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WHAT IT MEANS TO BE A PROFESSIONAL DEVELOPMENT SCHOOL

A statement by the Executive Council and Board of Directors of the National Association for Professional Development Schools, www.napds.org, April 2008

The Nine Required Essentials of a PDS© are:

1. a comprehensive mission that is broader in its outreach and scope than the mission of any partner and that furthers the education profession and its responsibility to advance equity within schools and, by potential extension, the broader community;

2. a school–university culture committed to the preparation of future educators that embraces their active engagement in the school community;

3. ongoing and reciprocal professional development for all participants guided by need;

4. a shared commitment to innovative and reflective practice by all participants;

5. engagement in and public sharing of the results of deliberate investigations of practice by respective participants;

6. an articulation agreement developed by the respective participants delineating the roles and responsibilities of all involved;

7. a structure that allows all participants a forum for ongoing governance, reflection, and collaboration;

8. work by college/university faculty and P–12 faculty in formal roles across institutional settings; and

9. dedicated and shared resources and formal rewards and recognition structures.

School–University Partnerships: The Journal of the National Association for Professional Development Schools (NAPDS) is published by the NAPDS as a service to members of the Association and others concerned with partnerships between higher education and P-12 schools and their communities. For association information please refer to http://www.napds.org.

School–University Partnerships: The Journal of the National Association for Professional Development Schools is nationally disseminated and blind-refereed. Each issue contains articles written by both university and school educators, usually in collaboration with each other, and highlights policy and practice in the school- university partnership.

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Introduction to Themed Issue: Technology to Support and Enhance Professional Development Schools

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Abstract: The purpose of this special issue to provide teachers, higher education faculty, and district personnel with ideas and resources on how to integrate technology into school-university partnerships and within the work of Professional Development Schools. The articles featured in this special issue highlight a range of innovative practices that utilize technology to enhance student and learning for all stakeholders and they describe how the work within PDS schools and partnerships is evolving in response to emerging technologies.

KEYWORDS: emerging technologies, internship, Professional Development Schools, teacher preparation, technology integration

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"One of the most important aspects of technology in education is its ability to level the field of opportunity for students." -John King, Former U.S. Secretary of Education

The Commission on Effective Teachers and Teaching (CETT; 2011) identified effective integration of a range of cutting-edge technological tools as one of four key qualities required for a new 21st century education system. Current innovations in technology coupled with advances in understanding how students learn have established a foundation upon which the way instructional technology is viewed in schools today is changing. Nationally, there is a growing

emphasis, both at the P-12 and university level, to effectively integrate technology that promotes teaching and learning. In a recent review of the literature, Delgado, Wardlow, McKnight, and O'Malley (2015) found increased access to technology in today's classrooms, with the average student-to-computer ratio being 1.7 to 1. Mobile learning devices, maker spaces, coding labs, and more are evolving in schools in a variety of ways (Barack, 2015). Technology has become more cost-effective, more interactive, and easier to use; it is no longer a novel "luxury" but rather a constant part of our society.

In these technology-rich environments, teacher candidates are increasingly required to utilize technology efficiently and developing these skills during the internship experience is essential to later translating them to their roles as new teachers (Gray, Thomas, & Lewis, 2010). Project Tomorrow (2012) found that teacher candidates identified observing a college professor model the use of instructional technology as one of the most effective ways to learn. Using this same premise, it is important that candidates see mentor teachers model the effective use of technology in their PDS placements as well. The Council for the Accreditation of Educator Preparation (CAEP; 2017) outlines the need for candidates to have technology-rich experiences, both in their program as well as specifically during internship. By preparing future teachers to effectively integrate technology with a focus on learning, they will be able to better meet the needs of the diverse learners in their classrooms.

Future Ready, the National Education Technology Plan (2016), speaks to the power of technology to help teachers become more collaborative and engage in learning in and out of the classroom. Teachers can connect with other educators across their districts and around the globe. By utilizing technology to support PDS partnerships, stronger connections between school-based and university-based faculty can be developed. There is no doubt that technology integration and teacher preparation now go hand in hand. However, the questions for those of those of us working in the trenches of teacher preparation is: How can technology be used to strengthen our existing partnerships and how can we make certain that we adequately prepare that our preservice teachers for technology-rich learning environments?

The number of emerging technologies that can be used to support PDS partnerships and experiences is growing and the purpose of this special issue is to present a collection of scholarly work which includes a discussion of these various technologies that broaden and support the continuum of clinical practices within teacher preparation programs. While the focus of this special issue is technology, the issues raised in each of the articles are relevant to anyone involved in teacher preparation, both at the school and university levels. In many instances, technology provides a fresh approach to addressing common issues in PDS partnership work. As the expectations for technology use in P-12 classrooms increase, internship experiences in PDSs have become an even more critical part of their skill development. This makes dialogue about the use of technology within PDS imperative to keep pace with this area of educational change.

In the first article, Kruft, McQuitty, and Piper tell the story of one district's journey to make revisions and improvements that emphasize technology and its impact on in-service teacher development and the preparation of pre-service teachers. This innovative learning center model capitalizes on district-based technology initiatives by bringing PDS interns into the fold,

teaching them to integrate technology and grow professionally alongside in-service teachers who are also growing in their development of technology integration and student-centered pedagogy.

In the second article, using cognitive apprenticeships as a theoretical framework, Heath challenges the conventions of typical observations that occur in PDS schools by offering an example of how technology can both enhance and scaffold these experiences. While early, field-based experiences are essential for preservice teachers, Heath reminds us that these don't have to be sedentary activities but that the instructor and observers can take a more active role through use of technology.

In the third article, Damjanovic and her team at the University of South Florida use technology to create new opportunities within traditional pedagogic documentation that supports the development of various stakeholders in the teaching and learning process. In this case, the technology was used to support the professional development of various stakeholder groups with the cohesive partnership between the university and the preschool program providing an ideal backdrop for this new tool.

In the fourth article, Cruzado-Guerrero, Alba-Martinez, and Mogge promote the use of technology and Universal Design for Learning (UDL) to facilitate projects that respond to the growing diversity in PDS schools by sharing an example of how universities can provide instructional support. Cruzado-Guerrero et al.'s explanation of their work serves as an important reminder of how universities and schools can support one another through innovative approaches to professional development which incorporate technology and promote the principles of UDL.

The final two articles contained in this special issue offer an exciting look at the potential future of teacher preparation, clinical curriculum, and university-school partnerships. Technology has the potential to transform our work and both Dieker et al. and Schmidt et al. show us descriptive and attainable examples of this. In this issue, Dieker and the team at the University of Central Florida extend their research on teaching simulations, challenging us to consider new methods of offering professional development and preparing all teachers. This technology also opens the door to new ways of thinking about a clinical curriculum.

We invited Schmidt and colleagues to discuss ways to make distance supervision accessible to more schools and programs and discuss the promising implications of this practice, because it helps to address many of the relevant issues that teacher preparation programs face. They offer distance supervision as a viable option for university programs that are seeking creative but still efficacious ways to support preservice teachers placed in PDS schools and introduce us to the concept in a way that even those new to the approach can easily understand.

The number of emerging technologies available to support PDS partnerships and experiences are growing and so too, is the demand for preservice and in-service teachers and university faculty to integrate these tools meaningfully into their instruction. In an effort to foster scholarly discourse in this area, we have called on authors in teacher preparation, instructional technology, and affiliated PDS work to submit manuscripts that detailed research, suggested novel concepts, and described innovative practices that address their use of technology toward

these efforts. Our hope is that this collection of scholarship advances the professional conversation throughout the PDS network to include technology integration and the preparedness of all of our partnership groups to embark on the next phase of 21st century classrooms.

References

Barack, L. (2015). Tech it to the limit: School librarians are maker space leaders who want more tools and bandwidth, according to SLJ's 2015 Tech Survey. *School Library Journal*, (8). 14.

Commission on Effective Teachers and Teaching (2011). Transforming teaching: Connecting professional responsibility with student learning. Retrieved from http://www.nea.org/home/49981.htm.

Delgado, A. J., Wardlow, L., McKnight, K., & O'Malley, K. (2015). Educational technology: A review of the integration, resources, and effectiveness of technology in K-12 classrooms. *Journal of Information Technology Education: Research, 14*, 397-416. Retrieved from http://www.jite.org/documents/Vol14/JITEv14ResearchP397- 416Delgado1829.pdf

Gray, L., Thomas, N. & Lewis, L. (2010). *Teachers' use of educational technology in U.S. public schools: 2009 (NCES 2010-040).* Washington, DC: National Center for Education Statistics, Institute of Educational Sciences, US Department of Education.

U.S. Department of Education, Office of Educational Technology (2016). *Future Ready Learning: Reimagining the Role of Technology in Education, The National Education Technology Plan,* Washington, D.C.

Project Tomorrow (2012). *Mapping a personalized learning journey: K-12 students and parents connect the dots with digital learning*. Irvine, CA: Author. Retrieved from www.tomorow.org.

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One District's Experience: Bringing Professional Development Schools Together Through Technology

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Abstract: Technology plays a significant role in shaping learning opportunities for interns, mentors, and university faculty within our Professional Development School (PDS) network. These opportunities take two forms. First, we explore how we can help interns learn to use technology to support deep, meaningful learning in K-12 classrooms. Second, we use technology to intentionally facilitate a culture of shared learning among our PDS partners. Our goal in this paper is to share how technology enhances collaboration among our PDS partners and the learning of elementary students, preservice teachers, mentor teachers, and university faculty.

KEYWORDS: professional development, Professional Development Schools, school-university partnerships, teacher education, technology integration

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The old adage says, "A picture is worth a thousand words." An update to this for the 21st century might be, "A multimodal digital artifact is worth a thousand pictures." As we all seek to embed more meaningful opportunities for partnership and collaborative learning in our Professional Development School (PDS) networks, technology affords us far-reaching options. Perhaps most importantly, it connects us and makes collaboration possible across settings that were not easily bridged in the past. We can digitally connect preservice teachers with real students and teachers in classrooms (Barnett, 2006) when physical visits are impossible. Mentor teachers in schools can digitally collaborate with university professors, such as those in psychology

or family studies, who may not have traditionally been involved in PDS work. We can connect schools within the PDS network with one another to share expertise and experiences across geographic distances (Theodore & Searcy, 2005). PDS partners—including mentors, preservice teachers, and university faculty—can even collaboratively create resources using online platforms.

Technology also allows us to generate digital artifacts that we can use to share contextually meaningful knowledge. Because we can capture real learning situations in classrooms and keep lesson videos, we are able to produce resources that support job-embedded professional learning. For example, in the past, preservice teachers have analyzed "generic" videos of instruction during their on-campus courses before entering schools, but we now have the ability to create videos that are contextually relevant to their future field placements (Decker, et al., 2014). These videos can also serve mentor teachers and university faculty by allowing us to share instruction that directly addresses local problems of practice. Thus, technology can make professional learning more meaningful, relevant, and applicable to the PDS context (Sutton, 2011).

In our PDS work, we have found two ways in which technology plays a significant role in shaping learning opportunities for all stakeholders. Technology supports meaningful learning in K-12 classrooms and creates a culture of collaboration among interns, mentors, and university faculty. This paper describes how we use technology to enhance our PDS network.

Context: PDS Learning Centers

Recently the Baltimore County Public School System (BCPS) began to concentrate its resources to create six PDS Learning Centers that are designed to accelerate innovation across both K-12 schools and the universities with which it partners. The Learning Centers model builds upon and expands traditional PDS work by promoting professional learning for *all* partnership participants. While our ultimate goal is to enrich children's learning, we recognize that improving adults' learning is an important step toward that end. The Learning Centers provide a site where teacher preparation interns and candidates, veteran K-12 teachers and leaders, and university faculty study teaching and learning through deliberate and critical attention to pedagogy, curriculum, and the cultural context of the participating institutions. All participants share their expertise, with the purpose of improving professional practice.

BCPS is the 27th largest school system in the United States, serving a population of students from very diverse demographic backgrounds: 41% white, 39% black, 8% Hispanic, and 12% other ethnicities, with 49% of the total student population eligible for free and reduced lunch. The largest-growing subsets of the student population in BCPS are (a) students from diverse ethnic groups, (b) English-Language Learners, and (c) students living in poverty. In order to nurture a teaching force ready to educate *all* students, BCPS chose the schools that serve high poverty and/or culturally diverse populations to be PDS Learning Centers. These PDS Learning Centers serve not only as innovative and collaborative teacher preparation communities, but also as hubs to deepen effective PDS partnerships. For example, preservice education majors, mentor teachers, and university professors from other PDS sites routinely visit the Learning Centers to observe instruction and innovative practices.

A steering committee of leaders and practitioners from both BCPS and local universities constructed the core tenets of the Learning Center concept. The tenets serve as the foundation for how we seek to enhance the effective PDS partnerships already in place with a new level of commitment and collaboration focusing on learning for all. The Steering Committee for PDS

Learning Centers agreed to base their six core tenets to extend and emphasize the National Association of Professional Development Schools (NAPDS) and state PDS standards. Therefore, at the core of a Learning Center is the study of teaching and learning wherein:

1. Partners make teaching and learning public through shared, reflective, and systematic inquiry.
2. Partners envision professional development—both at the university and school level—as a set of collaborative and job-embedded processes aimed at enhancing practitioner expertise, developing professional agency, generating new knowledge, and translating new learning into effective and evidence-based practices.
3. Partners honor and develop local expertise by building mutually-respectful and collaborative relationships.
4. Partners collaboratively identify and study challenges in teaching and learning, and actively seek innovative approaches to address them through scholarship, research, and reflective practice.
5. Partners implement their learning in syllabi, curriculum redesign, and engaging pedagogies in both the K-12 and university settings.
6. Partners disseminate new knowledge and insights gained through their collaboration in multiple forums and formats.

Using the *Nine Essentials of a PDS*, these tenets of the Learning Centers are based primarily on essentials 1, 6 and 7 (NAPDS, 2008).

Harnessing both on-site opportunities and technology to share with off-site groups, the Learning Center work supports much cross-subgroup learning among K-12 students, preservice education majors, interns, mentor teachers, and professors. The Learning Centers use technology to share insights and inquiry in a myriad of directions; technology is integrated into the fabric of the Learning Centers.

Learning Center Partners

Our work began in 2014-2015 with a planning year for the first Learning Center partnership. The first partnership was created between one BCPS elementary school and Towson University. This school was carefully chosen by the BCPS leadership because it exemplified a school facing demographic challenges in an urban setting. It was also chosen because it was a "turnaround school" that in five years had progressed from being a school with very low standardized test scores to a school the district began to showcase for its success. Within five years, this school had progressed to the point of being chosen as a "Lighthouse School"—one of ten in BCPS—that would be the first to implement student-centered learning environments, including one-to-one technology in the hands of the students.

The same year that the Lighthouse Schools initiative launched in the district, BCPS began planning to partner with Towson University to develop the first PDS Learning Center. Towson University was invited to participate as the institution of higher education that prepares the largest teacher candidate pool for the district: over 600 new hires each year. In addition, the educational leadership at the university is playing a pivotal role in helping to conceptualize the Learning Center model.

During the formation of the PDS Learning Center concept BCPS also began allocating resources for professional development to support *Students and Teachers Accessing Tomorrow*

(STAT), its instructional initiative that includes student-centered learning and one-to-one technology. The district established a STAT teacher at every school who provides professional development as a coach who has expertise in integrating instructional technology within student-centered learning environments. STAT teachers provide support with the hybrid tablet/laptop device the district purchased to implement its one-to-one initiative. The STAT teachers benefit the PDS Learning Centers because they coordinate job-embedded coaching and follow up to the PDS Learning Center work. This support from schools' STAT teachers ensures that the Learning Centers' efforts are sustainable and scalable.

During the 2015-2016 school year, four other universities began planning for Learning Center collaborations with six BCPS schools. These partnerships include public and private institutes of higher education (IHE), three elementary schools, two middle schools, and one high school. New partnerships are forming each year, as another university and BCPS high school Learning Center just began during the 2016-2017 school year. The partnership projects and activities conducted between each BCPS school and university team are developed based upon the needs identified in each school's progress plan and the strengths and resources each IHE could offer.

Another partner with district-wide connections through the Learning Centers is the Maryland Writing Project (MWP). The MWP, a local site of the National Writing Project, is housed in Towson University's College of Education and serves teachers across the state. As a professional learning community dedicated to building teachers' knowledge, practice, and leadership for writing instruction, MWP embodies many of the Learning Center principles: collaborative, job-embedded PD; professional agency; generating new knowledge and innovative approaches to writing instruction; honoring and developing local expertise; and disseminating new knowledge and insights. Since the partnership began, MWP has sponsored two, two-week summer workshops for Learning Center teachers, as well as after-school workshops in several BCPS schools and district-wide workshops for BCPS reading specialists.

Preparing Interns to Use Technology for Teaching and Learning

The Learning Management System

As part of its STAT initiative, BCPS focuses on technology integration across all aspects of teaching and learning, making this an integral part of the PDS Learning Centers. When elementary students received their own one-to-one devices, it became evident that interns and professors from Towson University needed two things right away: (a) access to the online curriculum and digital content through the BCPS learning management system (LMS) and (b) continuing opportunities for professional development and collaboration with teachers as they grew in their effective implementation of the one-to-one initiative.

One of the first challenges was creating a way for interns and professors to access BCPS One, the digital ecosystem for the school district. BCPS One includes an LMS composed of digital curricula, digital content, and an online gradebook-- critical tools that mentor teachers and interns use to co-plan, co-instruct, and co-assess in order to maximize student learning opportunities. Leadership in the school system's offices of Organizational Development, Curriculum and Instruction, and Information Technology collaborated to design a process that would enable senior year interns to be added as users in the system with all PDS sites in the district.

This allowed mentor teachers to share their classes with their interns and help them learn to use the LMS to support instruction and assessment.

Currently, interns access digital curricula and content in order to plan and differentiate lessons. They also place content onto digital "lesson tiles" to share with students and parents. Interns design and deliver tests and quizzes, enter assessment information, and share assessment data with students and parents under the supervision of their mentor. Through these collaborations, interns learn to leverage technology to customize and personalize instruction because lesson tiles can be designed for individuals, small groups, or the whole class. For example, digital reading materials can be selected and placed on tiles for students according to each student's reading level and interest. These reading materials can then be accompanied by teacher- or district-made videos, visual organizers, assessment tools, or other supplemental activities.

Preparing Interns to Use the School's Learning Management System

The process of preparing interns to use the LMS now begins as soon as an intern's placement in a school is confirmed. A school-based site coordinator holds an orientation for interns and helps them request user credentials from the BCPS Department of Information Technology. Once the interns have BCPS usernames and passwords, the site coordinator sends that information to the Office of Organizational Development on a roster, and the interns are added to BCPS One as users. Mentor teachers are notified when their interns have been added so they can "share" their classes with them and begin coaching them on how to use the LMS to plan, deliver, and assess instruction.

Providing interns access to the LMS has increased co-teaching practices between mentors and their interns. The BCPS Office of Organizational Development distributes a survey to all mentors within the district each semester. On the most recent mentor teacher survey given at the end of the Spring 2016 semester, nearly 90% of all PDS mentor teachers within the district reported that they regularly co-planned and co-taught with their interns. This represents a nearly 30% increase since access to the LMS for interns. The opportunity to co-plan and co-teach extends interns' learning beyond the traditional model in which they designed lessons that their mentors then view and critique. This suggests that access to the LMS has improved the learning opportunities interns experience and prepares them to use LMSs in their future classrooms.

Strengthening Interns' Ability to Integrate Technology

Internship Seminars

Given the prominence of technology in today's schools, a vital role of the PDS is to help interns apply what they learn about instructional technology at the university to real situations in K-12 classrooms. In order to provide just-in-time learning opportunities for these interns, the Towson University site coordinators invited Learning Center mentor teachers to co-teach a number of seminar sessions focused on technology. These after-school sessions address numerous technologies, such as interactive websites, blogs, and curriculum-planning options that the mentor teachers had discovered as they worked to integrate technology into their instruction. These seminars provide opportunities for interns to learn to create technologically rich and appropriate environments for their elementary students. These reflection and collaboration activities allow the

university and the mentors to consider how they can better prepare interns for the realities of curriculum planning and assessment in the one-to-one environment at the Learning Center.

Grade-Level Planning and Professional Development

Learning Centers structure ways for interns, mentor teachers, and university professors to collaboratively explore the possibilities of effective one-to-one technology integration. The first Learning Center had already established a highly effective practice of conducting grade-level planning sessions. The STAT teacher led each session, which included mentors, teachers, interns, and sometimes Towson University professors. During the early stages, these grade-level planning meetings often addressed technology frameworks that would help teachers consider best practices around technology integration. Each planning day was structured around (a) examining school and classroom data as a starting point, (b) introducing an instructional technology concept, and (c) conducting instructional rounds in the classrooms to search for evidence of the concept at work. The latter portion of each day-long session was then devoted to collaborative planning among the teachers, resource staff, and university interns. They work together to design lessons based on what they had learned during the morning's activities. In one of these sessions, the STAT teacher began the year presenting and helping teachers and interns search for effective examples of the SAMR Framework for technology integration (Puentedura, 2006). SAMR stands for "Substitution, Augmentation, Modification, and Redefinition," and it helps teachers and interns design lessons that go far beyond using technology as substitution tasks that have little educational value. For example, teachers and interns at different PDS sites across the district could now conduct conversations with real second graders at their schools by using Skype sessions together. This allows them to describe, show pictures, and ask questions of each other about their respective rural and urban community neighborhoods to make the concepts in the curriculum immediately applicable to their own students' experiences.

At the beginning of the school year, mentors and interns gained a foundation for lesson-planning with the SAMR model. Later in the year, an educational technology professor attended the grade-level meetings and worked in planning teams with teachers and interns. These teams integrated and extended the use of technology to differentiate instruction for all students. Grade-level teams of teachers and interns also worked to identify ways to deepen their use of SAMR to plan ways of redefining instructional activities and learning through the use of technology.

The grade-level planning meetings provide an excellent example of how the Learning Center enhanced learning for all the PDS partners. Mentor teachers and interns learn alongside one another, and the interns' expertise as "digital natives" (Prensky, 2001) in social media and various apps combine with the mentors' expertise in instruction and students' learning needs leading to a better understanding of effective technology integration. In addition, the university professor's expertise in instructional technology supports the interns' and mentors' learning, while also providing a setting where the professor could consider how technology could be used to address the needs of this school and its students.

Instructional Rounds

Opportunities for reflection about the use of instructional technology occur as university professors outside the Learning Center bring their students to examine technology-infused lessons.

Towson University professors brought students in various on-campus classes to the Learning Center for opportunities to conduct instructional rounds. These rounds focus on the rich and technologically-enhanced student learning environments throughout the school. For example, a special education professor brought her class, which was learning about Universal Design for Learning, to talk with the STAT teacher and participate in instructional rounds. They visited classrooms throughout the building and attended a debriefing session afterwards to consider how technology could enhance UDL implementation.

Another professor co-taught an Urban Education class with the BCPS Learning Center Liaison, hosting over half of the class sessions on-site at the Learning Center. The students in the course examined effective technology use and other effective instruction that would engage urban students. This class produced video presentations that included video clips captured at the Learning Center to illustrate the concepts from the course. For the culminating project, students presented how to build a better urban school using video, interviews, and multimedia footage that they captured at the Learning Center.

Using Technology to Share Professional Learning and Expertise

Distance Learning

One of the most exciting uses of technology in the Learning Centers has been designing digital platforms for sharing the learning of interns, mentors, administrators, and university faculty. In some cases, we share knowledge and expertise among the PDS partners, and at other times we share our learning beyond the walls of the Learning Centers. For example, the seminar sessions on technology integration, co-taught by the mentor teachers and the university supervisor at the first Learning Center, were so useful that we decided to offer them through a distance learning format. This enabled interns at more remote sites in neighboring school districts to attend.

Because our first foray into distance learning proved successful, we wanted to provide more opportunities to share our learning with a wider audience. This led us to design longer, more intensive digital learning modules in collaboration with the Maryland Writing Project (MWP). One important aspect of the MWP/Learning Center collaboration is the creation of new knowledge and insights about teaching writing. Teachers who participate in MWP's summer workshops (a) share about the writing instruction they have found effective in their own classrooms, (b) examine research about promising, evidence-based practices for teaching writing, (c) design new, innovative instruction that will meet the needs of students in their schools, and (d) create new curriculum resources to use in the classroom. By the end of the two-week workshop, teachers have generated new ideas about how to teach writing as well as artifacts such as lesson plans, teaching materials, and model texts that can be shown to students as exemplars.

An important goal of both MWP and the Learning Centers is sharing teachers' learning and expertise with other educators. Over its 30 year history, MWP had provided many different opportunities for teachers to disseminate their knowledge, but often, the venues and formats used allowed for only short presentations to a relatively small number of attendees. In light of the Learning Center mission to share knowledge across institutions with as many educators as possible, we wanted to find a more impactful way to share what the teachers had learned during the summer workshop.

In the summer of 2015, teachers who participated in MWP's summer workshop began designing digital learning modules to disseminate the knowledge and insights they gained during the workshop. These modules cover a variety of topics related to writing instruction, such as early childhood writing, multimodal composing, developing classroom writing communities, and teaching reluctant writers. Working in small groups, the MWP teachers use PBworks wikis (available at http://www.pbworks.com) to design 15-hour, online professional development modules for other teachers. Each module combines elements created by the designers (the MWP teachers), such as narrated PowerPoint presentations and videos of instruction made in their own classrooms, as well as "found" resources such as scholarly readings and videos from The Teaching Channel (https://www.teachingchannel.org). The teacher-designers also create interactive elements, including opportunities for written reflections and lesson planning.

For example, the first lesson in the module on Poetry Writing guides participants to write a reflection about their experiences teaching poetry, view a presentation created by the module's teacher-designers, view a publically available TED talk about "why people need poetry" (https://www.ted.com/talks/stephen_burt_why_people_need_poetry?language=en), and read an article about the importance of teaching poetry. During subsequent lessons, participants view examples of classroom instruction through Teaching Channel videos. They also write their own poems that could serve as model texts for their students, and they engage in an author study through a process that could be used in their classrooms. In addition, the teacher-designers include examples of digital poems written by their students and guide participants through the process of composing their own digital poems. The culminating activity engages participants in applying what they have learned by asking them to design lesson plans for teaching poetry writing.

