide specific examples from the lesson videos to support their responses. Leveraging the high tech aspect of the teaching playgrounds, we included opportunities for pMSTs to use text, images, and/or video to respond. In the

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Teaching Playgrounds we used with our pMSTs: Snapshots of Teaching Practice section, we share two pMSTs' responses.

Performance based tasks: Active experimentation

We addressed the fourth phase of Kolb's cycle by developing performance based tasks that pMSTs complete during concurrent classroom field experiences (See *Local context* section). In designing the performance based tasks, we targeted the intersection of all three presences in the CoI framework: Cognitive, Social, and Teaching. We linked course outcomes to pMSTs' work on the performance based tasks.

To illustrate, as part of the online mathematics methods course, pMTs completed a performance based task focused on formative assessment. The performance based task related directly to the focused prompts and tasks from the teaching playgrounds. For example, after having had opportunities to notice a teacher's use of formative assessment (see Figure 2), pMTs then engaged in their own use of formative assessment to collect evidence of their students' progress in meeting a learning objective.

Contextualizing our use of Teaching Playgrounds

Local context

We are located in an urban campus of a large US city. pMSTs selecting our program bring varied backgrounds and a range of life experiences. Some are undergraduate students, earning teacher licensure in conjunction with their undergraduate degree. Others are working adults, participating in a graduate teacher preparation program while balancing demands of work, home, and family. In conjunction with content methods courses, as part of our teacher preparation program, our pMSTs have concurrent classroom field experiences in secondary

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schools in the metropolitan area. When courses are not online, pMSTs have to travel to campus for evening classes after a full day in their classroom field experiences. By developing and delivering online content teaching methods courses, we have worked to address the needs of our pMST population while preparing pMSTs for the high-touch, high-interaction endeavor of teaching adolescents.

Our online content teaching methods courses

In the mathematics teaching methods course pMTs develop knowledge of assessment as a process, during which a teacher gathers evidence of students' mathematical knowledge and understanding and then uses that evidence to make inferences about students' mathematical learning and decisions about future instruction. Because mathematics assessment should be equitable, providing each student the opportunity to demonstrate his or her own mathematical knowledge and understanding, pMTs examine issues of race, culture, and language alongside assessment practices. In the course pMTs investigate four different purposes of assessment: monitoring students' progress, making instructional decisions, uncovering students' thinking, and evaluating students' work at a particular time.

In the science teaching methods course prospective science teachers (pSTs) examine current issues, strategies, materials, and technology related to the teaching and learning of science at the middle and secondary school levels. Through experiential, inquiry oriented, and reflective experiences, pSTs investigate science curricula, teachers' pedagogical content knowledge, and research in science education. Furthermore, they develop strategies to create a meaningful, engaging, and culturally responsive science classroom and establish a learning

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environment that is inclusive of students' diverse identities, life experiences, and learning preferences.

Teaching Playgrounds we used with our pMSTs: Snapshots of Teaching Practice

We include two responses to provide in depth illustrations of how pMSTs engage in teacher noticing as part of teaching playgrounds. In the teaching playgrounds that we share, we incorporated pMSTs' use of still images to communicate the teaching practices they notice (see also Oslund & Crespo, 2014). For each teaching playground, we provide a response from a pMT/pST. We intend for the responses to illustrate the range of professional noticing in which pMSTs engage.

Prospective mathematics teachers (pMTs): Snapshots of formative assessment

In this teaching playground, shown in Figure 2, pMTs had opportunities to notice the teaching practice of using formative assessment. In the investigation dimension, pMTs viewed a lesson in which a teacher used a full body approach to graphing linear equations, and explored teaching materials related to the lesson. In the reflection dimension, pMTs investigated how teachers can engage in formative assessment during their process of monitoring students' work on the task. In the response dimension, pMTs identified a particular teaching moment that captured the teacher's engagement in formative assessment. pMTs included a screenshot of the teaching moment, a caption for the teaching moment, and an explanation of how this teaching moment illustrated the teacher's engagement in formative assessment.

Figure 3 shows one pMT's caption and screenshot. In a text response, the pMT identified the moment as an instance of a teacher engaging in the process of gathering formative assessment data:

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The moment I wanted to highlight was the first group going when she was timing them. Their misunderstandings about where b is on the y axis gave Ms. Davis formative data about how this particular group was interpreting the y-intercept. It also appeared like this group struggled with slope. This information allows her to come up with ideas on what she needs to focus on in future lessons.

