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# "Watch It, Do It, Teach It": Technology and Early Childhood Field Experiences

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This article presents the WDT Framework, which consists of three levels of integrating field-based technology experiences into early childhood education coursework. Early childhood teacher education programs have historically utilized field experiences for the purpose of helping pre-service teachers build their understanding of developmentally appropriate practice, yet technology integration is not typically included within this context. The majority of teacher education programs rely on one stand-alone technology integration course to prepare pre-service teachers to use technology in their teaching, which is known to have minimal impact on their willingness and ability to use technology in subsequent teaching experiences in the early childhood classroom. In response to this disparity, the authors propose three levels of immersion with technology for pre-service early childhood teachers: watching, doing, and teaching (WDT). Each approach to the technology-infused field experience is discussed, as well as lessons learned and conditions for success necessary for effective implementation in an early childhood teacher education sequence.

Keywords: Pre-service teachers, technology integration, field experiences, internship, developmentally appropriate practice

## INTRODUCTION

Like never before, technology integration into the P-5 classroom is gaining tremendous importance. Digital literacy, the ability to use technology not just as a consumer but also as a producer, is becoming equally as important as reading, writing, and arithmetic because of the central position this skill is beginning to occupy in many aspects of society (O'Brien

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& Scharber, 2008). Citizens in the future will rely on technology more than ever to communicate and collaborate across global boundaries; manage, discern, and represent data; and learn and express ideas (Mishra, Koehler, & Henriksen, 2011).

The current generation of pre-service teachers has grown up surrounded by digital technologies, with nearly 98% reporting they use digital tools daily for personal activities (Smith, Rainie, & Zickuhr, 2011). Yet barely over 50% report feeling confident facilitating technology-based learning experiences with students (Purcell, et al., 2013). This dilemma is magnified further by outdated technologies in schools and a lack of on-going professional development for integrating it into their instruction (Jones-Kavalier & Flannigan, 2008; Nasah, et al., 2010). For these reasons, teacher education programs play an important role in helping prospective teachers experience the many possibilities for teaching and learning with technology through observation, hands-on learning, and practice teaching. The authors believe educational technology experiences should be included at multiple levels of pre-service teacher coursework, and they should also be purposely mapped into field experiences. The purpose of this article is to illustrate three levels of immersion with educational technology – watch it, do it, teach it – different teacher education programs have used to thread educational technology training throughout the teacher education sequence and into the P-5 classroom. We will include descriptions of the three different levels of immersion, as well as lessons learned and conditions for success for providing pre-service early childhood teachers with rich, meaningful educational technology learning experiences.

## LITERATURE REVIEW

### *EDUCATIONAL TECHNOLOGY COURSEWORK*

Many education programs rely on a single stand-alone technology course to prepare prospective teachers for technology integration by offering one general course that focuses on basic technology skills (Hammond, 2007; Wang, 2006; Hargrave & Hsus, 2000). Stand-alone technology courses presented in this manner have been shown to have little influence on teachers' decisions to use technology in their instruction (Christensen, 2002).

A limited number of programs have moved beyond the single course approach and departmentalize their technology courses by subject area for the purpose of demonstrating content-specific, technology-based teaching strategies (Pierson & Thompson, 2005). For example, the teacher education program at the University of Virginia separates its required educational technology class by content area: Elementary and Early Childhood, Secondary Humanities (History, English, Foreign Language) and Secondary STEM (Math, Science and Engineering education). The rationale behind this approach is that pre-service teachers can learn content-specific technology integration strategies more in depth than when the course is generalized to a mixed group of students. For example, Math and Science students go into detail with probes and sensors, as well as programs such as *Excel* and *Geometer's Sketchpad*, while Elementary and Early Childhood majors learn strategies for planning technology-rich lessons specifically for young children. Even though the departmentalized approach to educational technology helps pre-service teachers make deep connections between their content area and technology integration, results have indicated that pre-service teachers who take these courses still struggle to use technology autonomously in their field experiences due to a lack of modeling in subsequent methods courses and by cooperating instructors (Kajder, 2005).