The digital learning modules have proven to be a powerful way to share the learning that occurs through the MWP summer workshop. The teachers develop deep, rich understandings about writing instruction, and their knowledge extends far beyond what might be conveyed in a traditional, two-hour "sit and get" professional development. The digital modules allow the teacher-designers to combine written, visual, and audio elements into multimodal experiences that capture the breadth and depth of their expertise. The length of the modules--five to eight lessons, with each lesson designed to take two to three hours for participants to complete--provides "space" for them to share a significant portion of what they know about teaching writing.

The modules also provide a deep, rich learning experience for the participants who use them. The technology makes it possible for them to see videos of actual classroom instruction, view texts written by real students, read research that they may not have been able to locate on their own, and plan lessons under the guidance of the module designers. Again, the length of the modules allows for a more in-depth learning experience than a more traditional workshop. At the same time, though, because the modules are self-paced and available online, they are more appealing and accessible to many teachers than a face-to-face afterschool or Saturday workshop.

The digital nature of the modules also allows us to disseminate them widely. We are currently working with BCPS's English Language Arts Office to offer the modules to all district teachers as an option for continuing professional development. This is an important step toward making the Learning Centers true centers of learning that contribute to the quality of instruction across the entire district.

Designing the digital learning modules was a time consuming process. The teachers began developing them during MWP's summer workshop, but they did not complete the process until December 2015 or May 2016. To accommodate the time needed to finish this work, we created a

graduate course, offered through Towson University, which focused on designing, testing, and revising the modules. Some teachers registered for the Fall section of the course and completed their work by December, while others opted to register for the Spring section. Teachers in the Spring section wanted to collect work samples and videos of instruction in their classrooms across the entire school year and include these artifacts in their modules.

Websites, Wikis, and Twitter

Because the very foundation of what makes a Learning Center effective is difficult to capture with static words on a page, we have used websites extensively to share our work. The steering committee worked with the professional film crews and editors from The Education Channel, the BCPS internal television network that broadcasts on a local channel. With their expertise, we were able to embed short video clips into an infographic that captures the six tenets of the Learning Center framework in a way that a simple flyer or poster would fail to communicate. To view the framework, go to: https://magic.piktochart.com/output/8075316-the-learning-center#.VhguU8VGg>>P>A.gmail.

The Learning Center also sponsors a wiki of resources that grew out of the Maryland Writing Project (MWP) summer workshop in 2015. The BCPS English Language Arts Office identified a need in secondary schools for professional development around process writing and helping students revise their drafts. We formed a subgroup of middle and high school teachers who had participated in the MWP workshop, and they created and collected a large number of resources to support revision in secondary classrooms. For example, they designed "revision stations" that allow students to engage in multiple revisions of a draft. Each station guides students through a series of collaborative activities that teach them how to revise one aspect of their compositions, such as sentence variety, descriptive language, dialogue, introductions, and conclusions. Upon completing a station, each student then revises their draft using the strategies they learned at the station. The wiki includes directions for teachers about how to implement each revision station as well as all the student materials needed to engage in the stations' activities.

As with the digital learning modules, the wiki proved an extremely valuable platform for teachers to share their learning, enhance other teachers' learning, and, ultimately, provide deeper learning opportunities for students. The wiki designers offer professional development to schools across the district and share the wiki resources. These digitally-housed materials make it possible to upscale the effective instruction that the teachers had designed during the MWP summer workshop.

Another Learning Center created a website in partnership with the Maryland Writing Project (MWP). In light of the time-consuming nature of designing digital modules during Summer, Fall, and Spring of 2015-2016, we looked for a different way to disseminate the learning of teachers who attended MWP's summer workshop in 2016. Rather than designing learning experiences for other teachers, Summer 2016 participants created curriculum resources, including lesson plans, unit outlines, examples of teaching materials, and explanations of how to set up a writing workshop in the classroom. To disseminate this work, the teachers created a website using Weebly.com. Like the learning modules, the website allows teachers to share their learning multimodally and include visual, textual, and audio components. The site is also readily accessible to teachers within BCPS. Furthermore, during the entire Maryland Writing Project workshop, we used Twitter as a social media vehicle to spread the word about our efforts and engender interest

from the greater educational community. Thus, the Learning Center once again shared its knowledge and learning beyond its own walls.

Video Applications

The use of video technology is also transforming the ways that interns learn to teach, how university faculty prepare interns for the classroom, and ways that mentor teachers can give interns feedback. Towson University's College of Education has begun implementing a "clinical" curriculum (Grossman, Hammerness, & McDonald, 2009) in which preservice teachers learn, and then extensively rehearse, good "high leverage practice" (Teaching Works, 2016). This curriculum requires interns to video their teaching, analyze it, receive feedback about it from their peers and university professors, and then improve their teaching based on the feedback. We are currently using Swivl, a cloud-based service that allows interns to upload and share a video of their teaching and then receive written feedback that points to specific sections of the video. For example, when an intern clicks on a comment, the video jumps to the point in the video where the viewer made the comment. This allows interns to connect specific feedback with specific points in the lesson.

Although we are currently piloting the clinical curriculum and Swivl platform only at the university, this technology offers the possibility that a Learning Center's members could share their expertise with interns who are not in field placements there. Using the online platform, mentor teachers could view the teaching of interns who are still in campus-based courses and provide feedback about their teaching. Preservice teachers would benefit from the feedback of practicing teachers in addition to the comments provided by their university professors. However, mentors would also benefit from seeing how interns early in the program (pre-internship) gain teaching skill. This would help mentors to better understand the developmental progression of "becoming a teacher" and could inform and enhance their abilities to give feedback to interns at later points in the program.

While we have used distance learning technologies, websites, wikis, Twitter, and Swivl as ways to share learning and expertise, we see further opportunities to explore other technologies. Google Hangouts, Skype, and other interactive media are ripe with possibilities to support distance learning. In our future work, we plan to investigate how technology can help us connect with an even wider array of educators to share knowledge and improve learning for all K-12 students, interns, mentors, and university faculty.

Final Thoughts

Technology enables us to create a rich collaborative context within the Learning Centers and beyond. We use technology not just for the sake of using it, but to further the Learning Center goals in substantive ways. As we seek to make teaching and learning public, develop and honor local expertise, disseminate new knowledge and insights, and create a collaborative learning environment for interns, mentors, and university faculty—all goals of the Learning Centers—we see technology as crucial to our efforts. We have learned that we must select technology for specific outcomes that will further the learning of the various stakeholders within the school-university partnership. The students at the PDS site are ultimately the most important stakeholders,

and the thoughtful use of technology allows the adult activity and learning that surrounds students to contribute to their success as learners.

References

Barnett, M. (2006). Using a web-based professional development system to support preservice teachers in examining authentic classroom practice. *Journal of Technology and Teacher Education, 14*, 701-729. Retrieved from http://www.aace.org/pubs/jtate/

Decker, L. A., Kennedy, M. J., Smith, S., Vasquez, E., Rock, M., Thomas, C. (2014). Use of technology in the preparation of pre-service teachers (Document No. IC-11). Retrieved from University of Florida, Collaboration for Effective Educator, Development Accountability, and Reform Center website: http://ceedar.education.uft.edu/tools/innovation-configurations/

Grossman, P. L., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching: Theory and Practice, 15*(2), 273-289. doi:10.1080/13540600902875340

National Association of Professional Development Schools (2008). *What is means to be a professional development school: Nine essentials.* Retrieved from http://napds.org/nine-essentials/

Prensky, M. 2001a. Digital natives, digital immigrants. *On the Horizon 9*(5), 1-6. Retrieved from http://www.emeraldgrouppublishing.com/products/journals/journals.htm?id=oth

Puentedura, R. (2006). *SAMR model*. Retrieved from http://hippasus.com/resources/tte/part1.html--2006

Sutton, S. R. (2011). The preservice technology training experiences of novice teachers. *Journal of Digital Learning in Teacher Education 28(1)*, 39-47. Retrieved from http://www.iste.org/resources/thought-leadership/edtech-research

Teaching Works (2017). High leverage practices. Retrieved from http://www.teachingworks.org/work-of-teaching/high-leverage-practices

Theodore, P.A. & Searcy, L.B. (2005). Using computer-mediated bulletin board discussions to facilitate critical and reflective thinking among teacher education students in a professional development school. *Educational Media and Technology Yearbook*, *30*, 102-109. Retrieved from http://link.springer.com/bookseries/8617

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The Cognitive Apprenticeship Model, Backchanneling Technology, and Reflection in Early Clinical Experiences: A New Practice for Field-Based Courses in the Professional Development Schools

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Abstract: Teacher preparation programs have historically experienced logistical and epistemological struggles in implementing earlier clinical experiences, despite the value placed on reflective practice in early clinical experiences. To address this issue, the author, a university faculty member, partnered with a Professional Development School (PDS) to design a new PDS practice before the clinical experience. The new practice grounds itself in the Cognitive Apprenticeship Model (CAM) and backchannel technology in order to emphasize the implementation of this teaching theory into practice.

The practice uses a field-based social studies methods course to co-observe in-service teachers. Students observe with their classmates and their methods instructor, who serves as a teaching coach to the pre-service teachers. The coach uses backchannel chat technology (group text discussions) to orient, in real-time, the pre-service teachers' attention to the in-service teachers' pedagogical choices. This encourages pre-service teachers to embark in metacognition, reflective practice, and a real-time conversation surrounding clinical practices. After the observation period, the in-service teachers attend the methods course with the pre-service teachers and engage in the class discussion to further explicate their practice. This innovative use of technology, observation, and cooperation between the Institute of Higher Education (IHE) and the PDS facilitates scaffolded experiences of clinical practice through authentic learning in the PDS.

KEYWORDS: backchannel, clinical practice, cognitive apprenticeship, preservice teachers, Professional Development Schools, teacher preparation, technology integration

NAPDS NINE ESSENTIALS ADDRESSED:
2. A school–university culture committed to the preparation of future educators that embraces their active engagement in the school community;
4. A shared commitment to innovative and reflective practice by all participants;
5. Engagement in and public sharing of the results of deliberate investigations of practice by respective participants; and
8. Work by college/university faculty and P–12 faculty in formal roles across institutional settings

Effective Professional Development School (PDS) partnerships emphasize the implementation of teaching theory into practice through the use of deliberate and reflective analysis of best practice (Brindley, Field, & Lessen, 2008). Education preparation programs (EPPs) have long recognized the significant role of reflection in teacher preparation. Reflection

supports the creation of the specialized body of professional knowledge necessary to the profession of teaching (Dewey, 1910, 1916; Schön, 1983, 1987; Shulman, 1986). PDS partnerships should help support this critical skill of reflection; however, as the PDS movement has grown, the implementation and use of PDS has at times become diluted (Brindley et al., 2008).

One of the biggest obstacles to reflection in PDS is the structure of teacher preparation programs themselves (Chepyator-Thomson & Liu, 2003; Kim & Silver, 2016). Teacher preparation programs have accepted and adopted the belief that reflection is critical to professional knowledge and professional identity, but they continue to fail at providing frequent and meaningful clinical-based experiences for reflection (Chepyator-Thomson & Liu, 2003). Despite the growth of the PDS movement, students still spend the majority of their first three years of coursework on campus and then suddenly are thrust into the position of pre-service intern in a PDS for their professional year (Chepyator-Thompson & Liu, 2003). Pre-service interns may demonstrate a disconnect between their theoretical studies and the practical application of their studies (Previts, Kleine, & Mizelle, 2013; Zeichner, 2010). While methods exist which mirror the authentic experience of clinical practice (Colbert, Trimble, & Diesberg, 1996), due to time constraints and the need for a reflective skill set in place before the practice begins, it remains difficult to place pre-service teachers in more frequent and meaningful clinical settings (Troyan, Davin, & Donato, 2013).

A solution to the lack of skill development offered to pre-service teachers under the current model may lie in encouraging students to think like teachers before they are asked to assume the identity and role of teacher in their professional year. Teacher preparation programs have attempted this solution through a series of different methods, including action research projects, case studies and ethnographic studies of students, microteaching, and other structured curriculum tasks (Hatton & Smith, 1995). What practitioners have not tried is extensive, field-based practice in the PDS, completed before the full-time internship experience, and using technology to support the Cognitive Apprenticeship Model (CAM).

This new PDS practice utilizes technology embedded in field-based methods courses, offered in partnership with a PDS, prior to the internship experience. The practice provides opportunities to deepen the PDS partnership, develop the metacognitive skills of pre-service teachers, and cultivate a bridge between theory and practice. It affords pre-service teachers the opportunity to experience authentic and meaningful interactions with master teachers and P-12 students. This paper explicates this novel PDS practice designed to address the gap in teacher preparation, in particular the need for more frequent opportunities for reflection in clinical settings. The practice is grounded in the design tenets of the Cognitive Apprenticeship Model (CAM), the essential components of a PDS (Brindley et al., 2008), and the objective is to infuse reflection, clinical practice, and technology into the traditional PDS partnership.

Review of the Literature

Reflection and PDS partnerships as a best practice necessary for effective teacher preparation has become widely accepted and established in the field of education (Brindley et al., 2008; Etscheidt, Curran, & Sawyer, 2012; Grossman, 2008; Ostorga, 2006; Schön, 1987) and are considered the first step in building professional knowledge (Clarke & Hollingsworth, 2002; Kim & Silver, 2016). Professional accreditation standards have adopted reflection as a key component in effective teacher education programs (Interstate Teacher Assessment and Support Consortium,

2011; National Council for Accreditation of Teacher Education, 2008). This reform of teacher preparation to include reflection and PDS evolved as a reaction to the critique of teacher preparation programs as perpetuating an unacceptable status quo of ineffective pedagogy and poor performance outcomes (Gordon, 1985).

Field Based Teacher Preparation Courses

Reflection as defined by Schön (1983, 1987) needs a "text" of authentic experience. It cannot fully exist without the clinical experience of the pre-service practicum. While teacher preparation programs recognize the need for more clinical experience (Troyan et al., 2013), the difficulty in providing more opportunities for these experiences is two-fold. First, preparation coursework may involve scheduling dilemmas. Traditionally, pre-service teachers take preparation courses in order to ready them for their final year of clinical practice (Troyan et al., 2013). These courses often follow a rigid three semester sequence, leaving little flexibility to include clinical experiences during this time.

The second problem dates back to the critiques of earlier apprenticeship models during the clinical experience – those that encouraged replication, not thoughtful application, of a supervising teacher's methods (Zeichner, 1992, 1996). If the pre-service teachers participate in a clinical experience earlier in their educational careers, they do not have the adequate coursework before the clinical experience in order to facilitate effective reflection. Thus, they are ill-prepared to reflect and analyze on the experience. The effectiveness of the clinical experience is lost. Yost, Sentner, and Forlenza-Bailey (2000) call for more clinical experiences in teacher preparation programs that also allow for deep reflective practices.

Building Metacognition Using the Cognitive Apprenticeship Model

Pre-service teachers need to develop reflective practice and the ability to shift thinking practices from novice to practitioner (Clarke & Hollingsworth, 2002; Henry, 2016). They also need a master guide to help them understand what it is they are seeing in the classroom and to help them understand upon what, specifically, they should be reflecting (Loughran, 2002; Rakap, 2017; Zeichner, 1992, 1996). An effective pedagogical approach to address these needs is through a Cognitive Apprenticeship Model (CAM) grounded in the theory of Practice Fields (PF).

CAM considers the organic steps of learning in a traditional apprenticeship as observed by Lave and Wenger (1991) and systemetizes them into a design model, a more formal process which can be transferred to different settings. Lave and Wenger (1991) observed the transfer of knowledge and skills from master tailors to apprentice tailors and noted the process and steps of this transfer. Collins, Brown, and Holum (1991) noted that traditional apprenticeships, like the tailors described by Lave and Wenger, revolve around the transfer of observable and tangible skills; however, in some fields, the knowledge is "hidden" and unobservable. The thinking processes of the master remain obscured from the apprentice. Collins et al. (1991) suggested that the thinking be made visible so that the learner can begin to use similar patterns in her own thinking. To do this, Collins et al. (1991) propose the following process of cognitive apprenticeship:

1. identify the processes of the task and make them visible to students;

2. situate abstract tasks in authentic contexts, so that students understand the relevance of the work; and
3. vary the diversity of situations and articulate the common aspects so that students can transfer what they learn. (p. 9)

Part of making the invisible, visible, hinges on the ability of the coach to foster reflective practices in the learners by modeling the cognitive activity for the learners (Barab & Duffy, 2012). The coach models the thinking while working through a problem. Following this modeling, the coach leads the students through a complex, dynamic, and iterative process (McAlpine et. al., 1999) to identify strategies used to solve the problem (Schoenfeld, 1996).

However, in order to solve a problem, students must realize that a solvable problem exists in the first place. The problem must be made known to them (Loughran, 2002) and framed so that it might be seen from multiple perspectives. Once the problem is framed, students need guidance in *reflecting* on the problem, as opposed to *rationalizing* the problem (Loughran, 2002). *Rationalization* reinforces existing power structures and assumptions about students as the obstacles to learning. *Reflection* encourages examination of power and hegemony and reframes problems as within the practitioner's control (Loughran, 2002). It should lead to new ways of seeing. In a cognitive apprenticeship, the coach models and helps frame this process, so that learners can internalize this habit of mind (Cornish & Jenkins, 2012).

When the Cognitive Apprenticeship model (CAM) has been used in teacher education, it has been used during the student teacher's clinical experience (Kopcha & Alger, 2014). Since the cognitive apprenticeship assumes a clinical practice field in which to model tacit and invisible thinking, the natural place for this type of learning occurs during the clinical experience and tends to focus on the relationship of the mentor teacher and the student intern (Kopcha & Alger, 2014; van Velzen & Volman, 2009).

Technology to Support CAM

Current research focuses on the use of technology to support CAM during the clinical experience. In particular, it focuses on the ways in which the mentor and the university supervisor can foster reflective practices in the student intern (Kopcha & Alger, 2014). Often this entails email or Learning Management System support (Kopcha & Alger, 2014). Since there is a demand in teacher preparation programs to expose pre-service teachers to the field in advance of their clinical experience (Chepyator-Thomson & Liu, 2003), there have been attempts to utilize CAM before the clinical experience through videos of master teachers and guided discussion of the teachers' practices (Liu, 2005). However, utilizing video and encouraging reflection references Case Based Instruction more than CAM. While both methods of instruction value reflection, CAM differentiates itself by focusing on making the invisible, visible, through the use of modeling by a coach or expert.

The advent of mobile technology and the ubiquitous nature of devices has led to backchanneling as another pedagogical possibility to make the invisible, visible. Backchanneling refers to the use of technology to host a conversation about an event, while experiencing the event (Fredrick, 2013). This conversation may occur over social media, or through private texts and messages (Jarret & Devine, 2010). The technique allows users to engage their voices in the larger conversation. It also encourages students to support one another (Husbye & Elsener, 2014) as they reflect on the message of the event. Currently,

backchanneling has not been utilized in the literature as a tool to support pre-service teacher reflection.

Problem Statement

Meaningful reflection is critical to effective teacher preparation (Etscheidt et al., 2012; Grossman, 2008; Ostorga, 2006; Schön, 1987). This reflection should be a metacognitive consideration "of action" and "on action" (Schön, 1983, 1987) via multiple modalities and opportunities (Etscheidt et al., 2012). This type of teacher preparation leads to more effective teaching and the development of a professional capacity to shift thinking from novice to practitioner (Clarke & Hollingsworth, 2002).

Teacher preparation programs have attempted to develop reflective practice using case based analysis learning designs; however, the literature points to a need for more authentic experiences throughout the teacher preparation program (Etscheidt et al., 2012; Troyan et al., 2013). However, students still lack meaningful clinical experiences before their internship experience in a PDS. EPPs have struggled to simultaneously develop the skills of reflection and provide earlier, authentic, clinical experiences. This dilemma leads to the following question: *How can teacher preparation programs support the development of teacher reflection on practice? Specifically, how can they:*

1. *Provide earlier, more meaningful, clinical experiences;*
2. *Make visible the hidden cognitive processes of experts in the field;*
3. *Facilitate reflection "in action" and "on action" (Schön, 1983, 1987);*
4. *Connect theory and practice?*

PDS partnerships are intended to offer a solution to these issues, as evidenced by the nine essential components of *What it Means to Be a Professional School* (Brindley et al., 2008). Unfortunately, though the literature calls for reflection in more frequent clinical settings, EPPs have not yet consistently partnered with PDSs to address this call for early clinical experiences.

Learning Design Model: PDS, CAM, and Technology

CAM, using backchanneling between the pre-service teachers and the methods instructor, provides a potential instructional design solution to this dilemma. This model uses digital backchanneling in a CAM to examine the potential of a field-based middle school methods course to encourage pre-service teacher reflection in an authentic, PDS, setting. The PDS CAM has the overall goal of developing reflective practice. To develop the reflective practice, the methods instructor assists in modeling the invisible thought processes of the master teacher in the PDS. The methods instructor also facilitates students' ability to make connections between theory and practice.

In order to meet the need to place students in the field earlier in their experience and to encourage reflective practice before the clinical experience begins, the learning design for this research utilizes CAM in a field-based methods course. The course meets out in the field in a PDS middle school, and for the first 45 minutes of the course, the pre-service teachers and the methods instructor observe a middle school classroom. In the past, during this observation period, the pre-service teachers were given a list of "look-fors" so that the gaze of the pre-service teachers could be appropriately oriented toward the invisible work of the teacher. However, this list fell short in helping pre-service teachers identify problems and hone in on important

pedagogical and management decisions made by the master teacher in the PDS.

The pre-service teachers would leave sections of the observation form blank because they could not see the connections between the in-service teacher's pedagogical methods and the pedagogical theory that the pre-service teachers were learning in class. The pre-service teachers also remarked regularly on student behavior, but they could not identify how the teacher addressed the student behavior. For instance, the pre-service teachers were all able to identify which students were off task, but the pre-service teachers could not identify techniques the in-service teacher utilized to re-engage off task students. This reinforced *rationalization* (Loughran, 2002), including remarks from pre-service teachers that learning issues resulted because "It is the student's 'fault'" as opposed to *reflection* such as, "The practitioner has the ability to negotiate a solution." Since the pre-service teachers could not see the invisible processes of the in-service teachers, the pre-service teachers were also unable to make connections between the theory and the practice occurring in their midst.

Learning Objectives

Thus, to further develop the guided reflective practice, the methods instructor developed the new PDS practice, grounded in CAM design, to help model the invisible thought processes of the master teacher as well as to encourage students to make connections between theory and practice. In order to do this, pre-service teachers must be able to "see" the hidden cognitive processes of experts in the field. They also need to learn to reflect both "in action" and "on action" (Schön, 1983, 1987). Another goal of pre-service teaching, and of effective PDS partnerships, is to connect the theory that students have learned in classes with practice that they observe, and eventually act upon, out in the field. While the coach will begin this process, the pre-service teachers will gradually begin to moderate and lead these discussions. Finally, pre-service teachers need to develop a professional identity earlier in their pre-service career.

Audience

The learners making the connection between theory and practice are the pre-service teachers who have not yet begun their full time practicum. Once they enter their full time student teaching, these pre-service teachers will spend a significant portion of their time reflecting on practice (Kopcha & Alger, 2014). They should enter that experience more prepared to reflect on practice and with a more comprehensive understanding of the invisible cognitive processes of an effective teacher.

CAM, PDS, and Technology: Description

A practice field focuses on cognition of students in an artificial setting which replicates a real-world authentic environment (Barab & Duffy, 2012). A particular style of practice field, the cognitive apprenticeship, encourages a coach or mentor to model a style of thinking (Barab & Duffy, 2012). In the middle school methods practice field, the students are learning to teach by observing and practicing in a pseudo-teaching environment. The mentor or coach is the methods instructor who encourages students to embark in metacognition by highlighting the in-service teachers' pedagogical choices, and then encourages the pre-service teachers to consider why the

pre-service teacher made those particular choices.

The CAM utilizes a three-part model to make visible the invisible processes of a practice (Collins et al., 1991). First, the process must be made known to the students (Collins et al., 1991). A coach or mentor makes the students aware that a problem exists (Loughran, 2002) and frames the problem, not as an issue that needs rationalizing, but instead, needs reflection (Loughran, 2002). This leads to the second part of the process in which the mentor situates the problem in an authentic context (Collins et al., 1991). This helps the learner see the relevancy of an action or actions (Collins et al., 1991). It also reframes the problem as within the practitioner's control and leads to new ways of seeing (Loughran, 2002). Finally, as the apprentice sees the problem, understands the context of the problem, and begins to feel empowered to reflect and utilize processes to work through the problem, the last stage of the CAM occurs when the learner can transfer this understanding to a different situation.

The first step of this process, making the problem visible, occurs during the 45-minute observation period. However, instead of utilizing the failed observation form from the previous semester, the CAM mentor now uses backchanneling to make the problem visible. This backchanneling, or the phenomenon of sharing information with others while simultaneously involved in an event (Fredrick, 2013), accesses the affordances of mobile technology to reflect using Schön's (1983, 1987) "in" and "on" action. In this example, the mentor and the learners access backchannelchat.com across their mobile devices, in order to unobtrusively reflect on the in-service teacher's decisions in real-time. However, there are similiarly functioning backchanneling tools available online or through applications for mobile devices. The methods instructor highlights certain decisions of the master teacher, thus identifying problems for the learners, and then facilitates and encourages the pre-service teachers' engagement in conversation, reflection, and questioning of the choices of the master-teacher. The backchannel also leaves a trail of data, which both the learners and the coach can mine in order to measure growth and understanding of theory, practice, and reflection.

In the second part of the CAM process, the coach or mentor situates the abstract tasks into authentic contexts (Collins et al., 1991). This frames the problem from multiple perspectives and allows students to consider multiple solutions (Loughran, 2002). Since the methods class observes a middle school social studies teacher in an authentic classroom located in the PDS, the learners see the processes in the most authentic environment. Though they themselves are not yet in a clinical experience, the learning design model prepares them for that clinical experience. Using the PDS model, learners access the clinical field. Then, using technology, the methods instructor models reflective practices in real time. Once the coach orients the novice teachers' attention to the hidden practices, the coach backchannel texts the other learners and asks reflective questions such as, "What is the teacher doing, pedagogically, to address the problem?", "Notice the teacher's management strategy for negotiating this situation. What do you see her doing?" The coach guides the learners' gazes toward relevant processes occurring in the classroom, then asks the learners to reflect on what they are seeing and to make connections to the theory they have learned in their education classes.