Figure 3. "Teacher collecting data while students engage" image retrieved from https://www.teachingchannel.org/videos/graphing-linear-equations-lesson

In this pMT's response, her caption illustrated her noticing of both the teacher's and students' actions. In her response, she provided specific details regarding the kind of data the teacher was collecting as part of her formative assessment. Interesting to us, the image this pMT selected includes only students, and not the teacher. We interpret this pMT's selection of an image to suggest that she can notice a teacher's use of formative assessment even when the teacher is not showing in the image.

Prospective science teachers (pSTs): Snapshots of inquiry teaching

In this teaching playground, prospective science teachers (pSTs) had opportunities to notice aspects of the practice of teaching for inquiry, and to learn to use the 5E lesson planning template (Bybee, 2014) to transform even "cookbook" lab activities into inquiry investigations. In the investigation dimension, the pSTs explored how to modify existing lessons to promote the practice of teaching for inquiry, and viewed a video of a physical science teacher teaching eighth grade students to form and test predictions, the Teaching Channel's "Exploring Predictions"

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lesson (https://www.teachingchannel.org/videos/exploring-predictions-science-lesson). In the reflection dimension, pSTs focused in on a moment during the lesson which, for them, embodied the spirit of teaching for inquiry. In addition, pSTs identified the type of inquiry (structured, guided, coupled, or open) that the teacher was using. In the response dimension, pSTs included a screenshot of the teaching moment, a caption for the teaching moment, and an explanation of the type of inquiry.

Figure 4 shows one pST's caption and screenshot. In a text response, the pST identified the lesson as an example of guided/coupled inquiry (level 2/3), providing a reason for her identification:

I think this lesson falls into guided inquiry at a level 2/3. The students were given the subject/concept to study and specific materials to use and a partial explanation on how to test the concepts (learned yesterday) further. However the students were asked to make their own predictions and draw their own conclusions based on their experimentation. The lesson prior was used to build further knowledge of properties of physical science. The lesson fell within the Explore and Explanation of the 5E learning cycle. Students were exploring physical properties of matter and explaining their findings to the teacher and the class.

Figure 4. "Why our boat floats: Students answer" image retrieved from https://www.teachingchannel.org/videos/exploring-predictions-science-lesson

In this pST's response, she used a screenshot to identify a specific portion of the lesson. Yet, her description of the practice of teaching for inquiry remains in broad terms. To foster pSTs' development of interpretation in their professional noticing, we recommend a more precise and

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detailed explanation of how this particular instance represents the practice of inquiry teaching. For example, what is the teacher doing in this moment? How did his actions help these students to continue to work to meet the lesson's objective? We use these questions to illustrate our work to further guide and refine PSTs' noticing. In this instance, we intended to provide pSTs opportunities to translate their noticing into a practice of teaching for inquiry to stimulate student progress.

Methods

To provide evidence of the effectiveness of our online content teaching methods courses incorporating teaching playgrounds, we used quantitative analysis methods to determine if there were statistically significant differences in student outcomes when our content teaching methods courses were offered in fully online or face to face formats. To test for statistical significance, we conducted a Mann-Whitney U test. Assumptions underlying the Mann-Whitney U test include: dependent variable(s) measured at an ordinal or continuous level, an independent variable comprised of two categorical, independent groups, and the distribution of each of the independent groups having the same shape. We chose to conduct a Mann-Whitney U test rather than a t-test because our outcome data was not normally distributed (see Gibbons & Chakraborti, 2011).

We analyzed attainment of course outcomes by students in our mathematics (N=79) and science (N=50) methods courses from Fall 2010-Spring 2016. We compared the attainment results of students taking the courses in face to face vs. online formats. We offered the mathematics methods course three times in a face to face format (Spring 2011, 2012, 2013) and three times in a fully online format (Spring 2014, 2015, 2016). Thirty eight students took the

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mathematics methods course in a face to face format, and 41 students took the course in a fully online format. We offered the science methods course two times in a face to face format (Fall 2010, 2012) and three times in a fully online format (Fall 2013, 2014, 2015). Due to low enrollment numbers, we did not offer the science methods course in Fall 2011. Eighteen students took the science methods course in a face to face format, and 32 students took the course in a fully online format.

We drew on outcomes assessed in our yearly reports to the US Higher Learning Commission. For the mathematics methods course we used three outcomes: (1) Identification of a coherent collection of learning objectives to use to design an assessment for a unit of instruction, (2) Selection of tools appropriate for assessing students' progress toward meeting objectives, and (3) Noticing of students' mathematical thinking as a result of analyzing students' work on the assessment. For the science methods course, we used one outcome: Development of a content-driven unit plan that builds on students' prior ideas and understanding. Some of our science outcomes were redesigned in Fall 2014, resulting in our only being able to analyze one outcome across all semesters.