Consequently, researchers have begun exploring the role field experiences may play in helping pre-service teachers learn how to effectively integrate technology into their teaching (Dawson & Dana, 2007; Evans & Gunter, 2004; Wentworth, Graham, & Tripp, 2008). This transition makes sense, as field experiences are a foundation in pre-service teacher education programs. The "apprentice, learning by doing" approach has been found to be critical in helping students understand and apply important educational theory (Allsopp, et al., 2006; Capraro, Capraro, & Helfeldt, 2010; Zeichner, 1980). This method of learning applied skills is not unique to education. Medical and veterinary schools have used the "watch one, do one, teach one" approach to teaching surgical and other techniques for many years, and this experiential learning approach is believed to promote quick recall, adaptability, and life-long learning necessary for an ever-changing workplace (Spencer & Jordan, 1999).

### *FIELD EXPERIENCES IN EARLY CHILDHOOD TEACHER EDUCATION*

Early Childhood Education, in particular, is a field in which pre-service teachers benefit from time spent in classrooms both observing and working with children and experienced teachers (Snider & Fu, 1990). In addition to acquiring skills in instructional planning and creating a positive learning environment, early childhood pre-service teachers must pay particular attention to creating developmentally appropriate learning experiences for each child. Developmentally appropriate practice involves knowledge of both broad characteristics and theories of child development, as well as specific traits of the individual children under the teacher's care (NAEYC, 2009). Vygotsky (1987) called this subjective set of individual developmental traits the "zone of proximal development," and is defined as, "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). In order to determine that which each child can do either independently, under an adult's guidance, or in collaboration with a more capable peer, pre-service teachers much interact directly with children under the guidance of experienced teachers and university faculty (Chaiklin, 2003). Field experiences are the context determined by most teacher education programs in which these interactions take place. In fact, Snider and Fu (1990), in a study involving 73 early childhood teachers, determined that supervised field experiences are one of the main factors that directly affect a teacher's proficiency at creating developmentally appropriate instruction. While field experiences are a long-standing educational practice in teacher education programs, few programs have applied technology education within teacher field experiences (Willis & de Montes, 2002).

### *FIELD EXPERIENCES AND TECHNOLOGY INTEGRATION*

If early childhood teachers wish to integrate technology into the learning environment, they must do so in a manner informed by their understanding of developmentally appropriate practice (Chen & Chang, 2006). This would include knowledge of the positive and negative effects of technology on child development (Cordes & Miller, 2000; Donohue, 2003), each child's ability or experience using technology, and how to balance technology use with other developmentally appropriate activities (Van Scoter, Ellis & Railsback, 2001). Recent studies have indicated inconsistencies between teachers' beliefs about using technology with young children and how they actually use it. Yurt and Cevher-Kalburan (2011) found that while many teachers believe technology should be used for learning with young children, most of them only use it for personal productivity and instructional planning. Similarly, Gialamas and Nikolopoulou (2010) found that in-service and pre-service teachers had opposing perspectives on using technology with young children. In-service teachers believed in the potential of technology to enhance student learning, yet they lacked the technology skills or confidence to effectively apply it to their instruction. Conversely, the pre-service teachers in this study felt confident in their ability to use computers, but they lacked the pedagogical knowledge to use technology to support developmentally appropriate practice. In essence, many pre-service teachers maintain the mindset of students and complete their "homework" for an educational technology class, yet they fail to conceptualize these assignments as teaching strategies they may one day use with their own students (Mishra & Koehler, 2006). Consequently, their technological knowledge increases, but their pedagogical knowledge and skill at planning and facilitating learning experiences with technology is unaffected.

Three different teacher education programs have sought to reconcile this disparity between pre-service teachers doing technology "homework" and the applied skill of selecting, planning, and implementing developmentally appropriate technology-rich instruction for children. Three levels of technology immersion are considered: scenario-based instruction, deliberate curriculum mapping of field experiences that require use of technology, and partnering in-service and pre-service teachers in an educational technology "internship."

## THE WDT FRAMEWORK

The authors have devised the Watch-Do-Teach Framework as a way to structure the sequence of field-based learning with technology. This framework is comprised of carefully sequenced experiences, beginning with observation and scenario-based instruction (watch), transitioning to hands-on technology based projects (do), and culminating with technology internships with in-service teachers (teach). The following section describes each section of the WDT Framework, followed by a discussion of its theoretical foundations.