Finally, the last component of the CAM occurs when the learners can transfer the knowledge they have learned (Collins et al., 1991). This transfer occurs by varying the diversity of a situation (Collins et al., 1991). In this learning design model, the coach scaffolds the reflective process, leading to a gradual transformation for the learners from guided reflection to active reflection. Eventually, the learners lead the backchannel discussions, as the class observes

different social studies classes in different settings.

An effective way to support effective reflection on practice is through the grounded design of a PDS CAM which encourages reflective thought. The CAM is utilized before the full-time clinical experience, but it is still able to access a genuine field based experience, because the experience occurs in a PDS based methods course. Instead of a mentor teacher or university supervisor serving as the coach, the methods instructor serves as the "expert thinker" who models the hidden cognitive processes of the classroom teacher and helps to identify and frame problems with in the classroom.

Project Assessment

This learning design model was useful to immediately orient pre-service teacher attention toward management, teachers' instructional choices, teacher reflection, and praxis. It helped to deepen pre-service thinking about teacher choices. The archived discussions were helpful for students to use as reference for growth. Sometimes, the technology got in its own way, because the PDS' internet slowed and had a firewall. Sometimes the software overloaded if there were too many users at once.

Since the project contains multiple learning goals, the assessment utilized several tools for data collection. In order to assess how effectively students were able to "see" the hidden cognitive processes of teachers, how effectively students were able to note a theory put into practice, and to exercise their own reflective abilities in action, students completed weekly journals. Student journals noted the

a. cognitive processes that they saw in the day's lesson which they would not have seen without the observation and back-channeling,
b. times that they observed a specific theory they learned being put into practice,
c. an alternative method to either teacher or manage a situation from the day's class as supported by a specific theory.

Journaling served two purposes. First, the journal acted as a formative assessment for learning, since journaling encourages reflection (Cornish & Jenkins, 2012). It also served as an assessment of learning so that the instructor could shift instructional practices based on how frequently and effectively learners noted processes, theories, and praxis.

The instructor also used the backchanneled conversations as formative assessment tool. The backchanneled conversations were saved on the learning management system. This afforded the instructor the opportunity to review the conversations in order to observe and analyze trends in student reflection and learning. The instructor shifted questioning techniques based on student responses in the backchannel chats.

The backchannel chats included conversations focused on instructional planning. For example, when discussing a teacher's PowerPoint slides:

STUDENT A: I like how she has the objective written on every slide
PROFFESOR: Yes - what purpose would that serve - having the obj on each slide?
STUDENT B: The students are able to see that what they are doing will relate back to that objective in some way
STUDENT C: So the students are aware of what they are trying to accomplish
STUDENT A: The students know exactly where the lesson is heading. It may act as a guide for them

Sometimes the chats helped illuminate praxis. The following chat demonstrates this type of reflective conversation:

> STUDENT A: station activities promote cooperative learning
> STUDENT B: Stations are a great form of inquiry based learning
> STUDENT C: now it appears the more students are working individually and only collaborating with peers once they answered their question
> STUDENT D: Student centered learning is all the rage now
> PROFESSOR: @Student_D, can you talk a little bit more about that? Why do you think that is?
> STUDENT B: Students learn from one another and have fresh insight to give each other
> STUDENT E: I think it has to do with the generation of the students now. Student centered learning is all the hype because now they've discovered that students learn better when being able to do the work themselves with the opportunity to socialize with their peers
> STUDENT A: They become active participants in their own learning
> STUDENT D: Student centered learning has the student as the CENTER of the lesson. The teacher needs to plan a lesson that caters to the development and learning levels of their students. The most important part of a lesson is asking yourself as a teacher, "are my students meeting the objectives and how can I help my students meet those objectives"
> PROFESSOR: @STUDENT A, @STUDENT B, and @STUDENT D - I think, too, that it is grounded in a particular theory of learning as well. We didn't just wake up one day and say - it would be fun and beneficial to make students the center of learning!

Another interaction also demonstrates the way that live backchannel chat facilitated discussion about the implementation of Bloom's Taxonomy in practice:

> PROFESSOR: Think about our lesson last week and how you can organize the study of world history/cultures. How might this lesson fit into that structure?
> STUDENT A: In terms of learning theory – I think that the worksheet is set up in a way that scaffolds the student's thinking and guides them as they prepare to watch the film and as they watch the film.
> PROFESSOR: Yes! Can any of you weigh in on how the worksheet is structured in terms of Blooms Taxonomy and content?
> STUDENT B: The worksheet breaks down the key words and phrases the students have to understand. Then as the assessment the students have to take what they understood from the word and phrases and apply it to the importance of trans-Saharan trade.
> STUDENT C: The worksheet itself shows Blooms because it starts with knowledge questions and at the end has moved up to the analysis question.
> STUDENT D: Building off what STUDENT A, B, and C, said, the summary question is very effective. It is asking the student to compare and contrast modern day trade in the Saharan to traditional trans-Saharan trade. Helping the student pull knowledge from different areas to form their own ideas.

Sometimes the chats focused on management, like the following:

> PROFESSOR: Kid in back by STUDENT A is not doing the work. What strategy did the

teacher use to try and get him involved? Was it successful?
STUDENT B: He just encouraged him to do the work and told him that he wasn't going to help him if he couldn't help himself. Student is still resistant but picked up his pencil and started writing a little bit
STUDENT C: He said I'm not going to help you if you don't help yourself but it seems the students is still resistant like STUDENT B said
PROFESSOR: What else could a teacher do in this situation? "Passive resistance" in students is a common problem.
STUDENT B: I think the students can't play the war game if they aren't done with the worksheet right?
STUDENT D: In order to know how to address the passive student I think we need to know more. Is the student disengaged because they do not understand the content? Is it something else?
PROFESSOR: @STUDENT_D, great point. Speaks to a need to individualize your instruction and get to know your students.

Sometimes the chats could be used to illuminate the balancing of management and learning. For instance in the following chat, the pre-service teachers dissect the hidden work of the in-service teacher they are observing:

STUDENT A: She's really on top of time management with the students.
PROFESSOR: Look at all of the things that she is balancing right now: PBIS initialing, student wanting to turn on the fan; still running a meaningful discussion.
STUDENT B: She's giving out "PBIS Points" because students were responsible, prepared, respectful, and so on. A great way to reinforce correct behavior for all students.
STUDENT C: She definitely seems like the type of teacher who is understanding of student needs/problems.

In another instance, the pre-service teachers discussed how the in-service teacher managed the class during a brief video:

PROFESSOR: Another thing to consider: Social studies has a lot of great opportunities to show meaningful videos/visual media. What do you like and what might you do differently if showing this film? What is the teacher doing to facilitate the best understanding of the movie?
STUDENT A: She fast forwards the movie to the important parts.
STUDENT B: I'm pretty sure almost every student is watching!
STUDENT C: Maybe for a different approach with the film, she could pause after an important scene and have a brief class discussion based around it.
STUDENT D: Given the cultural diversity in this class, this video can definitely be a way for students to connect their cultural backgrounds to what they are learning.

Another discussion centered on the teacher's practices when guiding a discussion. The pre-service teachers noted how engaged the students were. That prompted the following backchannel conversation:

STUDENT A: She asks a lot of good guiding questions to the class. She's having more

of a conversation with the class.
STUDENT B: Yeah, she seems really competent at guiding class participation.
PROFESSOR: Ok, so WHY is she competent? What is she doing to guide her discussion well?
STUDENT A: She's knowledgeable about the content and is able to ask guided questions on the spot depending on student answers.
STUDENT C: Her knowledge goes deeper than just the movie. She has a clear understanding of the culture's values and their impact on the world.
STUDENT D: She is a competent guide because she asks the students to talk beyond the content on the paper. She uses the discussion to help students gain more context on the info/forces them to think critically about the content.

This new PDS practice has also encouraged a closer relationship between the university and the PDS partner. The in-service teachers debrief with the social studies methods class, and the pre-service teachers have an opportunity to ask the in-service teachers about intentional pedagogical choices evidenced in the lesson. The pre-service teachers are able to ask questions specifically related to their reflections on the earlier teaching.

Conclusion

PDS partnerships help develop teachers' ability to connect theory to practice (Brindley, et al., 2008). A useful way to meet this goal is through the grounded design of a CAM which utilizes backchannel technology to encourage reflective thought. The CAM occurs before the clinical experience, but because of the PDS partnership, it is still able to use a genuine field based experience. Instead of a mentor teacher or university supervisor serving as the coach, the methods instructor serves as the "expert thinker" who models the hidden cognitive processes of the PDS partner classroom teacher and helps to identify and frame problems with in the classroom. This new application of both the CAM and the field based methods course within the PDS partnership leads to deliberate and reflective analysis of best practices of teaching and learning. It supports pre-service teacher candidates' reflective skills while simultaneously supporting pre-service experience in a clinical setting.

References

Barab, S.A., & Duffy, T. (2012). From practice fields to communities of practice. In D. Jonassen & S. Land (Eds.), *Theoretical Foundations of Learning Environments 2nd Ed.* (pp. 29-65). New York, NY: Routledge.

Brindley, R., Field, B.E., & Lessen, E. (2008). *What it means to be a Professional Development School: A statement by the Executive Council and Board of Directors of the National Association of Professional Development Schools.* Waco, TX: NAPDS. http://www.napds.org/9%20Essentials/statement.pdf

Chepyator-Thomson, J. R., & Liu, W. W. (2003). Pre-service teachers' reflections on student teaching experiences: Lessons learned and suggestions for reform in PETE programs. *Physical Educator, 60*(2), 2-12. Retrieved from http://search.ebscohost.com

Clarke, D. & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education, 18,* 947-967. http://dx.doi.org/10.1016/S0742-

051X(02)00053-7

Colbert, J. A., Desberg, P., & Trimble, K. D. (Eds.). (1996). *The case for education: Contemporary approaches for using case methods*. Boston, MA: Allyn and Bacon.

Collins, A., Brown, J.S., & Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. *American Educator, 15*(3), 6-11, 38-46.

Cornish, L. & Jenkins, K.A. (2012). Encouraging teacher development through embedding reflective practice in assessment. *Asia-Pacific Journal of Teacher Education 40*(2), 159-170. http://dx.doi.org/10.1080/1359866X.2012.669825

Dewey, J. (1910). *How we think.* Lexington, MA: D.C. Heath & Co.

Dewey, J. (1916). *Democracy and education.* New York, NY: The Free Press.

Etscheidt, S., Curran, C.M., and Sawyer, C.M. (2012). Promoting reflection in teacher preparation programs: A multilevel model. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children, 35*(7), 7-35. doi: 10.1177/0888406411420887

Fredrick, K. (2013). Backchanneling: The conversation behind the conversation. *School Library Monthly, 29*(8), 24-25.

Gordon, B.M. (1985). Teaching teachers: Nations at risk and the issue of knowledge in teacher education. *Urban Review, 17,* 33-46. doi:10.1007/BF01141633

Grossman, R. (2008). Structures for facilitating student reflection. *College Teaching, 57,* 15-22. http://dx.doi.org/10.3200/CTCH.57.1.15-22

Hatton, N. & Smith, D. (1995). Reflection in teacher education: Towards definition and implementation. *Teaching and Teacher Education, 11*(1), 33-49. http://dx.doi.org/10.1016/0742-051X(94)00012-U

Henry, A. (2016). Conceptualizing teacher identity as a complex dynamic system: The inner dynamics of transformations during a practicum. *Journal of Teacher Education, 67*(4), 291-305. doi: 10.1177/0022487116655382

Husbye, N.E., & Elsener, A.A. (2014). To move forward, we must be mobile: Practical uses of mobile technology in literacy education courses. *Journal of Digital Learning in Teacher Education, 30*(2), 46-51. http://dx.doi.org/10.1080/21532974.2013.10784726

Interstate Teacher Assessment and Support Consortium. (2011). *InTASC model core teaching standards: A resource for state dialogue.* Washington, DC: Council of Chief State School Officers.

Jarret, K., & Devine, M.A. (2010). Get your students talking about what you want them to talk about: How to use backchanneling in your classroom. *NJEA Review, 83,* 10-20.

Kim, T., & Silver R.E. (2016). Provoking reflecting thinking in post observation conversations. *Journal of Teacher Education,* 67(3), 203-219. doi: 10.1177/0022487116637120

Kopcha, T.J., & Alger, C. (2014) Student teacher communication and performance during a clinical experience supported by a technology-enhanced cognitive apprenticeship. *Computers & Education, 72,* 48-58. http://dx.doi.org/10.1016/j.compedu.2013.10.011

Lave, J. & Wenger, E. (1991). *Situated Learning: Legitimate peripheral participation.* New York: Cambridge University Press.

Liu, T-C. (2005). Web-based cognitive apprenticeship model for improving pre-service teachers' performances and attitudes towards instructional planning: Design and field experiment. *Educational Technology & Society, 8*(2), 136-149. Retrieved from http://www.jstor.org/stable/jeductechsoci.8.2.136

Loughran, J.J. (2002). Effective reflective practice: In search of meaning in learning about teaching. *Journal of Teacher Education, 53*(33), 33-43. doi: 10.1177/0022487102053001004

McAlpine, L., Weston, J., Beauchamp, J., Wiseman, C. & Beauchamp, C. (1999). Building a metacognitive model of reflection. *Higher Education, 37,* 105-131. doi:10.1023/A:1003548425626

National Council for Accreditation of Teacher Education. (2008). *Professional standards for the accreditation of teacher preparation institutions.* Washington DC: NCATE.

Ostorga, A.N. (2006). Developing teachers who are reflective practitioners: A complex process. *Issues in Teacher Education, 15*(2), 5-20.

Previts, J. L., Kleine, K. L., & Mizelle, N. B. (2013). A New Professionalism in Middle Level Teacher Preparation: Toward a Signature Pedagogy: An Analysis of an Effective Middle Level Teacher Preparation Program Reveals Signature Pedagogies. *Middle School Journal*, *44*(4), 22-29. http://dx.doi.org/10.1080/00940771.2013.11461861

Rakap, S. (2017). Impact of coaching on preservice teachers' use of embedded instruction in inclusive preschool classrooms. *Journal of Teacher Education,* 1-15. https://doi.org/10.1177/0022487116685753

Schoenfeld, A. (1996). In fostering communities of inquiry, must it matter that the teacher knows the "answer"? *For the Learning of Mathematics, 16*(3), 11-16.

Schön, D.A. (1983). *The Reflective Practitioner*. New York, NY: Basic Books

Schön, D.A. (1987). *Educating the Reflective practitioner.* San Francisco, CA: Jossey-Bass.

Shulman, L.S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher 15*(2), 4-14.

Troyan, F.J., Davin, K.J., & Donato, R. (2013). Exploring a practice-based approach to foreign language teacher preparation: A work in progress. *The Canadian Modern Language Review, 69*(2), 154-175. http://dx.doi.org/10.3138/cmlr.1523

van Velzen, C., & Volman, M. (2009) The activities of a school-based teacher educator: A theoretical and empirical explanation. *European Journal of Teacher Education, 32*(4), 345-367. http://dx.doi.org/10.1080/02619760903005831

Yost, D.S., Sentner, S.M., & Forlenza-Bailey, A. (2000). An examination of the construct of critical reflection: Implications for teacher education programming in the 21st century. *Journal of Teacher Education, 51,* 39-49.

Zeichner, K. (1992). Rethinking the practicum in the professional development school partnership. *Journal of Teacher Education, 43,* 296-307. doi: 10.1177/0022487192043004009

Zeichner, K. M. (1996). Educating teachers to close the achievement gap: Issues of pedagogy, knowledge, and teacher preparation. *Closing the achievement gap: A vision for changing beliefs and practices*, 56-76.

Zeichner, K. (2006). Reflections of a university-based teacher educator on the future of college- and university-based teacher education. *Journal of Teacher Education, 57,* 326-340. doi: 10.1177/0022487105285893

Zeichner, K. (2010). Rethinking the connections between campus courses and field experiences in college- and university-based teacher education. *Journal of Teacher Education, 61*(1-2), 89-99. doi: 10.1177/0022487109347671

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The use of Pedagogical Documentation Techniques to Create Focal Points in a School-University Partnership in Early Childhood Education: Technologies that Create a 'Third Space'

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Abstract: In this paper, we examine the use of photo sharing technology in relation to the use of pedagogical documentation at a preschool that works in partnership with a university serving as a research laboratory and teacher training site. Using the theoretical framework of cultural-historical activity theory, we suggest that the photo sharing technology mediates the shared goals of enhancing children's learning experiences, teacher education, and professional development by creating focal points and opening up a 'third space' in which children, their families, teachers, teacher educators, and pre-service teachers have access to localized information on pedagogy and practice. We describe the use of the technology, provide perspectives of stakeholders, and make recommendations for policy and practice.

KEYWORDS: early childhood education, pedagogical documentation, photo sharing, Professional Development Schools, teacher preparation, technology integration

NAPDS NINE ESSENTIALS ADDRESSED:
1. A comprehensive mission that is broader in its outreach and scope than the mission of any partner and that furthers the education profession and its responsibility to advance equity within schools and, by potential extension, the broader community;
2. A school–university culture committed to the preparation of future educators that embraces their active engagement in the school community;
4. A shared commitment to innovative and reflective practice by all participants;
7. A structure that allows all participants a forum for ongoing governance, reflection, and collaboration; and
8. Work by college/university faculty and P–12 faculty in formal roles across institutional settings

Many have called for new forms of teacher education to bridge the gap between theory and practice, and to connect the multiple spaces in teacher preparation programs (National Council for the Accreditation of Teacher Education, 2010). In our program, the spaces take on different forms. The spaces are physical in nature, which include the university (teaching spaces for courses in teacher preparation in traditional university classrooms) and the university lab school (where children's learning and teacher's learning is happening simultaneously). The spaces are also psychological and philosophical in nature, where the ideas, goals, and actions of stakeholders are joined together for the purpose of the child and teacher learning. Teacher educators have long problematized the complexities and disconnect between university-based teacher education courses and field experiences. The past dichotomy between coursework and field experiences has led to a realization of the need for a common space in-between and overlapping field placement schools and universities (Feiman-Nemser, & Buchmann, 1985; Jónsdóttir, 2015; Lohmander, 2015; Martin, Snow, & Franklin Torrez, 2011; Zeichner, 2010).

The new 'hybrid' teacher educator works within a 'third space' to create a common ground between the teacher education program and placement sites for teacher education (Martin et al., 2011; Zeichner, 2010). This third space can be opened up by the use of technologies to provide stakeholders in early childhood teacher education (children, families, teachers, teacher educators, pre-service teachers, and the broader community) access to contextualized and localized information about the partnership school. Through enhanced observation and photo sharing technology, a platform is established for meaningful and current collaboration between the university teacher education courses and the life of the school related to children, their families, and staff.

In this paper, we describe photo sharing and pedagogical documentation as a promising practice that brings together a partnership between a university laboratory preschool serving children and families ages 2-5 years old, and a teacher education program at a major research-intensive university in the southeastern United States. Specifically, we put forward the idea that the technology of photo sharing aligned with pedagogical documentation can help bring together children, families, teachers, school administrators, university based teacher educators, and researchers in a 'third space." In this third space, learning and knowledge can come together in ways that are democratic and less hierarchical (Zeichner, 2010). This is made possible through the distinct and intentional approaches we take to pedagogy and teacher education.

Literature Review

Our review of literature provides the theoretical, historical and contemporary context for understanding pedagogic documentation as a pedagogy and a practice with roots in child observation. We discuss the connections between technology and pedagogic documentation techniques, and the concept of 'third space' as a contemporary approach to teacher education.

Documentation as a Pedagogy and Practice

Pedagogic documentation can be thought of as an enhanced form of observation and has its roots in Freidrich Froebel's Pedagogics of the Kindergarten (1887). Close observation of children's holistic experiences and the use of these observations help us to gain a better understanding of the nature of young children's social, emotional, physical, intellectual, and

spiritual life. As early education became more commonplace and child development became a 'science,' common forms of child observation became more discrete rather than holistic (Reifel, 2011). During the early part of the 20th century, there remained advocates for holistic learning and sensitive observation of young children's broad experiences to enhance pedagogy, as demonstrated in the work of Margaret McMillan and Susan Isaacs (Giardello, 2014). These pioneers of early education and sensitive observation were working at a time when technology for observation was limited to the use of writing and sketches made by teachers while they worked alongside children.

Observation of children and the use of documentation for the purpose of pedagogic enhancement were strengthened in the latter part of the 20th century, most notably by the inspirational practices of municipal schools of Reggio Emilia in Italy (Edwards, Gandini, & Forman, 1993, 1998; New, 1993) and Project Approach in the United States (Helm & Katz, 2011). Practices of pedagogic documentation in the 1990s and 2000s have become enriched by technologies, such as still and moving digital photography, computer software, and online photo sharing applications. Recent photographic and text-based technologies have enabled educators to easily share documentation and readily provide direct access to young children and their learning experiences.

In the past, the process of documenting pedagogy with photography and narrative writing involved developing photographs from film before writing narratives by hand or with a word processor. With the evolution of technology, we can now easily capture digital images using portable devices linked to readily accessible word processing programs. When this documentation is used to its full potential, children are active participants in the process and a platform is created for teachers to learn and share with stakeholders.

Pedagogic documentation is rooted in the spirit of collaborative and transparent inquiry, and is thought to create a space for democratic participation (Abramson, 2008; Dahlberg, Moss, & Pence, 2006; Kline, 2008; Kroeger & Cardy, 2006). The process of documentation makes learning visible while bringing transparency to the art of teaching. This is particularly important in play and project based preschool environments, due to the nature of child-initiated and free-flowing learning experiences that transpire in the everyday life of the classroom. With an emphasis on collaboration and co-inquiry in a fluid environment, photographic technologies can greatly enhance the ability of the learning community to reflect, analyze, and disseminate learning. Furthermore, pedagogical documentation techniques can enhance the links between university-based teacher education programs and school practicum experiences by providing current and contextualized information about what is going on in schools (Flannery Quinn & Parker, 2016).

Connecting Pedagogical Documentation and Technology

The use of technology for documentation provides an opportunity to enhance the professional development of in-service and pre-service teachers, by serving as a connection between the school setting and the teacher training institution (Flannery Quinn & Parker, 2016). Pedagogic documentation with the use of photo sharing and narrative writing technologies can enhance innovative classroom practices and help pre-service teachers to see, share, and debate how educational theories translate to practice.

Modern digital photography, including video, is a powerful technology in learning contexts because it offers increased accessibility. This media offers multiple means of representation and serves as an outlet for engagement with young learners, which are principles of Universal Design

for Learning (UDL). UDL fosters equity by providing educational experiences to learners with varied interests and abilities (Hall, Meyer, & Rose, 2012; National Centre on UDL; 2016; Rose & Meyer, 2002). This is an issue of relevance and concern in early childhood education and teacher preparation.

Research on the use of photography with young children shows that photographs give children opportunities to elicit thought and memory, particularly when children are involved in making the images (Clark, 2005; Clark & Moss, 2001; DeMarie, McLain, Mockenstrum & Stevenson, 2015). Through collaborative dialogue with adults, photographs can give preschool children prompts for discussions about thoughts and feelings. When in-service teachers and pre-service teachers use photographs of learning experiences with children, they reflect upon, discuss, and analyze concrete and contextualized learning experiences. This is a meaningful practice in teacher education programs, one that brings the early years classroom into the university by opening up a 'third space' for teacher educators and schools to work toward shared goals in teacher development.

The 'third space' is a shared, boundary spanning physical or virtual place for dialogue, reflection, connection, and learning. In teacher education, this could be a place where teacher educators, supervisors, and pre-service teachers bridge theory and practice when they "integrate competing forms of knowledge and discourse" across traditional spaces (Cuenca, Schmeichel, Butler, Dinkelman, & Nicholas, 2011, p. 1069). It could also be a space to address binaries by creating a place for reflection and renewal that leads to change in the traditional spaces of teacher education (Flessner, 2014). Another perspective defines third space in a virtual sense, where people inhabit both physical and remote spaces, creating a way for others to enter into and participate asynchronously (Packer, 2005). We interpret this third space as a place where learning and knowledge come together between the school and university teacher education program to bridge research and practice.

Research on the use of photographic technologies by in-service and pre-service teachers engaging in pedagogical documentation shows these technologies to be relevant and successful platforms for learning, particularly when used in collaborative learning groups (Davies & Head, 2010; Edwards et al., 2007; Flannery Quinn & Palser, under review; Flannery Quinn & Parker, 2016; Flannery Quinn & Schwartz, 2011; Hong & Trepanier-Street, 2004; Lemon, 2007; Moran & Tegano, 2005). Photographic images, whether still or video, have been found to provide something different from the standard written observations, particularly those conducted by pre-service teachers in early childhood programs. Photographic documentation serves as a prompt for discussion and sharing in university-based courses, where pre-service teachers can share their school experiences with fellow students and professors (Flannery Quinn & Palser, under review; Flannery Quinn & Parker, 2016). Moran and Tegano (2005) also highlight photographic technologies as a means for developing visual literacy for young children.

Pedagogical documentation techniques often involve narrative writing and there are a wide range of formats that narratives can take. A narrative can range from a brief description of content to a detailed story of the learning experiences and its relation to theories or curriculum intentions. Narratives that are constructed as part of pedagogical documentation are intended to provoke thought as well as invite questioning and dialogue. When narrative documentation accompanies photographs, videos, and work samples, it can contextualize learning and inquiry for pre-service teachers. The range of documentation allows for multiple modes of communication between pre-service teachers and collaborating teachers as they develop an understanding of theory and practice.

It also provides a pedagogic space aligning pre-service teachers, collaborating teachers, the partnership school, and university faculty to problematize and analyze practice. This process helps to enable the development of a critical consciousness of teaching and learning (O'Loughlin, 2016).

Enhancing Partnerships Through Pedagogical Documentation

We suggest that pedagogical documentation is a means for strengthening school-university partnerships because it involves a multifaceted, layered approach. It has benefits for all learners because it is contextualized in the teaching and learning experience of the school placement, rather than in abstract and disconnected case studies. It provides a layer of personalization to the learning experience, as called for by the Office of Educational Technology National Educational Technology Plan (2016). When pre-service teachers choose meaningful moments to document, this attends to their needs and interests. Pedagogical documentation also provides an opportunity for the pre-service teachers to enhance the holistic experiences of the children in schools by bringing reflective practice into their learning experiences. Both the pre-service teacher and the child can use the documentation to look back on learning experiences and explore them further.