At the conclusion of each semester, the instructor of record used students' work on course performance based tasks to assess their attainment of course outcomes. In the mathematics and science methods courses, we assessed students' attainment of outcomes using 5 point and 3 point Likert scales, respectively. Our distributions for both the fully online and face to face versions of the courses were skewed to the right, meaning that, in both formats, students demonstrated proficiency in attaining course outcomes.

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Results

Table 2 shows the Mann-Whitney U, Z, and p values for each outcome in the mathematics and science methods courses. Across all outcomes, p values are greater than 0.05. Hence, we can conclude that there was no significant difference in attainment of course outcomes from students taking the course in an online or face to face format. Therefore, we can claim that with regard to students' attainment of course outcomes, offering the mathematics and science methods courses in an online format is at least as effective as offering the same courses in a face to face format.

A finding of no significant difference between students' outcomes in online vs. face to face formats is by no means insignificant. By providing evidence to show that an online format is as effective as a face to face format, we demonstrate that fully online, high tech courses can be viable environments even for high touch courses and programs. We view our use of the teaching playgrounds to be central to the viability of our online content methods courses.

Table 2. Mann-Whitney U, Z, and p values across outcomes in mathematics and science methods courses

	Mann-Whitney U	Z	p
Mathematics Methods course: Outcome #1	711.500	-1.104	0.269
Mathematics Methods course: Outcome #2	751.500	-0.388	0.698
Mathematics Methods course: Outcome #3	724.500	-0.710	0.478
Science Methods course: Outcome #1	252.000	-1.548	0.122

We acknowledge a limitation in our ability to use our quantitative analysis to make direct claims about the effectiveness of our online content teaching methods courses for fostering teachers' professional noticing. Despite this limitation, Outcome #3 for the mathematics methods

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course does relate directly to professional noticing, in particular to pMTs' ability to notice students' mathematical thinking. pMTs enrolling in both online and face to face formats demonstrated proficiency in noticing their students' mathematical thinking, as evidenced by their interpretation of a student's mathematical thinking based on a student's response to a mathematical task.

Design Guidelines

We provide four design guidelines (Figure 5) to guide the development and use of fully online teaching playgrounds to foster pMSTs' professional noticing. The guidelines address design within (Figure 5, bottom) and across (Figure 5, middle) teaching playgrounds, as well as the situation of teaching playgrounds in a teacher education program (Figure 5, top). Through our design guidelines, we intend to demonstrate how the heuristics posited by Blomberg et al. (2013) can apply to the use of video in online learning environments.

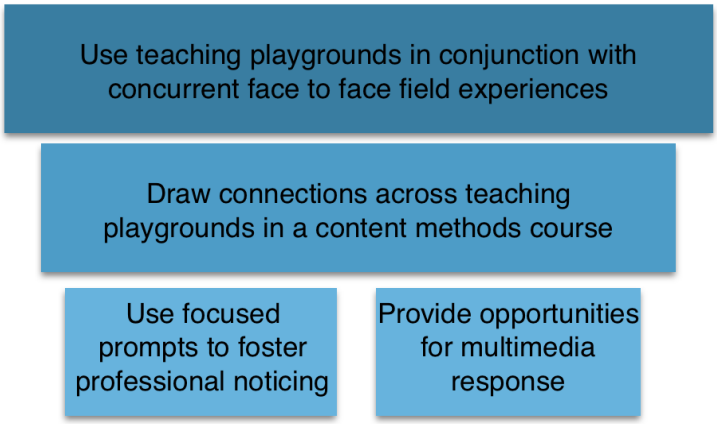

Figure 5. Design guidelines for the development and use of teaching playgrounds

Within a teaching playground

Within a teaching playground, we included focused prompts to foster pMSTs' professional noticing and opportunities for pMSTs to provide multimedia responses. Instructors'

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use of video in online courses can contribute to a multisensory learning experience with the potential to enhance student engagement online courses, which might otherwise entail conventional, text-based interactions (Draus, Curran, & Trempus, 2014; Hibbert, 2014; Lowenthal & Dunlap, 2010). By addressing particular aspects of teaching practice, the focused prompts serve to engender pMSTs' interpretive analysis as part of their professional noticing. In addition, they provide springboards from which instructors can build to further pMSTs' professional noticing. Furthermore, we view pMSTs' opportunities for multimedia responses as one way that we align our assessment methods with our video use, addressing the fifth heuristic put forward by Blomberg et al. (2013).