### *WATCH IT: SCENARIO-BASED INSTRUCTION*

Kean University utilizes scenario-based instruction at various phases of its teacher education program. Scenario-based instruction has long been used to help pre-service teachers develop professional ways of thinking about teaching (Kleinfeld, 1992). Using this method, pre-service teachers can vicariously experience authentic learning situations, "unpack" and analyze different components of the scenario, and synthesize the experience into their own thinking, all from within their classroom environment (Zipp & Maher, 2010). Throughout the two-year program, teacher education students explore technology as a teaching tool (focusing on the teacher, including such teacher tasks as curriculum planning, information presentation, communication with educational stakeholders, and data collection and documentation of children's development) and as a learning tool (focusing on the child, including promoting children's development and opportunities for representation and knowledge sharing).

Students enrolled in the Kean University teacher education program explore technology in four ways: (1) curriculum that use case-based video scenario instruction to develop an understanding of technology as an instructional tool, (2) curriculum that require students to work with children in "informal field experiences" to develop an understanding of technology as a learning tool, (3) a stand-alone educational technology course that provides intense technology education including scenario instruction and informal fieldwork with children, and (4) traditional student teaching internships where students use technology in their instruction and with children.

The video scenarios used throughout the teacher education program provide the students with a shared set of "teaching internships" across a variety of learning settings. Through the use of video scenarios, small groups of students and whole classes can view and discuss specific learning situations, which focus the pre-service teachers' attention on a variety of exemplary and less successful examples of technology-rich teaching practice.

Video scenarios provide multiple opportunities for students to consider teacher practice, both that of others and of themselves. Because the videos are presented in a controlled environment (i.e., without the possibility of distractions such as class bells, fire drills, announcements, or visitors entering the room), pre-service teachers can focus their observations precisely on what the instructor wants them to see.

### *DO IT: CURRICULUM MAPPING*

Georgia College & State University takes a non-traditional approach to field experience, integrating it throughout the two-year program so that students have well over 1000 hours of experience in the field prior to graduation. While students do complete a traditional ten-week student teaching internship, pre-service teachers also teach a minimum of two to three full days a week from the moment they begin coursework, with course assignments that fit naturally within these field placement components. In addition to three stand-alone educational technology courses, faculty within the program connect skills taught in technology courses by integrating the same technology pieces into content courses and assignments so that pre-service teachers a) move from being consumers to producers of technology; b) are intentional about technology use in their curriculum planning and communication; and c) understand digital literacy as a goal of the early childhood curriculum.

In what has become a program wide scholarship of teaching and learning project, course revisions that focused on educational technology inclusion have for the most part followed a thread of courses that help to scaffold developmentally appropriate teaching practices. In the first course, Developmental Learning, pre-service teachers utilize instructional technology as they are learning *about* P-5 students. Applications such as *Prezi*, *PhotoStory*, PDF conversion, *Inspiration* for concept mapping, and podcasting are utilized to increase digital literacy skills of pre-service teachers. The second course, Creative Expressions, continues the thread as students take previously utilized applications and expands them with video production, Webquests, and focused lesson planning to include various forms of educational technology, such as interactive white boards. Students are then required to implement several activities within field placement that move them from just using technology as a teacher to using technology both *for* and *with* students. This same thread is continued in their Curriculum course where the *Teacher Work Sample* is the main vehicle for curriculum development and growth as a professional. Students become intentional with their instructional technology use from the P-5 student perspective. One of the questions that guides their curriculum development is "How are you ensuring that P-5 students are learning how to use the technology, too?"

### *TEACH IT: EDUCATIONAL TECHNOLOGY INTERNSHIPS*

The Curry School of Education at the University of Virginia offers a field experience devoted exclusively to educational technology integration (Technology Infusion Project: TIP). This internship is in addition to and different from the traditional field experiences required in the teacher education program. The TIP internship is a field experience that grounds the theoretical coursework of learning theories, instructional design, and technology integration within a classroom context. Each student collaborates with an experienced teacher to plan and deliver a technology-infused unit that (a) introduces new innovations into the classroom, (b) aligns with the local curriculum and effective teaching strategies, and (c) provides opportunities for the intern and teacher to implement technology-based lessons in an authentic context.

TIP projects are open-ended, which means the number of classroom hours the pre-service teacher spends in the internship is determined by the project rather than the teacher education program. Since the emphasis of TIP internships is designing, implementing, and evaluating a technology-rich project in a classroom, the number of hours will vary. Most of these projects require between 20-30 hours in the classroom throughout the semester. Careful consideration is taken when partnering in-service and pre-service teachers, a joint effort between the course instructor and the district technology coordinator. Partnerships are carefully considered so that in-service and pre-service teachers matched together will possess technology and teaching skills that complement each other. In some cases, the pre-service teacher has stronger technology skills but lacks practical teaching experience, which is modeled by the internship teacher. In other projects, the pre-service teacher is matched with an in-service teacher who is skilled in both pedagogy and technology integration.