Pedagogic documentation allows university faculty to better understand the experiences of their school-based partners, while also creating a space for this partnership to become visible at the university. With the use of technology, links between schools and universities can be strengthened. While there have been empirical studies of the use of pedagogical documentation, none have specifically addressed the use of technology in relation to school-university partnerships. Our work, which describes this promising practice, is a starting point for sharing ideas and research into the effectiveness of these techniques more broadly.

Theoretical Framework

Cultural historical activity theory (CHAT) (Cole & Engeström, 1997; Douglas & Ellis, 2010) is a useful framework to consider how technology can create and support a 'third space' where schools and universities engage in partnerships (Bhabba, 1990; Cochran-Smith & Lytle, 1999; Zeichner, 2010). Cultural-historical activity theory has roots in Vygotsky's (1986) concept of the human experience as mediated by tools of culture. Vygotsky's theory places language as a central mediating tool and as a primary basis for shared thoughts and collective activity. In this theoretical tradition, thoughts and ideas are never individual or solitary; instead, they come from culture, communicated through the symbols of 'languages' that include verbal, gestural, and visual modes. The sharing of ideas is situated within an ecology, or a system of shared space (physical or cognitive) and time, within learning situations. This requires what Bodrova and Leong (2001) have called an 'orienting basis of action' to guide individuals to attend to what is meaningful and relevant. In order to bring two or more people together as they orient themselves toward an action, tools such as language (in spoken, written, or visual form) can be used to mediate the links between cultural-historical processes and individuals' psychological and cognitive processes (Wertsch, 2007). This work applies this theoretical framework to conceptualize the use of technologies that support pedagogical documentation as a mediating tool. This technological tool provides a 'focal point' for shared communication and action to enhance both children's learning as well as holistic experiences that further support teacher education.

Context

Laboratory Preschool

The University of South Florida Preschool for Creative Learning (PCL) is located on the campus of the University of South Florida (USF) and has been in existence for over 25 years. The PCL services approximately 76 children (ages two through five) from diverse cultural and linguistic backgrounds. The majority of the families are graduate students and faculty at the university that currently represent 16 nationalities. The PCL is a voluntary pre-kindergarten provider for the state of Florida, which provides a subsidy to all four year olds enrolled in the school. Additionally, the school accepts school readiness vouchers, a form of subsidized tuition provided to low income families. The school currently supports 15 children on this state funded program. The vision of the USF PCL is to exemplify an inquiry approach to teaching and learning by innovating and improving early childhood education through teacher education, research, and community engagement.

Teachers

The core faculty of the PCL is made up of nine teachers in five classrooms. The minimum requirements for the lead teachers is a bachelor's degree in early childhood education and several hold or are working toward advanced degrees. Most of the assistant teachers at the school hold a bachelor's degree in early childhood education or have a Child Development Associate (CDA) credential with a minimum of five years of teaching experience. There is a commitment to and an expectation of continued education and professional development through teacher inquiry for the staff at the school. All lead teachers are expected to mentor and serve as collaborating teachers to pre-service teachers at the university. Additionally, teachers engage in annual inquiry projects with the guidance of the director and university faculty. This commitment is supported by the partnership with USF through tuition bursaries for staff and through a shared commitment to the preparation of future educators, a feature essential to partnerships in professional development schools (NAPDS, 2008).

University Faculty

The faculty in early childhood education at the USF work closely with the PCL in a range of roles. Three tenured faculty members engage in research and teaching at the undergraduate and graduate levels, and one affiliated faculty member is involved in teaching, supervision, research, and serves as the Director of the PCL. The partnership between USF's early childhood education faculty and the PCL is further supported by two doctoral candidates, whose graduate assistantship roles include serving as (1) a liaison between the early childhood education program and the PCL, and (2) a technology liaison to provide technical assistance onsite . The faculty members and graduate assistants work closely with teachers at the PCL, providing regular professional development.

Partnership

The PCL has a strong partnership characterized by a shared commitment to innovative and reflective practice, research and inquiry, and a shared responsibility for educating children. The preschool, in partnership with the university, has developed a structure that allows participants a forum for reflection and collaboration that involves faculty in formal roles (NAPDS, 2008). This forum has been entwined with the PCL's implementation of Project Approach (Helm & Katz, 2011) and pedagogical documentation (Edwards et al., 1998; Katz, 1996; Turner & Wilson, 2009).

The preschool operates as part of an ongoing university partnership where pre-service teachers complete internship experiences and research is conducted. This partnership has multiple facets and the USF College of Education provides several services to the school. The primary assistance from the university includes providing a presence at the school in order to ensure exemplary early childhood education practices.

Professional development is central to the partnership work. USF created a graduate assistantship so that a graduate student may work as a part-time lead teacher in the state-funded pre-kindergarten classroom. This reflects the value placed upon school-based practitioner research. In addition, the partnership has an appointed faculty member in the USF College of Education to serve in a liaison role of professor in residence in addition to a graduate assistant who serves as preschool liaison. The liaisons assist the director in areas of need that are ever changing. Both liaisons provide professional development to the teaching assistants and lead teachers at the school.

Recently, this partnership has been strengthened through the use of technologies that enable professional reflection, collaboration, and contextualized understandings of children's experiences related to pedagogy and teacher preparation. The photo documentation applications used on portable touch screen tablets, allow stakeholders to share documentation related to to children's learning and teacher pedagogy. This supports the learning experiences of young children while also enhancing teacher preparation and professional development at the school.

Technology with Pedagogical Documentation at the PCL

The PCL recently began using a new technology developed by Kaymbu, a software company offering an integrated solution for creating, storing, and sharing portfolio documentation of student work. Kaymbu provided each teacher at the PCL an iPad loaded with the software for daily documentation. The use of Kaymbu on the iPad eases the process of documentation in the classroom because of its portability. It simplifies the process of capturing images, writing comments, linking to standards, and sharing documentation.

When working with young children, learning may occur in any situation throughout the day. Children demonstrate knowledge and expertise through conversations with peers and teachers, playing both in and out of the classroom, interacting at lunchtime, engaging in learning centers, participating in lessons, and many other opportunities throughout the day. Kaymbu provides a seamless outlet to capture these moments in all learning contexts. Instead of focusing only on capturing moments during instruction, the software allows us to capture spontaneous learning experiences throughout the day.

The software facilitates collaboration between PCL teachers and pre-service teachers. As such, it is a mediating technology that helps mentors and novices to engage in the cultural activity

of learning to teach. While pre-service teachers are learning how to use the software, their mentor teachers model appropriate ways to authentically assess children and engage in effective conversations about teaching practices. Mentor teachers have the opportunity to assess pre-service teachers by revisiting moments they have captured and contributing constructive feedback. This process enhances the partnership between the teacher education program and the PCL. Mentor teachers are given both an entry point into the 'third space' (between the university program and the school) and a focal point on which they are able to reflect-on-action and reflect while in-action.

Another advantage of the software is the functionality of linking children's representations of learning with teaching standards. When linking these moments with standards, teachers are making learning visible to all and it assists teachers in understanding how children are performing according to curriculum standards. The captured learning experiences can be tagged to standards by pre-service or in-service teachers and organized by moments related to curriculum and alternative indexing. This versatility allows stakeholders to go beyond curriculum standards and make links to richer, more meaningful interpretations of children's holistic experiences in a range of areas.

The ability to share moments through the software amplifies the access that children, families, and colleagues have to documentation, and it gives an entry point into the 'third space' of the school-university partnership. Moments can be shared by sending emails, creating storyboards, and passing along portfolios of children to other teachers. Using the software, teachers have the ability to send emails to parents to showcase remarkable events that happened during the day, and this quick communication has a great impact on parents' involvement and sense of belonging at the school. Kaymbu also provides teachers with the opportunity to exchange messages about a child's individual achievements or to send a quick note.

In relation to the classroom community, it is possible to create storyboards to showcase projects that are happening in the classroom, including anecdotal notes, narratives, learning domains, and important upcoming dates and events. Storyboards communicate the highlights to parents who can then initiate conversations with their children using more specific information about what was happening at school. This use of technology mediates child and family participation in the shared activities of school.

The use of the photo documentation software also informs colleagues about the activities across the school and opens opportunities for professional exchange among teachers. Another important feature of this software is that it allows teachers to send children's portfolios to their future teacher, thus supporting the collection of evidence of students' improvement, skills, and attributes.

Stakeholder Perspectives

In order to examine the use of technology in photo sharing and pedagogical documentation as a promising practice, we called together a working group of stakeholders that represented PCL teachers, teacher educators, a researcher, the school administrator, and families of children at PCL. To address the role of technology in a 'third space,' where knowledge is shared in a democratic atmosphere rather than a hierarchical one, we asked a representative from each of the stakeholder groups to share their perspective and write a narrative that would illustrate their engagement with the technology. Each of the stakeholders discussed their ideas and prepared a written narrative to be included in this paper and all stakeholders who participated in the writing are named authors in

the paper. Once the narratives were assembled, the stakeholders continued to discuss the overall concepts of technology as a mediating tool in the school-university partnership, and contributed to writing the discussion and recommendations. The following section includes these stakeholder narratives.

A teacher's perspective:

> *As a preschool teacher, assessing the whole child is a vital part of my practice. Young children demonstrate their learning through different ways, and it is up to me to be perceptive about how and when they are showcasing their skills and knowledge. I believe the best way for young children to meaningfully engage in learning experiences is through play, and so it is during this time that I can best assess their learning acquisition.*
>
> *The use of the Kaymbu assists me with the documentation of children's learning through the use of photography. When using the software to capture moments, I am able to write detailed narratives, anecdotal notes, and describe skills demonstrated. It also gives me the opportunity to tag the photos to an individual student's portfolio, specific teaching standards, and organize children's work collection overtime, which helps me to better visualize where children are at and where they should go.*
>
> *Once these documentations are created, they are automatically shared with my co-teacher and the director of the preschool. This ability to share simultaneously gives them the capacity to be a part of what is happening in the classroom and engage in deeper conversations. When we meet for planning and professional development everyone is on the same page. Moreover, we are able to have high-level conversations, critically reflect about students' improvement, and intentionally plan for the upcoming week.*
>
> *The software also assists my role as a mentor teacher. While I'm using the tool in the classroom, I am modeling for pre-service teachers how we authentically assess young children by collecting documentation. The easy use of the software makes it clearer for pre-service teachers to understand the importance and process of documentation. They are encouraged to use it to collect and learn about their practices and children's growth. Also, it is a great way to showcase their own progression as documentaries and for me to give appropriate feedback.*

A teacher educator's perspective:

> *As teacher educators, the use of a digital documentation tool has provided us with a way to help facilitate theory to practice connections in coursework, while helping us stay connected to practices and events occurring in the classroom. We found it to be an efficient and effective way to provide feedback and support, in person and virtually. The use of photographs, commentary, and tagging makes thinking and learning visible, while serving as a tool for reflection. In the field, we noticed in-service teachers documenting student learning and sharing their thinking with pre-service teachers. They served as a model for documentation practices while concurrently supporting coursework. Furthermore, they demonstrated the use of a digital tool for multiple, authentic purposes. We observed pre-service teachers using the storyboards and photos to reflect on events and practices they were observing. Through reflection, they were beginning to make connections to course content and theory. This helped us extend the learning and blur the lines between coursework and field experiences. Moreover, we could modify course content based on what we were seeing and hearing to make deeper and more practical connections.*
>
> *As teachers and pre-service teachers became more confident with the tool, we began to notice more complex documentation and reflective practices. As we became efficient with the tool and process, we recognized additional affordances. For example, the digital documentation format gave us an opportunity to archive and curate a vast number of experiences. At the same time, it served as an accountability tool, as we were collecting evidence of teacher learning and development and documenting their growth. It also gave us a chance to examine teachers' decision-making processes to analyze what they were documenting and how were they explaining their decisions.*

Child and Family Perspectives

In an effort to connect the classroom space to families, each family was asked to send in a family photograph at the beginning of the school year. These photographs served as a source of comfort to children who were struggling with the transition to school by providing a visual link to the people who love and care for them. In a similar fashion, the use of photographic documentation creates a link, allowing the social relationships that are formed in the classroom to be shared and supported at home.

A child's perspective:

> *Amy is currently in the 2.5-3 year old class at the PCL. From the first days of school, Amy's teacher began to send home brief summaries of*

what transpired in the classroom at least once a week. At home, looking at these pictures with her family, Amy was able to talk about the connections she made with peers at school using the images to tell about the activities she engaged in. She takes pride in being able to narrate the highlights of her day and share them with other important people in her life, much the way she felt comforted by being able to locate her family within the space of her classroom and connect those elements of her life.

A parent's perspective:

Like many parents, I am eager to hear about my child's day at school when I pick her up. While I often hear about playing outside or in a favorite learning center, my child is still developing the language skills to able to expand upon what she did in school without some contextual supports. The use of photographic documentation helps to breakdown this communication barrier in several ways. Often, an e-mail or text message will arrive while my child is at school. Having a sort of sneak peak into what's happening at my child's school gives me some prompts to use when discussing the day's events as we travel home. The ability for the teacher to easily share these moments in my child's life while I am away from her both keeps me connected to what's happening at the school and provides resource we can use later in conversation to support conversations about school.

The pictures generally come back out when we have the opportunity to sit together and look back at the messages sent by the teacher. The descriptors provided by the teacher act as conversation starters about my child's school experiences. Often she has thoughts to share about what was happening in the image and how she felt about it. These conversations often start at the image and then go beyond the moment captured by the teacher into connected experiences. Being able to extend our conversations through visual images has allowed for deeper, more meaningful conversation. Understanding the ways my child is interacting with new knowledge and being able to see the kinds of tasks she is engaged in also allows me to build off of that learning in our home environment.

The connectivity between home and school created by the use of digital photography and electronic documentation has allowed my child's teacher to include me in observations of my daughter. The description and image together create a powerful tool for understanding not only the skills my child is working on but the ways in which she is practicing them at school. The images provide powerful commentary on the ways through which my daughter is coming to understand the world around

her and allow me to make meaning of ideas she is not yet able to fully communicate. This support extends beyond the moment we look at the documentation shared between school and home into our lives through connections to learning experiences that arise in everyday life.

A program administrator's perspective:

Technology can be an expensive investment for any program, and care should be taken in choosing the proper one for a school's uses and needs. At the PCL, I chose the documentation software based on its compatibility with an everyday tablet. This way, the children or teachers could use the tablet for multiple purposes. Portability was also an important consideration when I was looking for technology. I wanted to be sure we could collect data anywhere in the school and on field visits, and that the data could be shared across pedagogic spaces (within the school, with families, and with teacher educators at the university).

New technologies and new practices require on-going job embedded professional development. At the PCL, the teachers were given the tablets initially to only explore and play. After the initial explore phase, they eased into documentation by taking photos of children and children's work. As time passed, the teachers began tagging standards with the children's work samples. I had one teacher meet weekly with our technology liaison to gain a deeper understanding of the software and how it could be used in the classroom for collecting work samples, as well as a tool for inquiry and reflection. She then became our teacher expert, who in turn supported other teachers in the school to utilize the software. Once the teachers had a feel for the software and all the capabilities for use inside and outside of the classroom, we began expanding our use of the Kaymbu as a data source for teacher inquiry, pre-service teacher development, and a primary communication tool for parents.

As teachers became efficient with how to utilize the software for classroom documentation and teacher inquiry, we extended our use as an additional tool to connect the university and preschool partnership. It took all of us at the PCL about one semester to attain a comfortable working knowledge of the Kaymbu. This included the ability to document and write about childrens' project work and to maintain electronic portfolios for each child. Teachers began to share their work with families and partners via weekly sheets of classroom life. As the teachers learned, I learned along with them with my own iPad. Rather than early learning standards, my Kaymbu account included the Florida Educator Accomplished Practices (FEAP's). While teachers were using the software as a data collection tool for children, I was using the same

technology to supervise pre-service teachers in their final level of internship. This information was then shared with the faculty and other stakeholders of the program.

A school culture that embraces technology and an inquiry stance is critical. The role of documentation as a platform for teacher learning should be valued and considered part of everyday teaching practice. The importance of pedagogical documentation is evident in PCL through the time created in the week for teachers to view, reflect, share, plan, and write about their artifacts. Directors and liaisons have an important role to facilitate these meetings and to provide support and mentorship for teacher inquiry and learning.

As the director, I had to carefully consider the ethics in relation to the use of technology and children's photographic images. Images provide a unique form of documentation that can be difficult to match in observational notes alone. However, the use of images, particularly across contexts, brings with it several important ethical considerations, such as storage, permissions, and photo sharing. To protect children, we agreed images would be stored on password-secured devices, as well as a password-protected site. These documents were available only to teachers at the school, administrators, and faculty of the university affiliated with the preschool. Classroom pre-service teachers had access to viewing photos; however, they were not permitted access outside of the school or without lead teacher supervision. When parents enroll in the program, multiple levels of photo releases are signed. Photos for documentation, photos to share among families, and photos for public dissemination all have individual releases.

At the PCL, ethical considerations go beyond permissions and are incorporated into the pedagogy of the project approach and pedagogical documentation, where children take an active part in using cameras and discussing their projects. There is a dedication to respecting children's agency by asking for permission to take photographs at the point of taking them, and encouraging children to take similar approach.

A pedagogic researcher's perspective:

I have been involved in a pedagogical research projects in partnership with the PCL for several years, initially, in my role as a teacher educator and supervisor of pre-service teachers from 2003 to 2009, and more recently, as a visiting researcher developing a project on incorporating children's perspectives in pedagogical documentation. In the early days of my work with the PCL, we would make photographs for pedagogical documentation with disposable cameras, and develop them at the local

photo shop later in the day, and have paper copies of these documents ready for discussions and sharing, often days after. These photos were shared with children and displayed at the school, and sometimes were photocopied to be included in newsletters for families. Photographs would also be used in child portfolios that were shared with families at the end of the semester or the end of the year. The photos were also used in lecture sessions with pre-services teachers to generate dialogue about pedagogy and practice. The use of paper photographs made from disposable cameras involved a lot of time and cost, and did not result in materials that were easy to share with groups of people. It was a particular challenge to engage children in dialogues about the photographs and the activities in a manner that could be meaningful to them.

With advances in technology, particularly digital photography and programs that enabled display of the photographs with narrative writing (such as slideshow programs), we began to be able to share the photos more easily and we were able to add written narratives in companion to the photos in one document. This enabled greater access for more people (children, parents, pre-service teachers, and colleagues) and provided the ability to discuss the photographs and record narratives in a more timely manner. We began to use the photographs and narratives as a tool of inquiry in a way that provided ecological validity (children in the context of their school) and gave visibility to the experiences of children in a preschool setting. This enabled a stronger connection between the university and the pre-school, but still the process involved challenges. Particularly challenges associated with the time needed to fulfill the roles associated with university teaching and research, and the role of making meaningful connections with a partner school. I did not find the technology available at the time helped to facilitate sustained engagement in research projects.

More recently, with the development of photo sharing applications used on tablets with indexing capabilities, the possibilities for meaningful research and inquiry that is based on the concerns of the children, their families, and the teachers at the school have been opened up. My experience engaging in inquiry with the children and the teachers at the school using the tablet allows children to take photographs and share stories about what is meaningful to them at that moment. The preschool environment is characterized by play and activities that move swiftly, the tablet allows children to have their hands and their voices heard within the action. This has enabled me, as a pedagogic researcher to think of new ways to engage in participatory research. However, it is not the technology itself that enabled this to happen - it is the committed desires of the teachers and their director to be a partner school that is

> *dedicated to inquiry that guides their practice. This is essential. The technology, as a tool, allows this to happen in ways that they deem appropriate.*

Discussion and Recommendations: Shared Focal Points in School-University Partnerships

Through the perspectives of the stakeholders in a school-university partnership, we see that the use of photo sharing and pedagogical documentation technology can provide focal points for a democratic partnership space, where knowledge can be shared from multiple perspectives. The focal points are related to the 'connections' articulated by the stakeholders: (a) the ability to share information simultaneously across the partnership, the ability to see practice in action, (b) the ability to think of research in relation to participatory approaches with children, and (c) the ability to provide families and their children with prompts for conversations about their experiences in school. By enabling connections rather than giving more or less power to one of the stakeholders in the partnership, we believe this promising practice serves to open up a democratic 'third space' in a school-university partnership, with lessons that could be learned by other schools or universities seeking to strengthen their partnerships.

When adopting photo sharing technology for use with pedagogic documentation, a culture of commitment to these new practices must be built over time. There should be active job-embedded professional development where regular time and space for reflection and discussion between all stakeholders is part of the process. This established culture should involve university faculty and administration, with dedicated time for faculty to join in the professional development of the partner school. Universities must also cultivate a disposition to the value of research taking place at partner schools, which is often action-oriented practitioner research. There are practical considerations with regard to the use of the technology, as articulated in the perspective of the program director in our study. We recommend that the investment in technology be considered with regard to cost and portability of the devices, and most importantly, the ease of access for children and families.

In order for this type of software to be utilized to inform practice and as a partnership tool, a strategic plan and time investment had to be in place. For any technology to be successful in the classroom, there must be significant buy-in from the administration of the program and from the users of the technology. Technology is often purchased for school use without the proper supports in place, and this can lead to ineffective use of the technology and a waste of resources. Time must also be specifically allotted for situated professional development in the use of the technology. Teachers need to learn the technology and then practice using the technology within the context of their classroom (Ertmer & Ottenbreit-Leftwich, 2010; Kopcha, 2012). Technology, as a mediating tool of the activity in the school, must be accessible and manageable for the users, and must meet a genuine need within the school culture.

There are many benefits to the use of pedagogical documentation, but also several challenges that must be considered. Both novice and experienced teachers may find documentation to be a challenge in relation to time constraints and the overriding priorities of teaching and running the classroom (management). There is a legitimate concern that taking photographs or video clips and writing narratives is a labor-intensive endeavor. If not managed properly it could detract from teachers being present with and available for children in a preschool learning environment. There is also a concern that documentation through photographic technologies could become an invasive

practice with regard to children's privacy, and may even lead to 'normalizing' particular childhood experiences (Flannery Quinn and Manning, 2013; Lindgren, 2012). Therefore, care must be taken to uphold and respect children's privacy by all stakeholders involved. There are additional challenges associated with introducing pedagogical documentation techniques in teacher education programs, particularly when the practice may not be in place in schools (Kroeger & Cardy, 2006). This makes a strong university-school partnership particularly important.

When using photographic technologies and pedagogical documentation techniques in early learning environments, it is recommended that consideration be given to a range of ethical issues, including but not limited to: (a) what is or is not photographed, (b) permission from families to make and use photographs, (c) permission from children and staff who are photographed to make and use the photographs, and (d) collaboration in the process of writing observational narratives. Photographs and narrative observations can often contain personal information and should be treated with respect and dignity (Flannery Quinn & Manning, 2013). The Office of Educational Technology, National Educational Technology Plan (2016) calls for a thoughtful use of technology. Ethical considerations and thoughtful approaches should be a component of the school-university partnership, with regular discussion about the implications of using technology with young children and in teacher education.

Conclusion

The emerging picture at our partnership lab school demonstrates how technology can enhance pedagogical documentation techniques and create a 'third space' for the shared goals of enhancing children's experiences at school, involving families in school experiences as well as providing exemplary teacher education and professional development. The application's indexing capabilities help stakeholders in the school-university partnership focus on how children experience school and how pedagogy is developed in practice at a partnership school. Shared focal points strengthen the school-university partnership by enabling the flow of information between multiple partners. This allows each stakeholder to have access to a pedagogical space where they can see, reflect upon, and take actions regarding theory in practice in the local dynamic environments of the school and the university.

The technology presented has the potential to enable strengthened school-university partnerships by providing a resource for research and inquiry in early childhood education and teacher education, and by providing naturalistic data that can help us better understand how pedagogy is developed through practice. This technology gives greater access to inquiry for teachers and pre-service teachers, and will enable the broader community access to teacher research based on children's lived experiences.

One of the most promising aspects of this technology is the connection it facilitates with families, who are often a missing piece in research and practice in teacher education (Epstein, 1995; 2001, Epstein & Sanders, 2006; Greenwood & Hickman, 1991). We suggest the technology allows families to have immediate access to information about their children's school experiences and invites their participation in dialogues about these experiences. This provides another focal point for the school-university partnership, which has potential to increase family and community engagement, and provides a pathway for parents to enter that 'third space' where schools and universities engage in the shared activities of children's and teachers' education.

References

Abramson, S. (2008). Documentation Communication Action: Co-inquiry meetings for facilitated interaction. *Voices of Practitioners,*1-10. Retrieved from http://journal.naeyc.org/btj/vp/pdf/Voices_Abramson_Co-Inquiry.pdf.

Bhabba, H. (1990). The third space. In J. Rutherford (Ed.), *Identity, community, culture and difference* (pp. 207-221). London: Lawrence and Wishart.

Bodrova, E., & Leong, D. J. (2001). Tools of the mind: A case study of implementing the Vygotskian approach in American early childhood and primary classrooms. INNODATA Monographs, 7, Geneva: UNESCO.

Clark, A. (2005). Ways of seeing: Using the Mosaic approach to listen to young children's perpectives. In A. Clark, A. T. KjØrholt, and P. Moss [Eds] *Beyond Listening: Children's Perspectives on Early Childhood Services* (pp. 29-49). Bristol: Policy Press.

Clark, A., & Moss, P. (2001). *Listening to young children: The Mosaic approach.* London: The Children's Bureau for the Joseph Rowntree Foundation.

Cochran-Smith, M., & Lytle, S. (1999). Relationships of knowledge and practice: Teacher learning in communities. *Review of Research in Education*, *24*, 249-306. Retrieved from http://rre.sagepub.com/cgi/content/short/24/1/249.

Cole, M., & Engeström, Y. (1997). A cultural-historical approach to distributed cognition. In G. Saloman (Ed.), *Distributed cognitions:Psychological and educational considerations* (pp. 1-46). Cambridge, UK: Cambridge University Press.

Cuenca, A., Schmeichel, M., Butler, B. M., Dinkelman, T., & Nichols, J. R. (2011). Creating a 'third space' in student teaching: Implications for the university supervisor's status as outsider. *Teaching And Teacher Education*, (7), 1068-1078. Retrieved from http://www.sciencedirect.com/science/journal/0742051X/

Dahlberg, G., Moss, P., & Pence, A. (2006). *Beyond quality in early childhood education and care: Postmodern perspectives.* London: Routledge.