Across teaching playgrounds

To develop connections across teaching playgrounds, we used the same classroom videos for different purposes, different classroom videos for the same purposes, and introductory course instructor videos included in each playground. By providing pMSTs opportunities to use different purposes to analyze classroom video and by balancing our use of shorter videos showing lesson clips with longer videos showing entire lesson, we intentionally draw on our awareness of affordances and constraints of video, addressing the fourth heuristic put forward by Blomberg et al. (2013). Furthermore, through our instructor videos, we have designed for social presence, by working to build community between pMSTs and the instructor (Garrison et al., 2000).

Situating teaching playgrounds in a teacher education program

We situated teaching playgrounds in conjunction with opportunities for pMSTs to engage in face to face classroom experiences. Including enculturating opportunities for pMSTs in

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teacher preparation programs is critical to preparing them for the teaching demands, challenges, and opportunities of their school settings and the professional communities of practice (see also Dunlap, 2006). Because teaching playgrounds provide pMSTs opportunities to notice vetted classroom practice, we argue that through teaching playgrounds we can engage pMSTs in an enculturating learning experience that more authentically reflects the nature and requirements of teaching in a school setting. Furthermore, engaging with teaching playgrounds can help pMSTs feel better prepared to share their knowledge and expertise with their own students, and identify themselves as effective teachers and contributing members of the teaching profession. In the words of one pMST: "I can watch videos, read a journal, try to apply something in my class and learn from that experience."

Discussion

Borko et al. (2008) called for researchers studying teacher education to investigate the viability of innovative technologies and online experiences in teacher education. We respond to their call in two ways. First, we provide evidence to support that high tech, online courses can be viable environments even for high touch courses, such as content methods courses in teacher education. Second, we share design guidelines for teaching playgrounds, which teacher educators can incorporate into fully online learning experiences. Furthermore, Borko et al. (2008) recommended that teacher educators provide opportunities for prospective teachers to develop proficiency with integrating technology into the classroom. Through our teaching playgrounds, we intend to provide prospective teachers with opportunities both to learn from and to use online resources.

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We contribute to the corpus of literature in teacher noticing by extending opportunities for teacher noticing from blended learning environments (Fernández et al., 2012) to fully online environments. Furthermore, our design guidelines illustrate how the heuristics put forward by Blomberg et al. (2013) can extend to fully online environments. Our online courses afforded us opportunities to seamlessly incorporate the use of video and still images into our assessment of prospective teachers' professional noticing. Furthermore, we were able to provide prospective teachers with opportunities to interpret vetted classroom videos for multiple purposes. We consider teaching playgrounds to be a viable environment for teacher educators to foster prospective teachers' interpretive analysis in their noticing. Future research could investigate the efficacy of online environments for promoting opportunities to engage in interpretive dimensions of teacher noticing, for both prospective and practicing teachers.

With our teaching playgrounds, we intend to blur boundaries between high tech and high touch courses. We intend to show that, under certain design conditions, high tech fully online environments can be suitable for even high touch courses, such as content methods courses in teacher education. In our view, teacher educators can extend teaching playgrounds beyond mathematics and science teacher education to the broader field of teacher education. Furthermore, we think that online course designers could develop parallel kinds of professional "playgrounds," in which they could train prospective professionals for other high touch professions.

Concluding Remarks

To create effective and engaging learning experiences, it is important to examine and identify growth opportunities in teacher education programs. Moloney et al. (2010) argue that

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blended learning environments represent a "growth opportunity" to increase students' access to higher education. We argue that online teaching playgrounds can provide another growth opportunity, increasing access for prospective teachers in urban, rural, and remote locations. Furthermore, we think that teaching playgrounds could extend to professional development opportunities for practicing teachers. University faculty, as well as school district coaches and administrators, could draw on such playgrounds to promote teachers' professional noticing.

We offer teaching playgrounds as an instantiation of the P+E framework, as applied to the design of fully online, high touch content teaching methods courses. Drawing on the P+E framework, designers and researchers can develop learning experiences for high touch courses that scholars and instructors may view as challenging or even undesirable to deliver as a fully online course. In summary, not only is it possible for university faculty to deliver such high touch content teaching methods courses fully online, there is also a greater range of possibilities available by leveraging the affordances of online learning. Teaching playgrounds allow designers, instructors, and researchers to tap into those affordances to create courses that are both high tech and high touch.

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