Pre-service teachers typically create a list of projects they would be interested in implementing, and the in-service teachers help them narrow the choices based on available resources, time constraints, the current content being taught, and student readiness. Past projects have included technologies such as digital storytelling, interactive whiteboards, digital images and video, and *VoiceThread*.

In addition to their time spent in the classroom, the pre-service teachers also participate in weekly class meetings, which consist of sharing their progress on their projects, discussing their learning experiences in the field, and supporting each other when technical and classroom management issues arise. In-service teachers are also encouraged to try projects that feature new technologies they would like to learn to use.

| Watch It | Do It | Teach It |
|---|---|---|
| **Vicarious Experience** ◄ | ——————— | ► **Authentic Experience** |
| ***Theoretical Support*** | | |
| Observational Learning (Bandura) | Constructivist Learning (Piaget) | Experiential Learning (Kolb) |
| ***Description*** | | |
| Pre-service teachers observe technology-infused lessons through video and direct observation. | Pre-service teachers create media products and learning objects using technology. | Pre-service teachers work alongside an in-service teacher to design, implement, and evaluate a technology project with students. |
| ***Purpose*** | | |
| Observe best practices, analyze pitfalls, and witness human-technology interaction first hand. | Develop technology skills and digital literacy through direct interaction with digital tools. | Apply classroom management, adaptation, and trouble-shooting skills within the socio-cultural context of a school. |

*Figure 1*. The WDT Framework. This framework illustrates the theoretical support, description and purpose of the three levels of technology immersion in the WDT Framework.

## *THEORETICAL FOUNDATION*

The WDT Framework (see Figure 1), which is comprised of three levels of technology-focused immersion in authentic teaching environments, is based on carefully sequenced theories of learning. The theories include Bandura's (1974) Theory of Observational Learning, Piaget's (1973) Constructivist Learning Theory, and Kolb's (1984) Experiential Learning.

*Observational Learning.* According to Bandura (1974), a significant amount of learning that takes place within individuals and groups of people is the result of observation. Concerning the significance of observational learning, he states,

It is difficult to imagine a culture in which languages, mores, vocational activities, familial customs, and educational, religious, and political practices are gradually shaped in each new member by direct consequences of their trial-and-error performances without benefit of models who display the cultural patterns in their behavior (Bandura, 1975, p. 2).

This theory has been extended into teacher attitudes and beliefs, explaining why many teachers tend to teach as they were taught, regardless of the theories and models of instruction they learned during their preparation. Lortie (1975) called this phenomenon the apprenticeship of observation, which was based on the fact that pre-service teachers have spent thousands of hours observing other teachers. Teachers, whether they realize it or not, have developed constructs for both positive and negative behaviors as a result of the many teachers they have observed as part of their own schooling.

In order to break down these preconceived perceptions of effective and ineffective teaching, teacher educators must provide instructional models upon which pre-service teachers can observe, analyze, and reflect. As Bandura (1974) remarked, advances in technology make it possible to observe both real-life and symbolic (video, images, text, etc.) models.

The *Watch* section of this framework aligns with observational learning because pre-service teachers watch and analyze video-based scenarios which highlight specific technology integration skills and early childhood teaching strategies in a variety of teaching contexts.

*Constructivist Learning Theory.* Beyond the practice of observing teaching practice, pre-service teachers must have hands-on opportunities to independently develop educational materials, such as lesson plans, learning objects, and supporting materials. Pre-service teachers should be given opportunities to transform from students to autonomous agents who make instructional decisions on behalf of their students. An important component to help develop the skills and habits of mind necessary for this transformation is to provide pre-service teachers with open-ended, project-based tasks.

These types of projects align with Constructivist Learning Theory, which hypothesizes that people produce knowledge and form meaning based upon their experiences (Piaget, 1973). According to this theory, learning is a process where learners draw upon resources to make sense of out things and construct meaning out of first-hand experiences (Wilson, 1996, p. 3). Projects of this sort create learning space for pre-service teachers to explore, set goals, make decisions, and demonstrate their learning in personalized ways. Learners in a constructivist learning environment are required to solve problems, think critically, and utilize multiple resources as they solve real-world problems and create authentic products.