Davies, H., & Head, C. (2010). Pedagogical exchange for professional development: Reflections on how collaboration has inspired and empowered a group of early years educators to find new ways of working to improve learning and teaching. *International Journal of Learning, 17*(9), 339–352. Retrieved from http://cgnetworks.org

DeMarie, D., McLain, J., Mockenstrum, L., & Stevenson, C. (2015). What preschool is like: Children' interviews, photographs, and picture selection from two different contexts.. In. S. Robson and S. Flannery Quinn (Eds.) *The Routledge International Handbook on Young Children's Thinking and Understanding.* (pp. 476-490) Abingdon, Oxon: Routledge.

Douglas, A. S. & Ellis, V. (2010). Connecting does not necessarily mean learning: Course handbooks as mediating tools in school–university partnerships. *Journal of Teacher Education 62*(5), 465–476. Retrieved from http://aacte.org/resources/journal-of-teacher-education

Edwards, C. P., Churchill, S., Gabriel, M., Heaton, R., Jones-Branch, J., Marvin, C., & Rupiper, M. (2007). Students learn about documentation throughout their teacher education program. *Early Childhood Research and Practice, 9*(2), 1-17. Retrieved from http://ecrp.uiuc.edu/v9n2/edwards.html/

Edwards, C. P., Gandini, L. & Forman, G. E. (Eds.) (1993). *The hundred languages of children: The Reggio Emilia Approach to early childhood education.* Greenwich, CT: Ablex.

Edwards, C. P., Gandini, L. & Forman, G. E. (Eds.) (1998). *The hundred languages of children: The Reggio Emilia Approach - advanced reflections [2nd Ed.]* Greenwich, CT: Ablex.

Epstein, J. L. (1995). School/family/community partnerships: Caring for the children we share. *Phi Delta Kappan, 76,* 701-712. Retreived from https://www.gpo.gov/fdsys/pkg/ERIC-ED467082/pdf/ERIC-ED467082.pdf.

Epstein, J. L. (2001). *School ,family, and community partnerships: Preparing educators and improving schools.* Boulder, CO: Westview.

Epstein, J. L. & Sanders, M. G. (2006). Prospects for change: Preparing educators for school, family, and community partnerships. *Peabody Journal of Education, 81*(2), 81-120. Retrieved from http://news.cehd.umn.edu/wp-content/uploads/2009/06/epstein-sanders-2006.pdf

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255-284. Retrieved from http://files.eric.ed.gov/fulltext/EJ882506.pdf.

Feiman-Nemser, S., & Buchmann, M. (1985). Pitfalls of experience in teacher education. *Teachers College Record*, *87*(1), 53-65. Retrieved from http://www.tcrecord.org

Flessner, R. (2014) Revisiting reflection: Utilizing third space in teacher education. *Scholarship and Professional Work-Education*, Paper 37, 231-247. Retrieved from http://dx.doi.org/10.1080/00131725.2014.912711.

Flannery Quinn, S., & Manning, J. (2013). Recognizing the ethical implications of the use of photography in early childhood education and care settings. *Contemporary issues in Early Childhood, 14*(3), 270–278 Retrieved from http://dx.doi.org/10.2304/ciec.2013.14.3.270

Flannery Quinn, S., & Palser, M. (under review). Early childhood teacher trainees' articulations of children's well-being in relation to their emerging pedagogy: A human ecological perspective. *Contemporary Issues in Early Childhood.*

Flannery Quinn, S., & Parker, L. (2016) Developing and articulating pedagogic principles: A case study of early childhood teacher trainees learning to use pedagogic documentation techniques. *Journal of Early Childhood Teacher Education. 37*(1), 96-113. Retrieved from http://dx.doi.org/10.1080/10901027.2015.1133462.

Flannery Quinn, S., & Schwartz, K. (2011). Preservice teachers' perceptions of pedagogic documentation techniques in early childhood teacher preparation. *Journal of Early Childhood Teacher Education, 32*, 39–54. Retrieved from http://dx.doi.org/10.1080/10901027.2010.547767.

Froebel, F. trans. J. Jarvis (1887). *Freidrich Froebel's pedagogics of the kindergarten or his ideas concerning the play and playthings of the child.* London: Edward Arnold.

Giardello, P. (2014). *Pioneers in early education: The roots and legacies of Rachel*

and Margaret McMillan, Maria Montessori and Susan Isaacs. Abingdon, Oxon: Routledge.

Greenwood, G. E., & Hickman, C. W. (1991). Research and practice in parent involvement: Implications for teacher education. *Elementary School Journal,* 91(3), 279-288. Retrieved from http://www.jstor.org/stable/1001714.

Hall, T. E., Meyer, A., & Rose, D. H. (2012). An introduction to Universal Design for Learning: Questions and answers. In T. E. Hall, A. Meyer, and D. H. Rose [Eds.] *Universal Design for Learning in the Classroom: Practical Applications.* New York: Guilford Press.

Helm, J., & Katz, L. (2011). *Young investigators: The Project Approach in the early years*. New York, NY: Teachers College Press.

Hong, S., & Trepanier-Street, M. (2004). Technology: A tool for knowledge construction in a Reggio Emilia inspired teacher education program. *Early Childhood Education Journal, 32*(2), 87–94. Retrieved from http://dx.doi.org/10.1007/s10643-004-7971-z.

Jónsdóttir, A. H. (2015). University–preschool partnership and workplace-based learning: A collaborative 'third space' or no space at all? Early Years, 35(2), 184–196. Retrieved from http://dx.doi.org/10.1080/09575146.2015.1026248.

Katz, L.G., (1996). The contribution of documentation to the quality of early childhood education, ERIC Digest, EDO-PS-96-2. University of Illinois, Urbana.

Kline, L. S. (2008). Documentation panel: The 'Making Learning Visible' project. *Journal of Early Childhood Teacher Education, 29*(1), pp. 70-80. Retrieved from http://www.tandfonline.com/loi/ujec20

Kopcha, T. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers & Education*, 59, 1109-1121. Retrieved from https://www.journals.elsevier.com/computers-and-education/

Kroeger, J. & Cardy, T. (2006). Documentation: A hard to reach place. *Early Childhood Education Journal, 33*(6), 389-398. Retrieved from http://www.springer.com/education+%26+language/learning+%26+instruction/journal/10643

Lemon, N. (2007). Take a photograph: Teacher reflection through narrative. *Reflective Practice, 8*(2), 177–191. Retrieved from http://dxx.doi.org/10.1080/14623940701288982.

Lindgren, A.(2012). Ethical issues in pedagogical documentation: Representations of children through digital technology. *International Journal of Early Childhood, 44*(3). Retrieved from http://dx.doi.org/10.1007/s13158-012-0074-x.

Lohmander, M. K. (2105). Bridging 'the gap' – linking workplace-based and university-based learning in preschool teacher education in Sweden. *Early Years*, *35*(2), 168–183. Retrieved from http://dx.doi.org/10.1080/09575146.2015.1025712.

Martin, S. D., Snow, J. L. & Franklin Torrez, C. A. (2011). Navigating the terrain of third space: Tensions with/in relationships in school-university partnerships. *Journal of Teacher Education, 62*(3), 299–311. Retrieved from http://aacte.org/resources/journal-of-teacher-education

Moran, M. J., & Tegano, D. W. (2005). Moving toward visual literacy:

Photography as a language of teacher inquiry. *Early Childhood Research and Practice, 7*(1). Retrieved from http://ecrp.uiuc.edu/v7n1/moran.html.

National Centre on Universal Design for Learning. (2016). UDL guidelines Version 1.0: Research evidence. Retrieved from http://www.udlcenter.org/aboutudl/udlguidelines.

National Association for Professional Development Schools (2008). *What it Means to be a Professional Development School: A Statement by the Executive Council and Board of Directors of the National Association for Professional Development Schools.* Retrieved from www.napds.org.

National Council for Accreditation of Teacher Education. (2010). *Transforming Teacher Education Through Clinical Practice: A National Strategy to Prepare Effective Teachers. Report of the Blue Ribbon Panelon Clinical Preparation and Partnerships for Improved Student Learning*.

New, R., (1993). Reggio Emilia: Some Lessons for U.S. Educators, ERIC Digest, EDO-PS-93-3, University of Illinois, Urbana.

Office of Educational Technology (2016). *Educational technology plan.* Washington, DC: Office of Educational Technology.

O'Loughlin, M. (2016). A manifesto for critical narrative research and pedagogy for/with young children: Teacher and child as critical annalist. *Journal of Pedagogy, 7*(1), 11-24. Retrieved from https://trunipdf.academia.edu/JournalofPedagogy

Packer, R. (2005). Composing with media: Zero in time and space. *Contemporary Music Review*, *24*(6), 509-525. Retrieved from http://openmusiclibrary.org/journal/contemporary-music-review/

Project Zero/Reggio Children (2001). *Making learning visible: Children as individual and group learners.* Reggio Emilia Italy: Reggio Children.

Project Zero, Ezra H. Baker School, & John Simpkins School. (2003) *Making teaching visible.* Cambridge, MA: Harvard Graduate School of Education.

Reifel, S. (2011). Observation and early childhood teaching: Evolving fundamentals. *Young Children*, March 2011, 62-65. Retreived from https://www.naeyc.org/files/yc/file/201103/OurProudHeritage_Online0311.pdf.

Rose, D. H., & Meyer, A. (2002). *Teaching every student in the digital age: Universal design for learning*. Alexandria, VA: Association for Supervision and Curriculum Development.

Turner, T., & Wilson, D. G. (2009). Reflections on documentation: A discussion with thought leaders from Reggio Emilia. *Theory Into Practice, 49*(1), 5-13. Retreived from http://dx.doi.org/10.1080/00405840903435493.

Vygotsky, L. (1986). *Thought and language*. A. Kozulin, (Ed. & Trans.). Cambridge, MA: MIT Press.

Wertsch, J. (2007). Mediation. In H. Daniels, M. Cole, & J. Wertsch (Eds.), *The Cambridge companion to Vygotsky* (pp. 178-192). Cambridge, UK: Cambridge University Press.

Wollons, R. [Ed] (2000). *Kindergarten and cultures: The global diffusion of an idea*. New Haven and London: Yale University Press.

Zeichner, K. (2010). Rethinking the connections between campus courses and

field experiences in college- and university-based teacher education. *Journal of Teacher Education, 61*(1-2), 89–99. Retrieved from http://aacte.org/resources/journal-of-teacher-education

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¡Hablo un Poquito de Español! Strategies to Develop a Spanish Course Using Technology in PDS Settings

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Abstract: This article examines how a conversational Spanish course was designed and delivered in a PDS site that identified teachers learning Spanish as necessary to improve communication with their Latino families. The article discusses how the principles of Universal Design for Learning (UDL) and technology were used to develop the course with the intention of having educators practice their Spanish and improve their pedagogical practices.The authors explore how teachers integrated the language learned using technology in order to facilitate instruction and increase family engagement. The article shares examples and lessons learned through the perspectives of the faculty teaching the course.

KEYWORDS: English language learners, Professional Development Schools, Spanish speaking, Universal Design for Learning

NAPDS NINE ESSENTIALS ADDRESSED:
2. A school–university culture committed to the preparation of future educators that embraces their active engagement in the school community;
3. Ongoing and reciprocal professional development for all participants guided by need; and
4. A shared commitment to innovative and reflective practice by all participants;

Professional Development Schools (PDS) must provide educators with professional development opportunities that meet their needs (NAPDS, 2008). This article examines how a conversational Spanish course was designed and delivered in a PDS site that identified teachers learning Spanish as necessary to improve communication with their Latino families. The article discusses how the principles of Universal Design for Learning (UDL) and technology were used to develop the course with the intention of having educators practice their Spanish and improve their pedagogical practices.

The educators of this PDS site understood that enhancing communication between school and home was critical because it could assist families in becoming more engaged in the education of their children. Research states that family engagement influences children's development and academic success (Delgado-Gaitan, 2004; Durand, 2011; Hoover-Dempsey & Whitaker, 2010; Lopez & Caspe, 2014). Thus, these teachers wanted to encourage and engage families in their children's education by creating school activities and using innovative practices at school.

Unfortunately, families and children who speak another language sometimes find it difficult to participate in these type of school activities or educational programs. Often, the schools fail to eliminate the barriers that inhibit families to participate in these events (Garcia & Kleifgen, 2010; Takanishi, 2004). The most evident barrier for immigrant families is communication in English (Ladky & Peterson, 2008; Turney & Kao, 2009). Many times, educators are not able to communicate effectively due to the language barriers with families and are unprepared to include culturally and linguistically appropriate practices in the classroom (Gonzalez, Moll, & Amanti, 2005). This PDS wanted to address these needs by having the university deliver graduate courses for their teachers targeting these areas. Consequently, the university's graduate reading program and the school worked in collaboration to establish the objectives of this initiative in order to meet the school's needs (Mogge, Martinez-Alba, & Cruzado-Guerrero, 2017).

Nature of the Course

The conversational Spanish course was developed at the request of teachers at a PDS located in the northeast of the United States by a university institution in that area. The population of this school had a drastic increase of Spanish speaking families who came to the United States from countries such as the Dominican Republic, El Salvador, Guatemala and Nicaragua. Consequently, the teachers felt the need to learn Spanish. The PDS team approached the university to share their concerns and work in collaboration in order to offer professional development opportunities for the teachers. Thus, the university offered a series of four courses that focused on teaching English to speakers of other languages and parent workshops in Spanish for families. The titles of these courses were: *Social, Cultural and Curricular Contexts for Second Language Learners, Instruction and Assessment for Second Language Learners*, *Linguistics for Educators. (*For a more detailed description of the university-partnership and other courses, see Mogge et al., 2017). The last course taken by the teachers was the *Conversational Spanish for Teachers of English Language Learners.*

The conversational Spanish course was designed to (1) help educators to communicate informally with children and families who speak Spanish; (2) explore strategies on how to use the Spanish language to facilitate the teaching and learning of children; and (3) learn more about the language and culture of the families (Mogge et al., 2017). The course was not intended for teachers to become fluent in Spanish but to learn words and phrases that are useful to communicate with families. In addition, the course aimed to engage all teachers in using the language in a low risk environment. These objectives are consistent with research practices that show that families tend to become more involved in the education of the children when the communication between home and school is mutual and effective, and when the schools consider and value the language and culture of the families (Gonzalez et al., 2005; NAEYC, 1995; Takanishi, 2004).

The development of the Spanish conversational course used a communicative language teaching approach to make the course meaningful to the diverse group of teachers enrolled. Communicative language teaching focuses on communicative objectives and meaningful activities to meet the communicative needs of the learner (Littlewood, 2013). The course assignments were designed to provide opportunities for teachers to develop their Spanish skills using authentic speaking, listening, reading, and writing activities as well as to explore the Latino culture in the classroom and school community. The course participants were elementary school teachers, speech pathologists, para-educators and the principal. These educators had different ability levels

in speaking Spanish and using technology. Most of these educators were females who represented a variety of ages, cultural backgrounds, and years of experiences working in schools.

UDL principles were used as a framework to develop the course. The UDL framework responds to the diversity of students in the classroom and eliminates instructional barriers in order to make learning accessible to all students (CAST, 2011). CAST (2011) emphasizes three UDL principles that should be considered when designing instruction in order to make it intentional and significant to teachers. The principles are to provide (1) multiple means of representation; (2) action and expression; and (3) engagement. According to the UDL National Center (2012) these principles emphasize that students differ in the way they understand and perceive information, express their knowledge, and feel motivated and involved in learning. Consequently, these principles allow teachers to design instruction, to decrease barriers, and identify technologies to make content accessible to students.

Course Activities Using Technology

Class activities included technology in several ways to make the material accessible and comprehensible to the teachers taking the course. The course was held at the school for a semester and classes were offered once a week after school for 15 weeks. The content of the classes focused on conversational Spanish. Therefore, the teachers had sufficient time to practice their conversational skills and explore strategies and resources in Spanish to improve communication with families and children who spoke Spanish during the week at school. The instructor used the English language when exploring educational strategies and the Latino culture during the course.

The format of the course included an opening activity with the whole group, then small group center activities, and closing with a whole group activity. For the opening activity, we reviewed the new material in Spanish, provided examples with different visuals, real items props and technology, explored cultural notes, and explained centers. Then, teachers completed differentiated small group activities in heterogeneous language proficiency groups. In the centers, teachers had opportunities to practice their vocabulary with their group members and use language applications such as Duolingo to help them with their pronunciation, role-play situations, read books, talk about different topics, and explore the cultural notes and personal experiences. Some teachers used these applications on their iPhones and others on their iPads. The applications included gamification elements that teachers found engaging and useful to learn the language (Nielsen, 2015). Last, we closed each session by reviewing the material and explaining the next topic and assignments.

In this course, the content was presented using multiple means of representation. Teachers also had the opportunity to share what they were learning using multiple means of action and expression. The instructor employed multiple means of engagement that kept students motivated in class. Table 1 includes UDL principles, guidelines, and examples of multimedia tools used in the course (CAST, 2011).

Table 1

UDL and Technology

UDL Principle	*Related UDL Guidelines*	*Examples of Multimedia Tools*
Multiple means of representation	Provide different options for perception	PowerPoint presentations with embedded audio and videos (YouTube) were used in class and on Blackboard.
	Provide multiple options for language and symbols	Google images, books and songs online to stress vocabulary through visuals and audio were used throughout the course.
Multiple means of action and expression	Use multiple media for communication	Teachers had the option to design videos, digital stories, or PowerPoint presentations for school projects, such as for the final project.
	Provide options for expression and communication	Facetime and Skype (video chat applications) were used to practice oral language skills individually with the instructor. Teachers practiced greetings, farewells, and how to make appointments with families.
Multiple means of motivation and engagement	Provide options to optimize individual choice, relevance, authenticity, and autonomy; and minimize threats and distractions	Teachers had options to work in small groups or individually on projects and to choose the context of projects. Classroom centers had a variety of activities targeting beginners, intermediate and advanced Spanish skills.
		Teachers had options to select themes for their projects depending on their interest, language proficiency level and technology knowledge.
		The instructor provided options to reduce anxiety and distractions by allowing teachers to practice language skills in small groups, individually with the instructor using video chat applications (or in person), and using language applications such as Duolingo.

Final Project

The final project required teachers to develop an oral presentation/activity for students and families in their classroom. The teachers had the opportunity to complete the final project on a topic that was relevant and meaningful to them using the technology tool or software of their

choice. Specifically, the option of creating digital stories or videos was presented for the purpose of reducing anxiety when speaking Spanish and to increase oral skills. These options were provided to teachers because videos and digital stories when created in small groups have been found to improve oral skills (Lee, 2014; Lys, 2013); reading fluency (Ortiz, Burlingame, Onuegbulem, Yoshikawa, & Rojas, 2012); and recognition of vocabulary (Castañeda, 2011) among students learning another language. In addition, the use of multimedia tools promotes social interaction, expression, and speaking fluency (Lee, 2014). In class, we discussed the importance of creating an environment in which students and families feel secure and comfortable. These options also make students feel less anxious about speaking another language (Krashen & Terrell, 1983; Sun, 2009).

Teachers could choose the context or theme for their final project. The project needed to include an introduction, the content which used vocabulary and phrases learned in class, and conclude with a farewell and personal contact information (Mogge et al., 2017) These areas were practiced during the semester. The areas that were specifically evaluated in this project were: (1) vocabulary, (2) pronunciation, (3) content (introduction, relevant content, farewell, contact information), and (4) format and quality of the presentation using technology. The teachers were required to complete a final reflection about their experiences and practices in the classroom using Spanish. They had the option to write the journals in English and/or Spanish. Teachers also had the opportunity to share these experiences orally during our class discussion. The reflections and discussions allowed the instructor to reflect on the lessons learned and future recommendations.

Teachers had the option of developing this final project individually or in collaboration with another teacher. Forty four percent of the class decided to work in collaboration with another colleague while fifty six percent of the class completed projects individually. Teachers also had the option to choose the type of technology and format for the final presentation. For this final project teachers used different technology and mobile devices to develop their projects. For example, some teachers used their iPhones, iPads, and software applications such as Movie Maker or iMovie to create and edit their videos. Other students presented their projects orally in class using PowerPoint. In class, teachers had the opportunity to brainstorm ideas and decide how they wanted to make their projects. Most of the teachers selected personal technology tools that they felt comfortable using individually or with a colleague. The instructor reviewed proposals and provided suggestions and resources before the projects were created.

The teachers developed their final presentations for different purposes depending on their immediate need in relation to their students and families. The vocabulary and content presented in the projects were also different. For example, some teachers used the vocabulary about the parts of the body and numbers, while others used vocabulary to describe services, events, and activities. Table 2 illustrates examples of the content of videos and the use given to it by the educators in the school environment.

Table 2

Examples of Video Content

Videos	*Content*	*Use of Videos*
Back to School Night	Teachers provided a guide to the school and introduced teachers.	New students, school assemblies, Parent Teacher Association meeting
Strategies to Read at Home	Teachers demonstrated strategies for families to use when reading in the home.	Parent workshop
Story Time	Teachers read a book, asked questions before, during, and after the story, and included an after reading activity.	Reading center and family reading activity
Cooking Recipes	Teachers shared recipes for making play dough, cookies for your pet and discussed information on healthy snacks.	Learning center activities, home school activities to extend learning about units of study
Homework Strategies	Teachers shared information about homework, strategies and materials that students need to do homework at home.	Parent workshop
Children's Songs	Common songs sung in class as part of the routine.	Classroom routines, family activity

Lessons Learned

The conversational Spanish course was developed and implemented to meet the specific needs of this PDS site (NAPDS, 2008). Key lessons were learned about collaboration among teachers and the PDS partners, the use of technology, and language learning.

Collaboration. The partnership between the university and school principal, PDS coordinator, teachers, children, and families was critical for the overall initiative but also for this course. The instructor took the feedback from the PDS to specifically address the needs of the teachers and create a low anxiety environment for this course (Krashen & Terrell, 1983). As explained in this article, meaningful activities were created relevant to school themes and families. Being able to include the ideas of the PDS partners in developing the course strengthened the relationship. In this school, the teachers signed up for this course voluntarialy and had the motivation to learn the language. Motivation, attitude, and interest in learning another language have been found to impact language learning (Mustafa, Rashid, Atmowardoyo, & Dollah, 2015). In addition, the principal of the school took the course and participated actively in class. This positive energy promoted the use of Spanish with students, families and teachers in the school.

Collaboration among the teachers was also evident in completing assignments and class activities because the course provided multiple means of engagement, action and expression.

Therefore, it was critical to use the principles of UDL in planning the course. Teachers had the option to collaborate, which they did in small groups. They also began to visit each other to observe, exchange ideas, and make decisions about their projects, which is crucial for learning. Teachers identified their classroom needs and made projects relevant to them and their families. Some teachers worked on these projects with their students using their native language and in doing so, they used best practices and valued the language and culture of their students (NAEYC, 1995). This outcome kept teachers engaged and motivated to learn Spanish.

Technology. Another important lesson was preparing to use technology in the classroom. In this course, teachers had the opportunity to explore, learn and integrate technology in their school using Spanish. In addition, technology was used to practice the language and reduce their anxiety, document their experiences learning the language, and create materials to use in the classrooms or with families. Overall, technology was a great tool to engage the PDS community in speaking some Spanish "un poquito de Español" and use their projects for future PDS events. It is important to note that the instructor dealt with having to plan for different skills levels in Spanish and technology. Therefore, it was important to be flexible, provide options, allow teachers to collaborate with other teachers in using the technology to practice their skills and have resources available for them. For example, for one of their assignments, teachers were tasked to explore their school community. To complete this assignment, the teachers were provided with a variety of options. They could visit a restaurant, store, organization or attend an event in the community where Spanish was used as the medium for communication. Students had to take photos, observe, listen, and interact (speak) with community members. Then they had to report what they learned in class. Some students worked in groups and presented their work using videos and PowerPoint presentations. The teachers felt this activity was relevant and useful because it was a real experience where they could participate in the community.

Language. It was beneficial to take a communicative approach when teaching the course. Emphasis on communication as well as including some traditional techniques was ideal for this course (Littlewood, 2013). These activities worked well when teachers with different levels of skills and knowledge of Spanish worked in small groups. For example, when teachers created videos, they divided their tasks based on their level to report the content. In one of the groups, one teacher narrated the video while the other teacher introduced the staff in the building. In another video, the teachers shared the task of showing how to make biscuits for dogs following a recipe children could do with their families. Other teachers prepared their videos after using more traditional methods, such as question and answer drills to feel more prepared before creating their videos.

In class discussions, teachers recognized that learning a language takes time and opportunities to practice the language are essential. Teachers shared that they now understood the frustration or anxiety that sometimes students may feel when they cannot do the task or activity using the English language. Nonetheless, the teachers felt positive about the course experience. The teachers felt they improved "un poquito" and initiated changes in the school to promote the use of Spanish with more teachers and families. Teachers were enthusiastic about supporting Spanish in the classroom through various events and activities. The exchange of these ideas also resulted in event planning. For example, they created a video for family Back to School Night. Teachers made a video touring the different classrooms of the school and presented it to other teachers. The teachers who created this video, taught other teachers who did not take the course how to introduce themselves in Spanish in the video. This video will be used in future Back to

School Nights with the purpose of guiding new incoming students and families. Teachers felt comfortable presenting videos and using the technology they chose for their projects. The instructor felt these presentations demonstrated how teachers improved their pronunciation and use of vocabulary and phrases in Spanish in order to communicate with families.

The use of Spanish in the classroom was more successful for some teachers than for others. Some teachers were able to establish communication with children and families quickly and effectively. For other teachers, establishing communication was more difficult as their Spanish skills were at the beginner level. These teachers could have benefited from more practice in effectively integrating Spanish in their classrooms. Nonetheless, these educators created videos in which they taught songs to their students to reinforce unit vocabulary. For example, one teacher created a video showing the students how to sing a song about the parts of the body. Another teacher created a video telling the parents the list of items they needed to buy at the beginning of the year. That teacher also used the video with the students to practice the vocabulary in both languages.

It is important to create a positive learning environment in which different languages and cultures are valued by the school. The Spanish course created a space to explore how to use the native language of children in the classroom. The teachers reported that using Spanish in their classroom motivated students and increased the interest of students when delivering instruction. Some teachers believed that this was one of the causes by which many students improved their behavior and completed their work in class. For example, teachers began to create letters, signs, posters, and graphic organizers in Spanish to include in their teaching. Completing the final project provided teachers with more confidence to use Spanish and put it into practice in their lessons and informal interactions with the families. Families began to notice this change by increasing their communication with teachers. For example, educators reported that they could engage in simple conversations with families. One of the first changes that educators implemented in their classroom was to greet and say goodbye to their families in Spanish. Doing this provided teachers with the opportunity to practice their Spanish as well as begin to make families feel more comfortable with them. The teachers found that parents began teaching them some words and helped them with the pronunciation of words.

Future Recommendations

This section will outline recommendations related to the *NAPDS Essentials* (2008) and the Spanish course.

Essential #3: Ongoing and reciprocal professional development guided by need.

This PDS initiative was guided by the need to support teachers in better serving culturally and linguistically diverse children and families (Mogge, et. al, 2017). This need was shared by the teachers in the school and supported by the principal of the school. In order to create these opportunities, university-school partners must work in collaboration to share their needs and develop a plan taking into consideration the ideas generated by the school community and the resources available.

In planning a language course, it is important to take into consideration the needs of the teachers taking the course, such as their time. It was important to build sufficient time to practice the language with children and adults in the PDS setting. Therefore, the course was designed to be once a week and included assignments that allowed the teachers to practice during

the week with students and parents in the PDS. However, teachers had other educational demands that limited their time after school. If teachers expressed the desire of having more class time or time to practice with families, the university could provide the option of having the course meet more than once a week and/or could include time to prepare materials in class. Also, the instructor could invite PDS families to participate in the course once a month to have the teachers practice their Spanish with them and families could practice their English. This idea could be developed with the Parent Teacher Association (PTA) or school staff development team and the university instructor.

Essential #4: A shared commitment to innovative and reflective practice by all participants.

Commitment was evident in the participation of the teachers and the principal taking a series of courses delivered by their university partner. Participation in language courses could be facilitated by creating flexible learning environments using technology and taking a communicative approach. Principles of UDL must also be taken into consideration to create flexible learning environments to address the variability of teachers (CAST, 2011). In planning and delivering instruction, include differentiated activities in Spanish and provide different technology tools for all levels. Teachers who participated in the course had different levels of proficiency in Spanish and technology. The instructor differentiated group work and provided examples of technology and how to use it. This helped educators and facilitated the process of teaching and learning. The instructor could include time in the school's technology lab to carry out some of the projects or include the technology specialist from the school as special guest. This could simplify some of the problems encountered by teachers when editing videos, exploring applications and using new software programs. Also, if the university is delivering more than one course, a technology course could be one delivered before the Spanish course.

Conclusion

This Spanish conversational course facilitated the learning of Spanish for teachers even though time, educational demands, different skill levels in Spanish and technology were challenges when delivering the course. The teachers felt they could speak some Spanish and felt proud of their final projects. Creating videos, digital stories, and/or oral presentations facilitated teaching and learning Spanish. Therefore, technology impacted the nature of the course. The fact that the course was delivered in the school environment was beneficial because it provided opportunities to teachers to practice with children and families in a natural environment. In addition, teachers were able to create their projects using technology and implement them in their PDS. The PDS served as a medium to practice Spanish and create meaningful projects relevant to the needs of teachers, children and families. These outcomes are aligned with the objectives identified by the PDS team. Consequently, the PDS benefitted greatly from this initiative.

In the future, this course could be replicated in a PDS site to investigate its effectiveness. In doing so, research studies could be conducted by teachers, student-teachers, or university faculty to explore a variety of topics related to learning a second language, technology tools for language learning, and family involvement. In addition, after taking the course one could explore how teachers use Spanish and other strategies to facilitate the teaching and learning in order to highlight best practices. Universities could facilitate this process by organizing inquiry groups in schools, encouraging action research projects for student-teachers targeting these areas, and providing a

forum and resources to share their findings in conferences, such as at local or national PDS conferences.

As mentioned before, the course was not designed to make teachers proficient in Spanish, but to begin the process of facilitating communication with Latino families. With the completion of the course, the teachers learned some Spanish, practiced their skills with families and felt their pedagogical practices improved by using Spanish and technology to deliver their projects.

References

CAST (2011). Universal design for learning guidelines version 2.0. Wakefield, MA: Author. Retrieved from http://www.udlcenter.org/aboutudl/udlguidelines/downloads

Castañeda, D. A. (2011). The effects of instruction enhanced by video/photo blogs and wikis on learning the distinctions of the Spanish preterit and imperfect. *Foreign Language Annals*, *44*(4), 692-711. doi:10.1111/j.1944-9720.2011.01157.x

Delgado-Gaitan, C. (2004). *Involving Latino families in schools: Raising student achievement through home-school partnerships*. Thousand Oaks, CA: Corwin Press.

Durand, T. M. (2011). Latino parental involvement in kindergarten: Findings from the early childhood longitudinal study. *Hispanic Journal of Behavioral Sciences 33*(4), 469 - 489. Retrieved from http://www-bcf.usc.edu/~cmmr/crede.html

Garcia, O., & Kleifgen, J. A. (2010). *Educating emergent bilinguals: Policies, programs, and practices for English language learners.* New York, NY: Teachers College Press.

Gonzalez, N., Moll, L., & Amanti, C. (2005). *Funds of knowledge: Theorizing practices in households, communities, and classrooms.* Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Hoover-Dempsey, K., & Whitaker, M. (2010). The parent involvement process: Implications for literacy. In K. Dunsmore & D. Fisher (Eds.), *Bringing Literacy Home* (pp. 53-82). Newark, DE: International Reading Association.

Krashen, S.D., & Terrell, T.D. (1983). *The natural approach: Language acquisition in the classroom.* Oxford: Pergamon.

Ladky, M., & Peterson, S. S. (2008). Successful practices for immigrant parent involvement: An Ontario perspective. *Multicultural Perspectives*, *10*(2), 82-89. doi:10.1080/15210960801997932

Lee, L. (2014). Digital news stories: Building language learners' content knowledge and speaking skills. *Foreign Language Annals*, *47*(2), 338-356. doi:10.1111/flan.12084

Littlewood, W. (2013). Developing a context-sensitive pedagogy for communication-oriented language teaching. *English Teaching, 68*(3), 3-25. Retrieved from http://www.ncte.org/journals/ej

Lopez, M, & Caspe, M. (2014). Family engagement in anywhere, anytime learning. *Family Involvement Network of Educators (FINE) Newsletter, 6*(3). Retrieved from http://www.hfrp.org/publications-resources/browse-our-publications/family-engagement-in-anywhere-anytime-learning

Lys, F. (2013). The development of advanced learner oral proficiency using iPads. *Language Learning & Technology*, 17, 94–116. Retrieved from http://llt.msu.edu/issues/october2013/lys.pdf

Mogge, S., Martinez-Alba, G., & Cruzado-Guerrero, J.R. (2017). Supporting school

responsiveness to immigrant families and children: A university-school partnership. TESL-EJ, 20(4). Retrieved from http://www.tesl-ej.org/wordpress/issues/

Mustafa, H. H., Rashid, M. A., Atmowardoyo, H., & Dollah, S. (2015). Students' attitudinal factors in learning English as a foreign language. *Journal of Language Teaching & Research*, *6*(6), 1187-1194. doi:10.17507/jltr.0606.05

National Association for Professional Development Schools (2008). What it means to be a professional development school. *Policy Statement.* Wako: TX. Retrieved from http://napds.org/wp-content/uploads/2014/10/Nine-Essentials.pdf

The National Association for the Education of Young Children (1995). Responding to linguistic and cultural diversity: Recommendations for effective early childhood education. *Position statement.* Washington: DC. Retrieved from http://www.naeyc.org/positionstatements/linguistic

Nielsen, L. (2015). Digital resources for ELL students and those learning a foreign language. *Tech & Learning*, *36*(4), 16-18. Retrieved from http://www.techlearning.com

Ortiz, J., Burlingame, C., Onuegbulem, C., Yoshikawa, K., & Rojas, E.D. (2012). The use of video self-modeling with English language learners: Implications for success. *Psychology in the Schools*, *49*(1), 23-29. doi:10.1002/pits.20615

Sun, Y.-C. (2009). Voice blog: An exploratory study of language learning. *Language Learning & Technology, 13*, 88–103. Retrieved from http://llt.msu.edu/vol13num2/sun.pdf

Takanishi, R. (2004). Leveling the playing field: Supporting immigrant children from birth to eight. *The Future of Children, 14*(2), 61-79. doi:10.2307/1602794

Turney, K., & Kao, G. (2009). Barriers to school involvement: Are immigrant parents disadvantaged? *The Journal of Educational Research, 102*(4), 257–271. Retrieved from http://www.worldcat.org/title/journal-of-educational-research/oclc/1695843

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Using Simulated Virtual Environments to Improve Teacher Performance

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Abstract: National research that is a collaborative between universities and school districts is critical to ensure innovative ideas are created to directly impact teacher performance in the classroom. This paper describes a national research study on using simulation in teacher professional development to impact teacher practice. A quasi-experimental, pre-post group design was used to examine the effects of the simulator on middle school teachers' practices in mathematics. Teachers were observed in the TLE TeachLivE™ (TeachLivE) classroom simulator and in their regular classrooms to determine the effects of treatment. Trained observers (a) collected pre-post frequency counts of teacher behavior on questioning, wait time, and feedback; (b) scored teacher classroom practice on modified sub-constructs of the Danielson Framework for Teaching; and (c) took qualitative field notes. Results from this study validate emerging research in the field of teacher professional development and simulation that suggests that professional learning in mixed-reality simulated classrooms can be effective in impacting teacher practice.

KEYWORDS: Danielson Framework for Teaching, preservice teachers, Professional Development Schools, High Leverage Practices, simulations, TeachLivE, teacher performance, teacher preparation, virtual environments

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2. A school–university culture committed to the preparation of future educators that embraces their active engagement in the school community;
3. Ongoing and reciprocal professional development for all participants guided by need; and
4. A shared commitment to innovative and reflective practice by all participants

Teachers are the single most important factor to influence student learning and academic outcomes, aside from the students themselves (Darling-Hammond, 2003; Kane & Staiger, 2008). High quality professional development (PD) is crucial for teachers to meet the new levels of standards in today's classrooms. The ultimate outcome of any PD is to make a positive impact on teacher practice and student academic outcomes. Due to the complex nature of collecting student

data in schools (Guskey & Sparks, 2002), research on PD using the What Works Clearinghouse (WWC) standards on student achievement is limited (Guskey & Yoon, 2009; U.S. Department of Education, 2008; Yoon, Duncan, Wen-Yu Lee, Scarloss, & Shapley, 2007). Yoon and colleagues (2007) reported a lack of rigorous research regarding the effects of teacher PD on student achievement, identifying over 1,300 studies between 1986 and 2003 of which only nine met the WWC evidence standards and all were at the elementary school level. In a follow-up analysis conducted by Guskey and Yoon (2009), each of the nine identified studies cited active learning and opportunities for teachers to adapt practices to their individual classrooms as having the greatest impact. Lauer, Christopher, Firpo-Triplett, and Buchting (2014) in their review of the literature found that 30 hours was a key point for PD to be effective but that it had to be grounded in teacher practice.

The search for effective practices and what should be included in effective PD to impact student learning (Earley & Porritt, 2014) emerged from a national study on the Measures of Effective Teachers (http://www.metproject.org/). This group reported as Teaching Works (2014; http://www.teachingworks.org/) analyzed core practices for teachers and developed a set of 19 high-leverage practices (HLPs) for instruction across content areas, that most likely lead to increased advances in student learning. These 19 practices are based on research linking particular practices to student achievement and are generated from published descriptions of teaching, videos of teachers at work, and expert experience (Loewenberg Ball, & Forzani, 2010). These practices were created from a "thorough analysis of what teachers do and yielded a large 'map' of nearly 100 tasks of teaching" (Teaching Works, 2014, para. 1) and then narrowed to 19 practices by expert teachers. The result was the creation of a framework of synthesized teaching practices aligned with the highest student learning outcomes. These 19 practices can be found at http://www.teachingworks.org/work-of-teaching/high-leverage-practices and are intended to provide a framework for skills that should be targeted in high-quality teacher education and professional development no matter the context (e.g., face-to-face, online, simulation) in which the professional development is being delivered.

Similar teaching practices are described in other published descriptions of teacher practice such as the Danielson framework. This framework is a "research-based set of component of instruction, aligned to the INTASC standards, and grounded in a constructive view of learning and teaching" (Danielson, 2011, p. v) and consists of four domains related to teacher practice to impact student learning. These domains provide a framework for teachers to discuss their practices and to identify areas in need of further enhancement in their own instruction. The Danielson framework provides indicators for eliciting student thinking, such as open-ended questions that allow students to use past experiences, prior knowledge, and previously learned content and relate it to newly learned content in order to create a well-thought-out answer (i.e. question statements that begin with "How", "What", or "Why").

If research is converging on a core set of high-quality teaching practices that positively impact student outcomes, and researchers have identified characteristics of high-quality PD for teachers, what are the best environments for delivering this PD to teachers? These frameworks, such as the Danielson and the HLPs, should be paired with practices such as those outlined by the National Association of Professional Development Schools (NAPDS) to provide the school and university partners with new and innovative models of PD. Yet, these models must be grounded in teacher practices that are aligned with increasing student learning outcomes.

Examples of next generation PD environments for teachers to learn both pedagogical and content skills aligned with recognized national frameworks are emerging, and computer simulation is at the forefront. As described in Dieker, Straub, Hughes, Hynes, and Hardin, (2014), simulated environments can provide educational experiences and opportunities that may not be available in real-world settings (Dieker, Straub et al., 2014; Dieker, Rodriguez, Lignugaris/Kraft, Hynes, & Hughes, 2014) and allow for safe practice of targeted skills (no "real" students are put at risk) until mastery is achieved. Despite this emergence of a new tool, the ultimate question that has to be answered is, "Does teacher professional development in virtual environments transfer to practice and impact student learning?"

A Virtual Learning Environment

This study is the first national study conducted using a virtual learning environment in teacher education and PD. The specific environment used here, TLE TeachLivE™ (TeachLivE), is an immersive, virtual classroom simulator that includes the features of a real classroom (see http://www.teachlive.org). Real and virtual worlds are combined in the environment to give the users a sense of immersion with both physical and social presence (Biocca, Harms, & Burgoon, 2003; Hayes, 2015), wherein the teachers interact with student-avatars in real time, holding authentic discussions on varied content areas. Student-avatars have personalities typical of real-life students, and teachers are faced with instructional decisions based on varying levels of content knowledge, discourse, and behavioral compliance. As more and more universities are using this virtual simulation tool, a research base is emerging focusing on the use of TeachLivE with teacher candidates and teachers.

A unique component of the TeachLivE environment is the opportunity to offer standardized experiences grounded in the HLPs with integrated video tagging software to record, play back, and export data collected during a session. That is, the simulated activity allows time for an integrated after-action-review (AAR) process to take place, in which teachers take part in structured reflection (Baird, Holland, & Deacon, 1999). Time in a simulator is compressed so that 10 minutes equates to between 30 and 60 minutes of real time (we can skip the starting, getting students seated or, if desired, start in the middle of a lesson with student work samples already produced). Most importantly, unlike in real classrooms, teachers can re-enter the simulated environment to fix instructional "errors" without affecting real students. Potentially, immersive virtual environments can change the face of teacher PD with innovative applications of the technology, but research is needed to establish the efficacy and effectiveness of the use of simulation for teacher education.

Theoretical Framework and Overarching Hypotheses

The overarching hypothesis of this study is that teachers who engage in virtual PD will improve their application of pedagogical knowledge as well as improve student content knowledge. The research team hypothesized that teacher learning is most effective in contextually meaningful settings (Dieker, Rodriguez, et al., 2014) and created a contextually meaningful simulation activity that provided learners with the opportunity to practice HLPs with student-avatars. This work is grounded in Brown, Collins, and Duguid's (1989) theory of situated cognition, asserting "what is

learned cannot be separated from how it is learned and used" (p. 88). Further, the research team hypothesized that learning occurring in a virtual classroom would transfer to a real classroom.

Research Questions for Teacher Performance

As noted in the hypothesis, the focus of this research study was on changing teacher practice. The team set about finding evidence of change in teacher practice in two environments: (a) the classroom simulator and (b) the teachers' classrooms. In both settings the team attempted to change teacher practice using TeachLivE or TeachLivE combined with other forms of PD. Research questions focused on the effect of the classroom simulator environment as compared to lesson resources and synchronous online PD on teacher performance (both in the virtual environment and back in their real classroom) and student learning outcomes. The researchers grounded the study in the following research questions: (1) Are there differences in performance over four 10-minute sessions of TeachLivE in a classroom simulator based on whether or not teachers received 40 minutes of online PD?; (2) What are the effects of simulation without after-action-review on teaching practice in a classroom?; (3) Are there differential effects of TeachLivE on teacher practice in a classroom based on whether or not teachers received online PD?; and (4) Are there differential effects of TeachLivE on student scores based on whether or not their teachers received online PD? These research questions were explored by working with middle school teachers in 10 research locations comprised of university and school district partners.

Method

Subjects

Participants were practicing middle school mathematics teachers. At each of 10 partnership sites, approximately 20 teachers were self-nominated or nominated by their supervisors with the intent of receiving innovative, technology-rich PD. Of those teachers, 135 teachers completed the study. Participation was entirely voluntary with minimal to no compensation provided. Demographic data for participating teachers are presented in Table 1.

Data were collected in two settings: the teachers' real classrooms (before and after the simulator experiences) and the classroom simulator. Teachers were observed in their respective middle school classrooms located in six states: Florida, Louisiana, Michigan, Mississippi, New York, and Utah. School settings included urban, suburban, and rural with public or private enrollment. Virtual simulated classrooms were located at 10 partner sites across the country in rooms at a nearby university or school district partner sites.

Teacher data. All teachers were observed teaching in their classrooms pre- and post- treatment using quantitative and qualitative observations on the Teacher Practice Observation Tool (TPOT, a validated tool used to measure teacher practice; Hayes, Hardin, Dieker, Hynes, Hughes, & Straub, 2013).

Table 1. Teacher Demographic Data

	Control (n = 35)		PD Only (n = 35)		TLE Only (n = 35		TLE & PD (n =30	
Variable	n	(%)	n	(%)	n	(%)	n	(%)
Professional licensure								
Yes	32	(91)	32	(91)	31	(89)	29	(97)
No	0	(0)	1	(3)	0	(0)	1	(3)
No response	3	(9)	2	(6)	4	(11)	0	(0)
If licensed, is license in math?								
Yes	26	(74)	25	(71)	25	(71)	26	(87)
No	6	(17)	7	(20)	6	(17)	4	(13)
No response	3	(9)	3	(9)	4	(11)	0	(0)
Area of certification								
Grades 5-9 math only	13	(37)	15	(43)	9	(26)	10	(33)
Grades 6-12 math only	6	(17)	8	(23)	12	(34)	11	(37)
Other	9	(26)	3	(9)	6	(17)	4	(13)
Grades 5-9 & 6-12 math	1	(3)	0	(0)	1	(3)	2	(7)
Grades 5-9 math & other	0	(0)	1	(3)	1	(3)	1	(3)
Grades 6-12 math & other	0	(0)	1	(3)	0	(0)	1	(3)
Grades 5-9 & 6-12 math, & other	1	(3)	0	(0)	0	(0)	0	(0)
No response	5	(14)	7	(20)	6	(17)	1	(3)
Grade levels taught								
6-8 only	17	(49)	14	(40)	18	(51)	19	(63)
K-5 & 6-8	5	(14)	7	(20)	6	(17)	3	(10)
6-8 & 9-12	6	(17)	10	(29)	7	(20)	8	(27)
K-5, 6-8, & 9-12	4	(11)	2	(6)	0	(0)	0	(0)
No response	3	(9)	2	(6)	4	(11)	0	(0)
Highest academic level								
Bachelor's	17	(49)	19	(54)	18	(51)	21	(70)
Master's	15	(43)	14	(40)	13	(37)	9	(30)
No response	3	(9)	2	(6)	4	(11)	0	(0)
Area of masters degree								
Math education	2	(6)	4	(11)	4	(11)	2	(7)
Educational leadership	5	(14)	2	(6)	2	(6)	2	(7)
Other	7	(20)	9	(26)	7	(20)	7	(23)
Educational leadership & other	1	(3)	0	(0)	0	(0)	0	(0)
Not applicable	14	(40)	13	(37)	14	(40)	16	(53)
No response	6	(17)	7	(20)	8	(23)	3	(10)
Years teaching math								
One year	2	(6)	6	(17)	7	(20)	3	(10)
Two years	2	(6)	4	(11)	2	(6)	5	(17)
Three years	2	(6)	1	(3)	5	(14)	1	(3)
Four years	2	(6)	2	(6)	0	(0)	4	(13)
5-10 years	13	(37)	9	(26)	9	(26)	9	(30)
More than 10 years	11	(31)	11	(31)	8	(23)	8	(27)
No response	3	(9)	2	(6)	4	(11)	0	(0)

	Control (n = 35)		PD Only (n = 35)		TLE Only (n = 35		TLE & PD (n =30	
Variable (Cont's)	n	(%)	n	(%)	n	(%)	n	(%)
Age								
18-29	7	(20)	1	(3)	7	(20)	7	(23)
30-39	11	(31)	7	(20)	10	(29)	9	(30)
40-49	6	(17)	12	(34)	6	(17)	11	(37)
50 or above	8	(23)	13	(37)	8	(23)	3	(10)
No response	3	(9)	2	(6)	4	(11)	0	(0)
Gender								
Male	7	(20)	9	(26)	8	(23)	5	(17)
Female	25	(71)	24	(69)	23	(66)	25	(83)
No response	3	(9)	2	(6)	4	(11)	0	(0)
Ethnicity								
American Indian	0	(0)	0	(0)	0	(0)	1	(3)
Asian	2	(6)	1	(3)	0	(0)	1	(3)
Black	2	(6)	3	(9)	3	(9)	1	(3)
Hispanic	4	(11)	2	(6)	0	(0)	0	(0)
White	24	(69)	26	(74)	28	(80)	27	(90)
Other	0	(0)	1	(3)	0	(0)	0	(0)
No response	3	(9)	2	(6)	4	(11)	0	(0)

Valid Participants = 135 Attrition = 22

During classroom observations, data were collected on (a) the frequency of HLPs determined to increase the likelihood that these teaching behaviors would have a positive effective on students' learning outcomes (Teaching Works, 2014), (b) modified sub-constructs from the 2011 Danielson Framework for Teaching Evaluation Instrument, and (c) qualitative field notes. The HLPs provided the defined behaviors to be observed and were aligned with the study at the request of the funding agency. The Danielson framework provided sub-constructs for observation of practices that overlapped with the HLPs and overall teacher development. Data were collected in five-minute intervals, rotating across constructs, so observers focused on one construct at a time during the interval. For the teachers who experienced the classroom simulator, data also were collected on their four sessions in the TeachLivE environment, and the frequency of the specific targeted HLPs exhibited in each session in the simulated classroom were coded.

The HLP behaviors observed were the teachers' frequency and type of eliciting and interpreting individual students' thinking (HLP #3). Specifically, data were collected on frequency of (a) asking student to describe or explain types of questions; (b) short response questions; and (c) yes/no questions. These targeted HLP's were selected based upon feedback from teacher preparation experts involved with the study and were identified as both observable and measurable behaviors that could be seen in the simulator. The final reason for selection was that the mathematic experts involved with the study felt these behaviors aligned with best practices in math discussion and also aligned with both the HLP's and the Danielson framework.

In the classroom simulator, frequency data were collected. Each session lasted 10 minutes and focused on teachers' discussing students' error patterns in mathematics from already completed student work samples. In the simulator the frequency and type of instances for each behavior were noted. In the teachers' classrooms, lessons varied in length (45 to 95 minutes), so a percentage of

describe/explain questions was calculated based on the ratio of occurrences of describe/explain questions to the sum of all questions (describe/explain, short, and yes/no) asked by the teacher.

Frequency data were coded on the type of feedback teachers gave students. Effective feedback is specific, not overwhelming in scope, focused on the academic task, and supports students' perceptions of their own capability (HLP #12). The teachers' type of feedback exhibited in the simulator was separated into two categories and defined as specific feedback or general feedback.

Just as with other teacher behaviors in the classroom simulator, frequency data of specific feedback were collected. In the teachers' real classrooms, the time in each class period varied, so a percentage of specific feedback was calculated based on the ratio of the occurrences of specific feedback to all feedback (specific plus general).

Finally, frequency data were collected on the amount of time teachers waited after asking questions as a means of providing students with sufficient time to think about their response, to reflect on the comments of their classmates, and to deepen their understanding (HLP #3). Brophy and Good (1986) recommended three to five seconds of wait time after a question is posed. For the purposes of this study, wait time was defined as a dichotomous variable, separating it into time greater than or equal to three seconds or time less than three seconds.

Sub-constructs from 2011 Danielson Framework for Teaching. Eight sub-constructs correlated with student achievement were identified from the 2011 Danielson Framework for Teaching Evaluation Instrument (MET Project, 2010). Key words from Danielson's indicators were chosen to create an abbreviated version to be used in classroom observations combined with the collection of frequency data in relation to describe/explain questions, specific feedback and wait time. Danielson's four levels of performance were the basis for a four-point scale for each sub-construct: establishing a culture for learning, engaging students in learning, managing student behavior, managing classroom procedures, communicating with students, using questioning and discussion techniques, creating an environment of respect and rapport, and using assessment in instruction. The research team in an earlier study (Straub, Dieker, Hynes, & Hughes, 2014) created a rating scale of what was observable for each of these four constructs with level 1 being limited observation of the skill to level 4 being mastery of the skill. These categories were vetted, validated, and reliability training occurred for the research team prior to use in classroom observations and simulation observations.

Methods used to enhance the quality of measurements. Due to the national nature of the study, researchers and observers were at sites across the country, and this presented challenges for observational teams in terms of training and reliability. Therefore, all data collectors were trained online using a combination of asynchronous assessment and synchronous data collection training on the constructs (e.g., Danielson sub-constructs and HLPs) and methods (e.g., frequency counts during rotating intervals as described above) for data collection. Data collectors used the asynchronous online modules to demonstrate proficiency with the content of observations. Each practice was defined and a case example was provided. Observers had to pass a multiple-choice content assessment with 90% accuracy for the asynchronous portion of the training. The synchronous online group training consisted of a series of activities delivered via a video conferencing platform that exposed observers to operational definitions and required the collection of frequency counts in real time while watching a video online to simulate classroom observations.