The *Do* section of the WDT Framework aligns with this theory because pre-service teachers create learning objects and other teaching resources, as well as hone their technology skills, through hands-on activities. The prospective teachers are actively engaged in constructing their own meaning about how to effectively and efficiently create products and teach with technology, and eventually instruct their own students how to use technology.

*Experiential Learning.* This is the third theory in the WDT Framework goes beyond creating products with technology and extends into designing technology-based projects with an experienced teacher in an authentic learning environment. Dewey (1938) stated, “there is an intimate and necessary relation between the processes of actual experience and education” (p. 7).

Kolb (1984) believed that immersing learners in authentic experiences created an interaction between the experience and the learner's perception, cognition, and behavior. His theory of experiential learning is perhaps best understood through the following model (Figure 2).

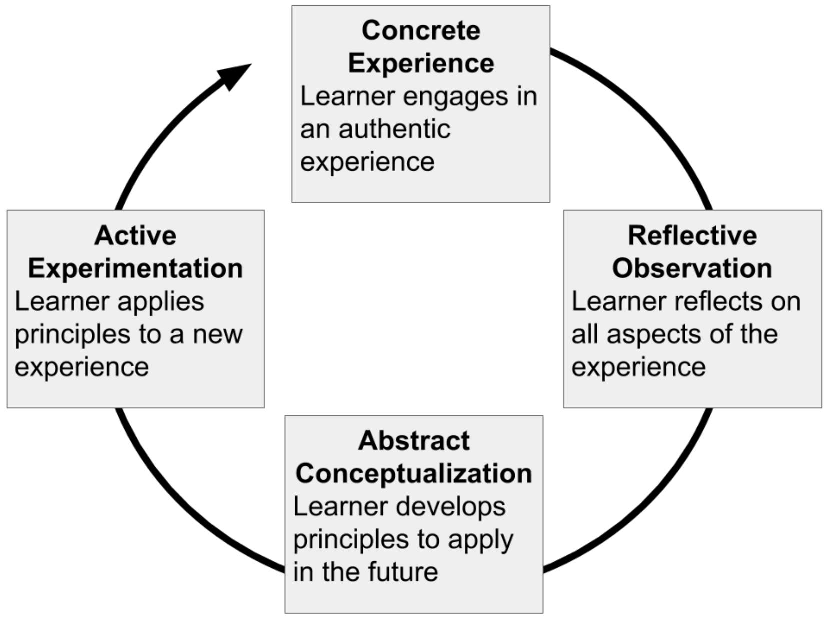


*Figure 2*. Kolb's Cycle of Experiential Learning. Learner's begin by having a first-hand experience, reflect on the experience, generate principles based on the experience, and apply those principles to a new or similar experience.

Placing pre-service teachers in a partnership with an in-service teacher for the purposes of planning and delivering instruction provides the learner with multiple iterations of the same skill, which is the essence of Kolb's theory. Learners are immersed in an experience, which causes them to reflect on what worked well and what did not. This reflection leads the learner to develop a set of principles or action items for subsequent experiences, which then shapes each future experience. Pre-service teachers not only gain first-hand experience with planning and delivering instruction with technology, but they experience the interaction between personalities, student readiness, time constraints, an available resources. Pre-service teacher do not only learn how to use technology in schools; they learn how to make it fit within an existing socio-cultural context. This level of technology integration can only be achieved by carefully addressing the previous components of the framework, where pre-service teachers develop a conceptual model and personal skill for using technology.

## DISCUSSION

### *LESSONS LEARNED*

Based on the experiences of the authors, several "lessons learned" emerged as pre-service teachers integrated technology into their field experiences. First, students found that as they progressed through the field experiences, technology integration became easier. Regardless of their personal comfort level with technology, most pre-service teachers exhibited a learning curve as they integrated technology into content-area instruction, just as it takes time and patience when scaffolding P-5 learners in their growing knowledge and skills. It is important to expect that it will take longer for pre-service teachers to work through these projects at the beginning, and eventually move towards faster thinking and utilization as they grow more comfortable with the possibilities inherent in integrating technology into instruction in purposeful and developmentally appropriate ways. Consequently, allowing more time for practice and planning on the front end of any field experience that utilizes technology is important.