Each observer was checked for reliability during the online training and required to complete a synchronous online activity with 90% accuracy.
During each session in the simulator, videos were tagged for frequency and type of questions and feedback. See Table 2. Dependent Variables for an overview of dependent variables collected in the study.

Student data. Data also were collected from middle school students in the participating teachers' classrooms on student performance on a curriculum-based measure of algebraic equations based on the National Assessment of Educational Progress (NAEP). Ten items from the eighth grade 2011 NAEP were used to collect information about student achievement. Teachers were instructed to give students 20 minutes to complete the assessment (pre-post).

Table 2. Dependent Variables

Construct	Type
HLP # Questioning	Describe/explain questions
	Short response questions
	Yes/no questions
	Wait time greater than or equal to three seconds
	Wait time less than three seconds
HLP #12 Feedback	Specific feedback
	General feedback
Sub-constructs from Danielson Framework	Establishing a culture for learning
	Engaging students in learning
	Managing student behavior
	Managing classroom procedures
	Communicating with students
	Using questioning and discussion techniques
	Creating an environment of respect and rapport
	Using assessment in instruction

Research Design

The research design was a group randomized trial, consisting of four groups of teachers measured pre-post in the classroom, and two of the groups were measured four times in the classroom simulator. To prevent treatment diffusion across conditions, teachers at each school (G1 36, G2 41, G3 41, G4 39) were grouped together into a unit and randomly assigned to one of four treatment conditions as a unit. The random assignment procedure took place at all 10 partnership sites, resulting in four experimental groups.

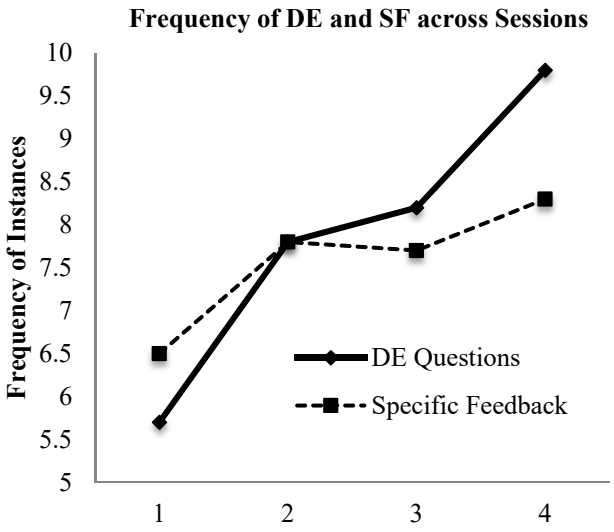
Interventions

Teachers received varying levels of PD based on a lesson plan aligned to the Common Core standards, Classroom Challenges: Solving Linear Equations in One Variable (Mathematics Assessment Resource Service, 2012) and were assigned to one of four groups: Group 1 (G1) teachers served as a comparison group and received lesson plans only; Group 2 (G2) teachers received lessons and online PD; Group 3 (G3) teachers received lessons and TeachLivE; and

Group 4 (G4) teachers received lessons, online PD, and TeachLivE (without AAR). See Figure 1 for an overview of the four treatment groups. As with all groups, teachers in the comparison group received the mathematics lesson plan on linear equations via email. They were encouraged to explore the lesson plan and implement it with their students during the school year. They were given no other intervention while in this study.

Teachers in G2 received a digital copy of the lesson plan (like the teachers in G1), as well as one 40-minute session of online PD with a nationally recognized expert in the Classroom Challenges curriculum, delivered via the Adobe Connect platform. The online PD content included a discussion of the five strategies of formative assessment: (a) clarifying and sharing learning intentions and criteria for success; (b) engineering effective discussion, questions, activities, and tasks that elicit evidence of learning; (c) providing feedback that moves the learner forward; (d) activating students as instructional resources for each other; and (e) activating students as owners of their own learning (Thompson & Wiliam, 2008). After the conclusion of the discussion, teachers took part in an analysis of five authentic student work samples (the same samples used in the simulator) in response to a formative assessment included in the lesson followed by another discussion about questioning strategies and feedback for students. Teachers were asked to create questions and provide feedback for students based on the provided examples of student work. The treatment length of online PD was 10 minutes of orientation followed immediately by 40 minutes of PD; this set amount of time equaled the amount of time to be spent in the simulator.

Figure 1. Frequency of Describe Explain and SF across sessions



Teachers in G3 received a digital copy of the lesson (like teachers in G1 and G2), as well as four 10-minute virtual sessions in TeachLivE. In the simulator, teachers attended individual PD and interfaced with TeachLivE. Classroom simulators at the 10 partner sites across the country were connected via secure server and provided fidelity of treatment as all sessions were controlled from the primary research site. For operation at the teacher partner sites, the simulator required a computer with TeachLivE software, large display monitor, webcam, lavaliere microphone, speakers, system for tracking movement, and an Internet connection. A session facilitator, trained on how to use the software and enact the research procedures, facilitated the sessions and collected

the data. The teachers experienced computer-simulated classroom activities with the student-avatars as they would with human students in a traditional classroom. Visits to the simulator took place over the course of four to six weeks.

As with G2 during the online PD, teachers in G3 participated in 10-minute orientation sessions, but here those sessions were in the TeachLivE system. After orientation, teachers received four 10-minute sessions in TeachLivE as PD with data on targeted behaviors gathered during each session. Prior to any of the sessions, teachers were given the same student work samples used in the online PD, but in this condition, teachers were told that each work sample was a product of a specific student-avatar. Teachers were instructed to teach the whole class discussion portion of a specified Classroom Challenges lesson (Solving Linear Equations in One Variable; Mathematics Assessment Resource Service, 2012) and, at the close of each session, they took part in an after-action-review of their performance. After-action-review consisted of three parts: (a) teachers were asked to estimate their frequency of higher order questions and specific feedback; (b) teachers were shown their actual frequency of observed behaviors in the session; and (c) teachers were asked how they intended to use this information. Upon completion of the after-action-review, teachers returned to the simulation for another session. After orientation, teachers typically took part in two 10-minute sessions and returned within a month for another two 10-minute sessions.

Teachers in G4, the TeachLivE and Online PD group, received the lesson plan, participated in the online PD, and engaged in virtual teaching in TeachLivE as outlined above. However, they did not receive any after-action review.

The 135 teachers were grouped by school, then randomly assigned to four groups in a randomized group design nested within school. Teachers attended events individually (e.g., teachers had a selection of the online PD and TeachLivE sessions to choose from); therefore, group assignment could occur prior to the intervention.

Treatment Fidelity

Fidelity checks were in place throughout the study. All teachers received the lesson plan in digital format, as evidenced by a checklist of teacher contact information at each site. The online PD was monitored by a facilitator who checked for fidelity of implementation at each phase of the online session. All online PD sessions were delivered at 100% accuracy as evidenced by a lesson plan checklist outlining the content. During the TeachLivE sessions, the facilitator followed a detailed procedural checklist to turn on and operate the software for the simulation, ensuring fidelity of implementation.

Data Analyses

Teaching practices were defined on three distinct dimensions of pre- and post-intervention: (a) describe/explain questions (DE), (b) specific feedback (SF), and (c) summary score on the TPOT (TPOT Sum). For research question 1, to determine if a difference in effects in performance occurred from four 10-minute sessions of TeachLivE in a classroom simulator based on whether or not teachers received 40 minutes of online PD, a two-factor mixed design ANOVA was performed. Time (four sessions) was cast as a within-subjects factor, and condition (two levels,

online PD and no online PD) functioned as a between-subjects factor, with dependent variables of DE and SF. Due to a lack of research in simulation (as similar research in other fields has not occurred related to performance due to the life and death nature of past use of simulation – pilot training, surgery, military training) the team predetermined that a level of significance with greater type I error would be considered, as the simulator creates an environment without risk and any changes of teacher performance provided a foundation for future research. Partial eta squared was used to interpret effect size rather than eta squared because a multifactor design was used (Pierce, Block, & Aguinis, 2004), and there was a desire by the team to compare effects across different factorial designs used in the study (Levine & Hullet, 2002).

Two observers collected data on frequency of DE questions asked by teachers per TeachLivE session. Pearson's correlation provided a basis for interpreting reliability of scores between observers during each session (session 1, r = .952; session 2, r = .820; session 3, r = .660; session 4, r = .986). Results from a two-factor mixed design ANOVA indicated no differential effects for teachers who did or did not get online PD ($F(3,171) = .735$, $p = .532$, $\eta 2p = .13$). However, a significant time effect was identified ($F(3,171) = 9.993$, $p = .000$, $\eta 2p = .149$). Pallant (2007) recommends interpreting partial eta squared using Cohen's (1988) guidelines for eta squared effect size: small (.01), medium (.06), or large (.14), resulting in a finding of a large effect for time (i.e., session). Mean scores increased at each session (see Table 3).

Table 3. Mean DE Questions across 10-minute TeachLivE Sessions

		TeachLivE Sessions			
		Session 1	Session2	Session 3	Session 4
PD Factor	*n*	M *(SD)*	M *(SD)*	M *(SD)*	M *(SD)*
No Online PD	34	5.1 *(4.2)*	7.6 *(4.9)*	8.4 *(5.3)*	9.9 *(4.8)*
Online PD	25	6.5 *(4.2)*	7.9 *(4.5)*	7.9 *(5.9)*	9.5 *(8.1)*
Total	59	5.7 *(4.2)*	7.8 *(4.7)*	8.2 *(5.5)*	9.8 *(6.3)*

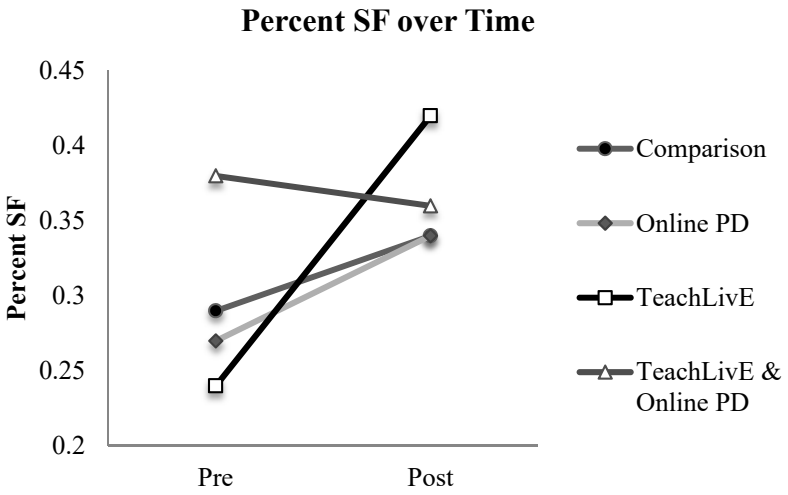
Two observers collected data on frequency of SF given to student-avatars by teachers per TeachLivE session. Reliability of scores between observers during each session was calculated (session 1, r = .928; session 2, r = .872; session 3, r = .811; session 4, r = .790). Results from a two-factor mixed design ANOVA indicated no differential effects for teachers who did or did not get online PD ($F(3,168) = 1.989$, $p = .118$, $\eta 2p = .034$). Yet, a significant time effect was found ($F(3,168) = 2.306$, $p = .079$, $\eta 2p = .040$). Again, mean scores increased at each session (see Table 4). Figure 2 shows the trend of mean scores of frequencies of instances of DE and SF across sessions.

Table 4. Mean SF Questions across 10-minute TeachLivE Sessions

		TeachLivE Sessions			
		Session 1	Session2	Session 3	Session 4
PD Factor	*n*	M *(SD)*	M *(SD)*	M *(SD)*	M *(SD)*
No Online PD	34	6.2 *(5.1)*	8.3 *(6.0)*	8.7 *(4.8)*	8.6 *(4.6)*
Online PD	24	6.9 *(4.5)*	6.7 *(3.6)*	6.3 *(3.9)*	7.9 *(6.7)*
Total	58	6.5 *(4.8)*	7.8 *(5.1)*	7.7 *(4.6)*	8.3 *(5.5)*

To investigate the effects on teacher practice in a classroom setting, observers collected data during classroom observations pre- and post-treatment. Teacher behavior was considered without and with an integrated after-action-review process in TeachLivE. To examine performance of teachers in a classroom after TeachLivE sessions without after-action-review, a three-factor mixed design ANOVA was calculated with between-subjects factors of simulation (TeachLivE and no TeachLivE) and online PD (online PD and no online PD), and a within-subjects factor of time (pre- and post-intervention).

Figure 2. Mean Scores of Frequency of Instances across Sessions



Note G4 TeachLivE & Online PD did not receive AAR

The dependent variable was percentage of wait time that was three seconds or more (WT>3). An observer collected data on frequency of WT>3 in a class, and two observers observed 30% of classes to establish inter-rater reliability. Reliability of scores between observers during both observations was calculated. Scores were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$); however, ANOVAs are considered to be robust to deviations from normality. There was homogeneity of variances for frequency of wait time at both pre ($p = .827$) and post-intervention ($p = .161$), as assessed by Levene's test for equality of variances. Results from a three-factor mixed design ANOVA indicated a non-significant effect for the three-way interaction effects of time, simulation, and online PD ($F(1,130) = 1.003$, $p = .318$, $\eta 2p = .008$). No effects were found for simple two-way interaction between time and simulation ($F(1,130) = .002$, $p = .968$, $\eta 2p = .000$), and this finding was expected because no performance feedback had been provided to teachers. Further, no effects were found for simple two-way interaction between time and online PD ($F(1,130) = .304$, $p = .582$, $\eta 2p = .002$) or for time ($F(1,130) = 1.580$, $p = .211$, $\eta 2p = .012$).

While no significant effects for TeachLivE simulation without after-action-review were found, TeachLivE with after-action-review did contribute to changes in teacher practice, and that effect differed across teachers who received online PD as well. Again, the research team used a three-factor mixed design ANOVA to evaluate the effectiveness of TeachLivE with after-action-review. Dependent variables of DE questions, SF, and TPOT Sum were analyzed.

In the teachers' classrooms, lessons varied in length (45 to 95 minutes), so a percentage of DE questions was calculated and used as the pre-post measure. Observer reliability was evaluated using Pearson's correlation (pre-intervention, r = .701; post-intervention, r = .795).

A three-way mixed ANOVA was conducted to understand the effects of TeachLivE, online PD, and time on percentage of DE questions asked during a lesson. Scores were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). There was homogeneity of variances for percentage of DE asked at both pre- ($p = .065$) and post-intervention ($p = .335$), as assessed by Levene's test for equality of variances. Results of the three-factor mixed design ANOVA indicated no differential effect of time for online PD when combined with TeachLivE ($F(1,130) = .168$, $p = .682$, $\eta 2p = .001$). The interaction between TeachLivE and online was not statistically significant ($F(1,130) = .015$, $p = .902$, $\eta 2p = .000$). There was a statistically significant two-way interaction between time and online PD ($F(1,130) = 5.735$, $p = .018$, $\eta 2p = .042$) and time and TeachLivE ($F(1,130) = 3.479$, $p = .064$, $\eta 2p = .026$).

Statistical significance of a simple main effect was accepted at a Bonferroni-adjusted alpha level of .050. All pairwise comparisons were performed for statistically significant simple main effects. Bonferroni corrections were made with comparisons within each simple main effect that was considered a family of comparisons. Adjusted p-values are reported. Statistically significant differences existed at pre-intervention for those assigned to online PD, ($F(1,130) = 4.854$, $p = .029$, $\eta 2p = .036$), but not at post-intervention ($F(1,130) = 1.204$, $p = .902$, $\eta 2p = .275$), which suggests a difference in groups at pre-intervention. For those assigned to the online PD groups, mean percentage DE was higher at pre-intervention than for those who were not, with a mean difference of 5.7% (90% CI, 0.014 to 0.100), $p = .029$. However, the overall focus of the research was TeachLivE with online PD only as a secondary consideration.

When comparing the effects of TeachLivE over time, there was not a statistically significant difference between groups assigned to TeachLivE at pre-intervention ($F(1,130) = 1.274$, $p = .261$, $\eta 2p = .010$), but there was a post-intervention ($F(1,130) = 9.827$, $p = .002$, $\eta 2p = .070$), suggesting effects for TeachLivE as an intervention. Mean percentage DE was higher at post-intervention for those who received TeachLivE than those who did not, with a mean difference of 10% (90% CI, 0.048 to 0.154), $p = .002$. Because the three-way interaction was not significant, it is appropriate to compare performance of teachers pre-to post-intervention on both TeachLivE and online PD. Teachers who received the online PD decreased their questions by 3%, whereas those who did not receive online PD increased questions by 7%; however significant differences between groups pre-intervention existed. Conversely, TeachLivE teachers increased DE questions by 6%, whereas teachers who did not get TeachLivE decreased them by 2%, and no significant differences existed pre-intervention. See Table 5 for mean changes from pre to post.

An a priori hypothesis was established to determine whether or not there would be differences in percentage of DE questions for teachers who received TeachLivE as compared to teachers who did not. The researchers, using a test of contrast, suggested evidence against the null hypothesis of no difference. Teachers who received TeachLivE, on average, asked a significantly higher ($t(132) = 3.198$, $p = .002$) percentage of DE questions at post-test ($M = 24\%$ than those who did not ($M = 14\%$).

Table 5. Means Changes in Percent DE.

	TeachLivE Factor		Online PD Factor	
	TeachLivE	No TeachLivE	Online PD	No Online PD
Time Factor	M *(SD)*	M *(SD)*	M *(SD)*	M *(SD)*
Pre	18 *(17)*	16 *(14)*	20 *(16)*	14 *(13)*
Post	24 *(20)*	14 *(16)*	17 *(18)*	21 *(20)*
Change	+6	-2	-3	+7

Next, SF was evaluated. Pearson's correlation provided a basis for interpreting reliability of scores between observers. A three-way mixed ANOVA was conducted to understand the effects of TeachLivE, online PD, and time on percentage of SF given during a lesson. Scores were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). There was homogeneity of variances for percentage of SF at both pre- ($p = .794$) and post-intervention ($p = .731$), as assessed by Levene's test for equality of variances. Results of the three-factor mixed design ANOVA indicated a differential effect of time for online PD when combined with TeachLivE ($F(1,130) = 3.486$, $p = .064$, $\eta 2p = 0.26$). Statistical significance of a simple two-way interaction was accepted at a Bonferroni-adjusted alpha level of .050. There was a statistically significant simple two-way interaction of TeachLivE and online PD at pre-intervention ($F(1, 131) = 3.638$, $p = .059$, $\eta 2p = .027$), but not at post-intervention ($F(1,130) = .527$, $p = .469$, $\eta 2p = .004$). Statistical significance of a simple main effect was accepted at a Bonferroni-adjusted alpha level of .050. All pairwise comparisons were performed for statistically significant simple main effects. Bonferroni corrections were made with comparisons within each simple main effect considered a family of comparisons. Adjusted p-values are reported. Data are mean ± standard deviations unless otherwise stated. No significant positive changes were found between G1 and G2 so no further analysis of these groups were completed. Teachers in G3 had the highest gains (+18%) of the four treatment groups, yet their colleagues in G4, who received both TeachLivE and online PD decreased in SF (-2%), the only decrease across all four groups.

Finally, TPOT sum scores were evaluated. Observer reliability was evaluated using Pearson's correlation (pre-intervention, r = .933; post-intervention, r = .970). A three-way mixed ANOVA was conducted to understand the effects of TeachLivE, online PD, and time on TPOT sum score on a lesson. Scores were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$). There was a homogeneity of variances for TPOT sum at both pre- ($p = .218$ and post-intervention ($p = .519$), as assessed by Levene's test for equality of variances. Results of the three-factor mixed design ANOVA indicated a differential effect for time for online PD when combined with TeachLivE ($F(1,117) = 3.003$, $p = .086$, $\eta 2p = .025$). Statistical significance of a simple two-way interaction was accepted at a Bonferroni-adjusted alpha level of .050. There was neither a statistically significant simple two-way interaction of online PD and TeachLivE at pre-intervention

($F(1, 125) = 1.180$, $p = .280$, $\eta 2p = .009$), nor post-intervention ($F(1,121) = .008$, $p = .928$, $\eta 2p = .000$). As with SF, teachers who received TeachLivE without online PD had the highest gains (+1.03) of the four treatment groups; yet their colleagues who received both TeachLivE and the online PD decreased by the largest amount (-.78). See Table 6 for changes in scores over time.

Table 6. Changes in Mean Score of TPOT Sum over Time.

		Time		
		Pre	Post	
Treatment Groups	*n*	M *(SD)*	M *(SD)*	Change
Comparison	32	22.06 *(3.75)*	22.00 *(4.20)*	- .06
Online PD	32	21.33 *(5.35)*	21.83*(4.81)*	+ .50
TeachLivE	32	21.63 *(4.53)*	22.66 *(3.97)*	+1.03
TeachLivE & Online PD	27	23.19 *(3.88)*	22.41 *(4.49)*	- .78

Discussion

In the present study, researchers investigated the use of the TeachLivE simulated classroom to increase HLPs (Loewenberg Ball, & Forzani, 2010), and whether taking online PD differentially increased those practices in both a simulated and real classroom. Further, changes in students' achievement scores also were evaluated in real classrooms using questions from the NAEP for a pretest/posttest comparison. The use of this PD model aligned with teacher performance being embedded in a true relationship between a university and local school districts. This type of collaborative partnership aligns with the recommended practices associated with the NAPDS. This study specifically aligns with four of the nine practices found in effective school-based PD of "2) A school–university culture committed to the preparation of future educators that embraces their active engagement in the school community; 4) A shared commitment to innovative and reflective practice by all participants; 7) A structure that allows all participants a forum for ongoing governance, reflection, and collaboration; and 8) Work by college/university faculty and P–12 faculty in formal roles across institutional settings" (NAPDS, 2008). A recommendation to the field would be to further expand work with online PD and simulation to align with all 8 components in creating long-term partnerships for teacher PD embedded in PDS.

This future embedding of simulation aligns with the findings of this research team. In this study, teachers overwhelmingly agreed that the classroom simulator felt like a real classroom and that the avatar students represented the kinds of students that existed in the real world. Further, teachers asked significantly more DE questions and provided more SF to avatars as sessions progressed. That is, after four 10-minute sessions of TeachLivE, teachers increased their use of

HLPs in the simulator, regardless of whether or not they had 40 minutes of additional online PD. This immediate and transferable impact of skills makes the need for ongoing PDS partnerships to align with these types of "innovative" practices essential.

Results from the simulated classroom were reflected in the real classroom after four 10-minute sessions in TeachLivE. In classes with real students, teachers asked significantly ($F(3,130) = 3.479$, $p = .064$, $\eta 2p = .026$) more DE questions than comparison groups, regardless of whether or not they had online PD. Although main effects for TeachLivE were not found for SF, TeachLivE combined with online PD produced a differential effect. Teachers who received TeachLivE without online PD had the highest percent of SF across all four groups, while their counterparts who received online PD decreased their scores, the largest decrease across all four groups. Although this change could not be explained, this finding does provide an opportunity for further research. On a general measure of teacher performance in the classroom, all teachers improved significantly from pre- to post-observation. As with SF, teachers who received TeachLivE without online PD had the highest gains (+1.03) of the four treatment groups. As predicted, teachers who received TeachLivE with no after-action-review on WT>3 did not show significant improvment in their amount of WT. That is, by withholding feedback (after-action-review) from teachers after a simulation, their performance did not change.

Finally, in terms of student achievement data, all students' scores increased significantly from pretest to posttest on 10 items from the NAEP assessment, which was expected as a result of instruction over the course of the year. However, differential effects of TeachLivE combined with online PD, seen in teachers' SF and the general performance measure, also were echoed in the student achievement scores.

Taken as a whole, results from this study support emerging research in the field that suggests that professional learning in virtual environments can be an effective tool for PD that transfers to classroom practice. The researchers found support for the overarching hypothesis that time in the virtual environment increases teachers' frequency of higher order questions and specific feedback to students, and that this increase also was observed in their classrooms. Teachers who took part in a series of sessions in TeachLivE increased their instances of teaching practices in the simulator, similar to smaller studies conducted earlier (e.g., Dawson & Lignugaris/Kraft, 2103; Elford, James, & Haynes-Smith, 2013; Vince Garland et al., 2012). The current study contributes to the literature by demonstrating effects that extend HLPs for teachers from simulated classrooms to real classrooms.

Limitations

The results should be considered in light of limitations to internal validity. Limitations resulted from the nested design in which teachers were grouped by school, because teachers within one school may be more similar than teachers across schools. Future research should include random assignment at the teacher level, rather than the school level. Random assignment at the teacher level would allow for balancing of similarities within each school.

As an intervention, delivery of TeachLivE requires moderate technology assets (computer, projection screen, projector and a Kinect). Also, the intervention is generally not delivered in the school setting, so teachers must travel to the simulation sites. Teachers receiving TeachLivE were required to visit the classroom simulator three times, which required significant scheduling efforts in the cases of last minute cancellations or delays resulting from technology issues. Future research

should include the use of a mobile lab brought to teachers' classrooms, removing the barrier of teacher travel.

Future Research and Implications

Findings from this study can be generalized to other middle school mathematics teachers who receive four 10-minute sessions of TeachLivE with after-action-review and aligned specifically with recommended practices for best practices in university-school partnerships (NAPDS, 2008). Teachers of other age levels and content areas should be considered in future research. Also, length and content of simulations should be varied to determine the optimal level of treatment needed to produce the desired results. Interaction of TeachLivE with other professional learning should be considered. Student achievement outcomes should be expanded to include a variety of measures to capture potential differences resulting from their teachers' treatment; and most importantly, maintenance of effects over time should be considered (Earley & Porritt, 2014).

The use of TeachLivE is being further investigated to determine if less time, additional sessions, or booster sessions would produce similar results or would maintain results over time, improving on the practice of requiring 30 hours to potentially produce teacher learning gains (Lauer et al., 2014). The ultimate goal of the research team is not to replace "real" teaching with the simulator, but rather to use the simulator to allow for safe practice that is targeted and personalized. The team also hopes to build upon the concern by Guskey and Yoon (2009), to find effective learning opportunities through virtual environments to provide PD that teachers can immediately adapt for their individual classrooms to positively impact student learning. As new teachers enter the classroom, as teachers take leave and then come back to teaching, or when veteran teachers move into new roles, the hope is that simulators can be used to prepare and retool the skills of teachers at all levels from pre-service to in-service.

The team currently has three areas of unanswered questions for future research related to time. First, if four 10-minute sessions impact practice, how long will this practice sustain? Are periodic sessions required to ensure retention of new skills acquired in the simulator? Second, what is the optimal session length needed to change a behavior? Third, how can the decoupling of content and pedagogical teaching practices best be taught and taken apart and put back together? The research team plans to continue the work for teachers and with teachers, with the ultimate goal to directly impact student learning outcomes.

With the agnostic nature of this simulator, the research team also wants to consider the impact of this tool on other educational professionals such as administrators, guidance counselors, psychologists, and speech therapists. The future of research in teacher education has the potential for more standardized approaches and comparison through work with simulation, much like is seen in flight simulation training or standardized patient care in medicine, providing safe ways to help shape and support teachers in targeted areas of concern.

References

Adobe Systems Incorporated. (2014). Adobe Connect. [Computer software]. Santa Clara, CA: Adobe Systems Incorporated.

Baird, L., Holland, P., & Deacon, S. (1999). Learning from action: Imbedding more learning into the performance fast enough to make a difference. Organizational Dynamics, 27(4), 19-32.

Biocca, F., Harms, C., & Burgoon, J. K. (2003). Toward a more robust theory and measure of social presence: Review and suggested criteria. Presence: Teleoperators and Virtual Environments, 12(5), 456-480. doi: 10.1162/105474603322761270

Brophy, J. E., & Good, T. L. (1986). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), Handbook of research on teaching (3rd ed., pp. 328-375). New York, NY: Macmillan.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher, 18(1), 32-42. doi:10.3102/0013189X018001032

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Common Core Standards Initiative. (2011). Preparing America's students for college and career. Retrieved from http://www.corestandards.org

Danielson, C. (2011). The Framework for Teaching Evaluation Instrument. In T. D. Group (Ed.), The Danielson Group. Princeton, NJ.

Darling-Hammond, L. (2003). Keeping good teachers: Why it matters, what leaders can do. Educational Leadership, 60(8), 6-13.

Dawson, M., & Lignugaris/Kraft, B. (2013). TLE TeachLivE™ vs. role-play: Comparative effects on special educators' acquisition of basic teaching skills. In <blinded for review>. Conference Proceedings for First National TeachLivE Conference. Paper presented at First National TeachLivE Conference: <blinded for review>.

Dieker, L. A., Rodriguez, J., Lingnugaris-Kraft, B., Hynes, M., & Hughes, C. E. (2014). The future of simulated environments in teacher education: Current potential and future possibilities. Teacher Education and Special Education, 37(1), 21-33. doi: 10.1177/0888406413512683

Dieker, L. A., Straub, C., Hughes, C. Hynes, M. C., & Hardin, S. E. (2014). Learning from virtual students. Educational Leadership, 71(8), 54-58.

Earley, P., & Porritt, V. (2014). Evaluating the impact of professional development: the need for a student-focused approach. Professional development in education, 40(1), 112-129.

Elford, M., James, S., & Haynes-Smith, H. (2013). Literacy instruction for pre-service educators in virtual learning environments. In Hayes, A., Hardin, S., Dieker, L., Hynes, M., & Hughes, C., & Straub, C. (Eds). Conference Proceedings for First National TeachLivE Conference. Paper presented at First National TeachLivE Conference: Orlando, FL: University of Central Florida.

Forzani, F. (2014) Understanding "Core practices" and "practiced-based" teacher education: Learning from the past. Journal of Teacher Education, 65(4), 357-368

Guskey, T., & Sparks, D. (2002). Linking professional development to improvements in student learning. Presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA. Retrieved from http://files.eric.ed.gov/fulltext/ED464112.pdf

Guskey, T., & Yoon, K. S. (2009). What works in professional development? Phi Delta Kappan, 90(7), 495–500.

Hattie, J. (2003). Teachers make a difference: What is the research evidence? Camberwell, Victoria: Australian Council for Educational Research.

Hayes, A. T. (2015). The experience of presence and social presence in a virtual learning environment as impacted by the affordance of movement enabled by motion tracking. Unpublished Ph.D. Dissertation, University of Central Florida.

Hayes, A., Hardin, S., Dieker, L., Hynes, M., & Hughes, C., & Straub, C. (2013). Conference Proceedings for First National TeachLivE Conference. Paper presented at First National TeachLivE Conference: Orlando, FL: University of Central Florida.

Kane, T. J., & Staiger, D.O. (2008). Estimating teacher impacts on student achievement: An experimental evaluation. (Working Paper No. 14607). Retrieved from National Bureau of Economic Research website: http://www.nber.org/papers/w14607

Kane, T. J., & Staiger, D.O. (2012). Gathering feedback for teaching: Combining high-quality observations with student surveys and achievement gains. Seattle, WA: Bill & Melinda Gates Foundation.

Lauer, P. A., Christopher, D. E., Firpo-Triplett, R., & Buchting, F. (2014). The impact of short-term professional development on participant outcomes: a review of the literature. Professional development in education, 40(2), 207-227.

Levine, T., & Hullett, C. (2002). Eta squared, partial eta squared, and misreporting of effect size in communication research. Human Communication Research, 28(4), 612-625.

Loewenberg Ball, D. & Forzani, F. (2010). Teaching skillful teaching. Educational Leadership, 68(4), 40-45.

Loewenberg Ball, D., Sleep, L., Boerst, T. A., & Bass, H. (2009). Combining the development of practice and the practice of development in teacher education. The Elementary School Journal, 109(5), 458–474. doi:10.1086/599340

Loucks-Horsley, S., & Matsumoto, C. (1999). Research on professional development for teachers of mathematics and science: The state of the scene. School Science and Mathematics, 99(5), 258-271.

Mathematics Assessment Resource Service. (2012). Solving linear equations in one variable [Lesson plan]. Retrieved from http://map.mathshell.org/materials/download.php?fileid=1286

Measures of Effective Teaching Project. (2010). Danielson's Framework for Teaching for classroom observations. Retrieved from http://metproject.org/resources/Danielson%20FFT_10_29_10.pdf

National Center for Education Statistics. (2013). NAEP questions tool. Retrieved from http://nces.ed.gov/nationsreportcard/itmrlsx/search.aspx?subject=mathematics.

National Association for Professional Development Schools. What it means to be a professional development school. Retrieved from http://napds.org/nine-essentials/

Pallant, J. (2007). SPSS Survival Manual. New York: McGraw-Hill Education.

Pierce, C. A., Block, R. A., & Aguinis, H. (2004). Cautionary note on reporting eta-squared values from multifactor ANOVA designs. Educational and Psychological Measurement, 64(6), 916-924.

Straub, C., Dieker, L., Hynes, M., & Hughes, C. (Eds). (2014). Proceedings from TeachLivE 2014: 2nd National TLE TeachLivE Conference. Orlando, FL: University of Central Florida.

Teaching Works (2014). High Leverage Practices. Retrieved from: http:// www.teachingworks.org/ work-of-teaching/high-leverage-practices#sthash. I4xK7DG4.dpuf

Thompson, M., & Wiliam, D. (2008). Tight but loose: A conceptual framework for scaling up school reforms. In E.C. Wiley (Ed.), Tight but Loose: Scaling up Teacher Professional Development in Diverse Contexts. ETS: Princeton, NJ.

U.S. Department of Education. (2008). Foundations for success: The final report of the National Mathematics Advisory Panel. Washington, D.C. Retrieved from http://www2.ed.gov/ about/bdscomm/list/mathpanel/report/final-report.pdf

Vince Garland, K., Vasquez, E., & Pearl, C. (2012). Efficacy of individualized coaching in a virtual classroom for increasing teachers' fidelity of implementation of discrete trial teaching. Education and Training in Autism and Developmental Disabilities, 47(4), 502-515.

Yoon, K. S., Duncan, T., Wen-Yu Lee, S., Scarloss, B., & Shapley, K. L. (2007). Reviewing the evidence on how teacher professional development affects student achievement. (No. Rel 2007-No. 033) (p. 55). Washington, D.C.: US Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest. Retrieved from http://ies.ed.gov/ncee/edlabs/regions/southwest/pdf/rel_2007033.pdf

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Re-imagining Teacher Supervision Using Mobile Computing Technology: Project RITE's Distance Observation Solution

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Abstract: This article describes a low-cost distance observation system developed for the University of Florida under a 325T grant. The system uses iPad Mini tablets to live stream pre-service teachers' field-based teaching to supervisors who are geographically distant. Using mobile data plans coupled with a variety of peripherals, this system overcomes many known limitations of distance observation using mobile devices. In this article, we describe the current system, including hardware and software components. We also provide a cost/benefit analysis that compares our system with traditional observation, with results suggesting that distance observation can result in significant cost savings over traditional observation methods. Ramifications of distance observation are discussed.

KEYWORDS: distance observation, mobile technology, pre-service teachers, Professional Development Schools

NAPDS NINE ESSENTIALS ADDRESSED:
2. A school–university culture committed to the preparation of future educators that embraces their active engagement in the school community;
4. A shared commitment to innovative and reflective practice by all participants; and
5. Engagement in and public sharing of the results of deliberate investigations of practice by respective participants

The setting is Mrs. Yoshimura's third grade classroom at Pahala Elementary, a small, rural K-12 school on the Big Island of Hawaii. As students file in to class, they are not surprised to see Ms. Mahina preparing to give the lesson. Ms. Mahina has been a teacher intern for the third graders this whole first quarter. Ms. Mahina is planning to teach a lesson to the third graders entirely on her own as part of her field experience. The students have been learning about sustainability and aquaponics, and they seem excited to continue working on their projects with Ms. Mahina.

Ms. Mahina is concentrating on an iPad Mini tablet at the front of the room. She has attached the iPad to a small tripod and she has affixed a small lens and a wireless microphone receiver to the iPad Mini.

"Can you hear me now?" she asks through her wireless lapel microphone. Then she looks at the iPad screen and nods. "OK, great," she says, "Are you receiving video as well?" She again looks at the iPad screen and nods. "OK then, I think we can go ahead and get started!"

"Who're you talking to?" asks Kimo, one of the boys in the class.

"Oh, why, that's my eSupervisor, Kimo," Ms. Mahina replies. "She's on Oahu and she's going to watch our lesson today."

Makana, another student, chimes in, "How can she watch our lesson from Oahu? That's a different island!"

Ms. Mahina holds up the iPad for the class to see. "I'm broadcasting my lesson to my supervisor over the Internet; she can see and hear us, even though she is in her office at the university."

"But Mrs. Yoshimura says our Internet at school is too slow for videos," remarks Makana. "How come you can do videos?"

"Well, I'm not using the school's Internet. This iPad is connected using the cellular network, just like a smartphone," replies Ms. Mahina.

"That's cool, I guess," says Makana. He does not seem particularly impressed. Many of the students at Pahala use iPads and Chromebooks on a regular basis, especially in Mrs. Yoshimura's class, so it is no surprise to see Ms. Mahina using one.

Ms. Mahina begins the aquaponics lesson with the iPad placed stationary on the side of the classroom. Following this, students begin working on their group projects. Ms. Mahina moves from group to group, setting the iPad's tripod on each table as she interacts with students. At the end of the lesson, she returns to the front of the class and concludes the activities with the iPad back on the side of the classroom.

The next day, Ms. Mahina and her distance supervisor connect using a web conferencing app to debrief and review the supervisor's report of Ms. Mahina's performance.

What is Distance Observation?

The above scenario is one of many demonstrating how distance observation can be used to provide supervision and guidance to pre-service teachers engaged in field experiences online and at-a-distance. Distance observation is the use of electronic telecommunications technology to provide field-based observation to teacher interns who are not in the same location as the supervisor (McAdams & Wyatt, 2010). Pre-service, novice teachers need guidance as they translate research and training into practice in their classrooms (Billingsley, Griffin, Smith, Kamman, & Israel, 2009). Typically, this is achieved by supervisors overseeing teacher interns in classroom-based field experiences. However, due to the significant management, time, and travel associated with traditional models of field-based teaching observations, the costs to support such programs are high. Alternatively, substantial cost savings can be realized through distance observation using Internet-enabled mobile devices such as smartphones and tablets.

In addition to cost savings, distance observation for pre-service teachers enhances accessibility and convenience for both supervisors and pre-service teachers, and has the potential to provide opportunities that are not possible using more traditional observation methods. While interest in distance observation solutions is growing (e.g., Bolton, 2010; Hager, Baird, & Spriggs, 2012; Rock et al., 2009; Routier & Otis-Wilborn, 2013), understanding is limited (Routier & Otis-Wilborn, 2013). Some reports suggest that the technology is less intrusive than having a supervisor present;

that teleconferencing promotes enhanced collaborations between supervisors, pre-service teachers, and partner teachers; and that pre-service teachers are able to receive more timely feedback (Bolton, 2010; Rock et al., 2009, 2012). However, further work is needed to develop efficient and effective systems that re-imagine teacher supervision using mobile technologies while retaining needed features of traditional supervision methods. Challenges that limit current distance observation efforts include using school networks (Hager et al., 2012), audio that is difficult to hear (Rock et al., 2012), limited field-of-view, poor video (Gronn et al., 2013), and a general lack of mobility (Kelly & Bishop, 2013). However, application of new technologies with advanced capabilities mitigates many of these problems.

Observing Teachers from a Distance with the iPad Mini

Using common, off-the-shelf technology, we developed a cost-effective system for observing teacher interns at a distance as they perform their field-based teaching. With our system, we have attempted to overcome many of the problems outlined in the previous section. The system was developed as part of Project RITE (Restructuring and Improving Teacher Education), a 325T grant project at the University of Florida (UF) to prepare special education teacher graduates to meet the Highly Qualified (HQ) requirements of the Individuals with Disabilities Education Act (IDEA; 2004). The system centers on an iPad Mini attached to a small tripod for streaming audio and video to field supervisors over the Web. We provide a brief description of the system below. A complete description of the system is provided in Schmidt, MacSuga-Gage, Gage, Cox, and McLeskey (2015).

The iPad Mini is ultra-mobile, has outstanding battery life, and is quite small; however, despite its diminutive size, it is capable of recording and streaming with exceptionally high quality. The decision to use this device was based on cost, ease-of-use, quality and reliability of device, the iOS app ecosystem, and networking capabilities. We chose to use iPads with cellular connectivity because school networks often require special permission and sometimes have incongruent access policies, restrictive firewalls, and highly variable bandwidth availability at peak usage times. To increase reliability and ease-of-use, we opted to use a high-speed 4G LTE cellular network.

We also extended the capabilities of the iPad Mini through the use of a small tripod, a detachable wide-angle lens, and a wireless lapel microphone. The tripod provides stability while retaining mobility. The wide-angle lens allows the distance supervisor to see more of the classroom than with the stock lens. The wireless lapel microphone provides high-quality audio to the distance supervisor while at the same time allowing the pre-service teacher to have free range of motion. Audio and video are streamed at up to 1080p high definition quality. On the iPad, Wowza Media System's GoCoder app is used to encode the video stream. We use Wowza Streaming Engine to stream the video to a password-protected webpage in the university's learning management system, where it can be viewed by distance supervisors. A diagram of the system is provided in Figure 1.

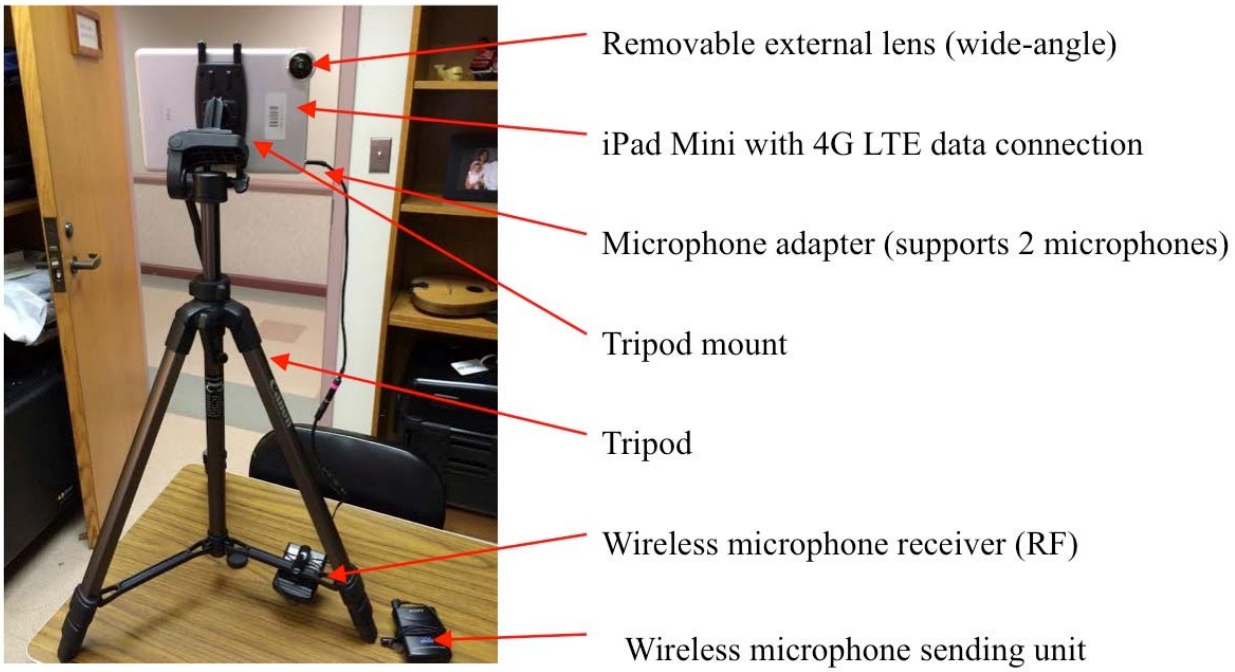

Figure 1. iPad Mini mounted to tripod with peripheral devices attached for distance observation.

Potential Cost Savings with Distance Observation

We performed a cost/benefit analysis that showed the distance observation solution has the potential for substantial cost savings. For this analysis, we compared supervisors' travel costs per year with the cost of implementing and supporting distance observation per year. To determine supervisors' travel costs, we calculated three 150 mile round trips per semester using standard mileage reimbursement and per-diem rates. To determine the cost of implementing and supporting distance observation, we calculated software, hardware, and service costs per year. Analysis suggests that in the short term, traditional observation is more cost-effective than distance observation. However, due to the technological nature of distance observation, economies of scale and related cost-savings can be realized with this approach that are not possible with traditional methods.

Assuming two years of use with the distance observation system, the total cost to observe a single pre-service teacher is $3,425. For traditional observation, the cost is $1,650. In this case, the distance observation solution costs more than traditional observation. Scaling up to five students over two years narrows this gap, with distance observation costing $10,650 and traditional observation costing $8,100. This trend continues, with greater cost savings for the distance observation solution being realized at scale. Using distance observation over four years for five students per year results in total costs of $17,100. For traditional observation, the cost is $33,000. With 100 pre-service teachers, the savings are even greater. In this case, traditional observation costs reach above $650,000, whereas distance observation costs remain below $200,000. This suggests that a greater than a 66% cost advantage could be achieved using distance observation.

This cost/benefit analysis provides compelling results, suggesting distance observation could provide substantial cost savings over traditional methods. An additional benefit is the time

that is saved by reducing travel for supervisors. However, the question of how this particular distance observation solution compares to traditional methods in terms of quality remains open. From a small-scale pilot, we found that the quality of supervisor comments on standard supervision forms was very similar. In addition, distance observers reported that audio and video were of sufficient quality to provide meaningful feedback to teacher interns. We are encouraged by these findings, but we also consider them to be inconclusive and limited. It is too early to say the degree to which distance observation might replace traditional methods in the short term. Nonetheless, we posit that distance observation can support pre-service teachers and supervisors today as a supplement to traditional methods. As our understanding of distance observation improves and technology continues to advance, it is not inconceivable that distance observation could begin to replace traditional observation methods.

Conclusion

Distance observation is of particular importance in a time when online and blended programs are steadily growing in popularity and, in some instances, supplanting traditional programs. For institutions considering moving teacher education programs into online and blended formats, distance observation warrants attention. While the question remains as to whether distance observation will fully replace more traditional methods, it is not unreasonable that programs which adopt distance observation methods could very well overtake programs that do not. Cost savings might play a role in this, but what will ultimately play a greater role is the overall quality of online and blended teacher preparation programs. Distance observation provides an avenue for improving teacher preparation programs by reducing the travel requirements of supervisors, thereby freeing up supervisors' time to focus on nurturing and mentoring pre-service teachers.

The argument that distance observation can contribute to improved teacher preparation is supported by research by Kopcha and Alger (2011). In their work exploring differences in knowledge, performance, and teacher self-efficacy between student teachers who engaged in distance supervision (which they call "eSupervision") and those who did not, they found that eSupervision students:

> [R]eceived fewer site visits by their supervisor, but had greater access to supervisory experiences mediated by technology (video reflection, online discussion, lesson plan EPSS, observation forms). The fact that they performed as well as their non-eSupervision peers on PIAR suggests that traditional supervision (i.e., a series of observations from a supervisor) may not be the only way to effectively supervise student teachers during the field experience. (p. 66)

This suggests that teacher preparation programs might be able to prepare teachers equally well without the use of traditional methods, and leaves the question open as to whether technology-mediated approaches can lead to improved outcomes. In a later article, Kopcha and Algers (2014) report substantial reductions in costs associated with traveling to school sites as well as statistically significant improvements for eSupervision teachers. They assert "[eSupervision S]tudents were exposed to a wider variety of issues, opinions, and underlying cognitive processes associated with teaching" (p. 56).

These findings provide some evidence that distance observation solutions can have financial impact while at the same time resulting in improved teacher preparation. However, while these findings are promising, more research is needed. Observing teachers, while very important, is but one component in the broader framework of pre-service teacher supervision and preparation. If distance observation has a role to play in distance supervision, we must determine just how it fits within this broader framework. Some researchers have begun to examine this question, including Kopcha and Algers' work (2011, 2014) and the work of researchers from UNC Charlotte investigating the Remote Observation of Graduate Interns (ROGI) program (Hartshorne, Heafner, & Petty, 2011, Petty & Heafner, 2009). In our own research and development, we continue to refine our technological approach, establish best practices, and identify error points. To this end, we are continuing small pilots at three sites and are in the process of bringing new pilot sites onboard. With this research, we hope to demonstrate that distance observation not only has widespread application and can be a cost-saving and efficient means of supporting pre-service teachers and supervisors, but also that it can play a role in a broader supervision framework that leverages technology innovations to meet 21st century educational needs.

References

Billingsley, B., Griffin, C. C., Smith, S. J., Kamman, M., & Israel, M. (2009). *A Review of Teacher Induction in Special Education: Research, Practice, and Technology Solutions. NCIIP Document Number RS-1*. National Center to Inform Policy and Practice in Special Education Professional Development.

Bolton, M. (2010). Fly on the wall: Using teleconferencing to supervise student teacher performance. *Journal of Open, Flexible and Distance Learning*, *14*(1), 62–76. Retrieved from http://www.jofdl.nz/index.php/JOFDL

Gronn, D., Romeo, G., McNamara, S., Teo, Y. H., Gronn, D., Romeo, G., … Teo, Y. H. (2013). Web conferencing of pre-service teachers' practicum in remote schools. *Journal of Technology and Teacher Education*, *21*(2), 247–271. Retrieved from http://www.aace.org/pubs/jtate/

Hager, K. D., Baird, C. M., & Spriggs, A. D. (2012). Remote teacher observation at the University of Kentucky. *Rural Special Education Quarterly*, *31*(4), 3–8. Retrieved from http://acres-sped.org/journal

Hartshorne, R., Heafner, T., & Petty, T. (2011). Examining the effectiveness of the remote observation of graduate interns. *Journal of Technology and Teacher Education*, *19*(4), 395- 422. Retrieved from http://www.aace.org/pubs/jtate/

Individuals With Disabilities Education Act, 20 U.S.C. § 1400 (2004).

Kelly, L., & Bishop, J. (2013). Remote video supervision in adapted physical education. *Journal of Physical Education, Recreation & Dance*, *84*(1), 26–29. doi:10.1080/07303084.2013.744945

Kopcha, T. J., & Alger, C. (2014). Student teacher communication and performance during a clinical experience supported by a technology-enhanced cognitive apprenticeship. *Computers & Education*, *72*(2014), 48-58. Retrieved from https://www.journals.elsevier.com/computers-and-education/

Kopcha, T. J., & Alger, C. (2011). The impact of technology-enhanced student teacher supervision on student teacher knowledge, performance, and self-efficacy during the field

experience. *Journal of Educational Computing Research*, *45*(1), 49-73. Retrieved from http://jrnledcompresearch.com/index.php/jecr

McAdams, C. R., & Wyatt, K. L. (2010). The regulation of technology-assisted distance counseling and supervision in the United States: An analysis of current extent, trends, and implications. *Counselor Education and Supervision*, *49*(3), 179–192. Retrieved from http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1556-6978

Petty, T., & Heafner, T. (2009). What is ROGI. *Journal of Technology Integration in the Classroom*, *1*(1), 21-27. Retrieved from http://www.ntejournal.com/journal.html

Rock, M., Gregg, M., Gable, R., Zigmond, N., Blanks, B., Howard, P., & Bullock, L. (2012). Time after time online: An extended study of virtual coaching during distant clinical practice. *Journal of Technology and Teacher Education*, *20*(3), 277–304. Retrieved from http://www.aace.org/pubs/jtate/

Rock, M., Gregg, M., Thead, B. K., Acker, S. E., Gable, R. A., & Zigmond, N. P. (2009). Can you hear me now? Evaluation of an online wireless technology to provide real-time feedback to special education teachers-in-training. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children*, *32*(1), 64–82. Retrieved from http://journals.sagepub.com/home/tes

Routier, W., & Otis-Wilborn, A. (2013). Supervision in Distance Education: Technology for Reflecting, Evaluating and Learning in Teacher Education. In *World Conference on Educational Multimedia, Hypermedia and Telecommunications* (Vol. 2013, pp. 2251–2256). Retrieved from http://www.editlib.org/p/112285

Schmidt, M., MacSuga-Gage, A., Gage, N., Cox., P., & McLeskey, J., (2015). Bringing the field to the supervisor: Innovation in distance supervision for field-based experiences using mobile technologies. *Rural Special Education Quarterly, 34*(1), 37-43. Retrieved from http://acres-sped.org/journal

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