Additionally, each approach has shown the need for intentionality when planning early childhood instruction to include technology. This intentionality matches what is already well established about field experiences: they must be structured and purposeful (Calderhead, 1988; McIntyre & Byrd, 1996). Since each approach demonstrates structure and purposeful thinking about digital literacy, pre-service teachers became less likely to integrate technology for its own sake and began to demonstrate intentionality when choosing technology that supported their teaching and learning goals. Thoughtfulness and reflection about the projects created richer experiences for P-5 students, particularly when pre-service teachers matched the interests and developmental level of their students with technology possibilities.

Finally, from these projects it became evident that applied technology integration in an authentic learning environment served as a catalyst for a paradigm shift from thinking like an education student to that of a professional educator (Kleinfeld, 1992). Students entered the classes thinking, "How do I learn how to use these technology tools to complete the assignment." As long as the students' focus is on completing university assignments rather than how to teach P-5 students with the technology, their learning is limited. Our experience has shown us those pre-service teachers who are able to make the paradigm shift from thinking like students to thinking like teachers are more open to initiating technology-rich pedagogy in their clinical experiences. Of the three levels of integrating technology currently used in most teacher education programs (stand-alone educational technology instruction, technology instruction integrated into content-methods course, and field-based educational technology instruction), the field-based approach appears to be most effective in encouraging this paradigm shift and a more open disposition toward initiating technology-rich projects with students.

## *CONDITIONS FOR SUCCESS*

Teacher education programs can utilize field experiences to help teacher candidates link methods and theories highlighted in their coursework to practice (Brush & Saye, 2009). Field experiences, especially those where early childhood pre-service teachers are trying new technology-based teaching strategies for the first time, are an ideal environment for teacher candidates to improve their skills. Inherent in the field experiences highlighted in this paper are several "conditions for success" (Dede, Honan, & Peters, 2005), which help pre-service teachers transform their "practice teaching" into "teaching practice." Each of these conditions helps make the field experience environment a two-way street for both learning and teaching others.

One key condition is including ongoing conversations and reflections about technology use within a community of practice (Ertmer, 2005). A key common condition for field-based technology education programs is giving the pre-service teachers opportunities to plan, implement, reflect upon, and improve the teaching strategies they studied in their courses. Much like any other attempt to practice content and pedagogy through field experiences, thinking about technology like one does math or reading instruction improves intentionality.

Additional key conditions include opportunities for observation and opportunity to make multiple attempts at implementing tools and strategies (Ertmer, 2005). In the Georgia College program, the deliberate mapping of instructional technology into the field placement experience over two years allows for these multiple attempts, which in turn increases proficiency.

Projects in the University of Virginia TIP program typically span two or more units of instruction, allowing participants the opportunity to implement the same technologies over multiple lessons. As the pre-service and in-service teachers integrate the technology into their regular teaching practice, they become more comfortable using the technology and begin to develop more advanced applications of these innovations into their regular teaching practice. This aligns with research on the efficacy of professional development that is ongoing, collaborative, and targeted at the enhancement of content and pedagogical knowledge (Guskey, 2003).

Technical and pedagogical support from peers and experts has also added to pre-service teacher success (Ertmer, 2005). Participants in the TIP program at the University of Virginia are given multiple opportunities to receive support from the various stakeholders in the course: their peers, the partnering teacher, and the course instructor. Students write reflective blog posts about their teaching and project planning, which are then shared with others in the class. In addition, the students give frequent updates on their projects in class and talk about lessons learned with each other. Throughout the course of these presentations, students share tips and tricks for planning and implementing technology in the classroom. These conversations have been reported as one of the most important aspects of the TIP program.

In the Georgia College program, pre-service teachers were able to utilize both instructional technology and content area professors for support, in addition to in-service teachers. While the support emerges from different sources and at different times, both programs provide a safety net of support so early childhood pre-service teachers are more confident in their practice. Pre-service teachers are not attempting new skills in a vacuum.

These programs each utilized explicit and systematic selection of technology, technology-based teaching strategies, and student projects. Each program thoughtfully matched technology to student population and curriculum goals. Faculty carefully chose technologies that stretched the pre-service teacher's technical skill set. Established technologies, such as PowerPoint or Word, that have been well-explored by teachers were addressed alongside emerging technologies, such as *Prezi*, interactive white boards, and digital storytelling. Participants reflected on this technology inclusion to develop an understanding of how to match technology to student population, interest, and curriculum goals.

## IMPLICATIONS FOR PRACTICE

The WDT Framework provides a systematic, structured approach to providing pre-service teachers with rich, field-based experiences with technology at increasingly deeper levels. Each phase of the framework is intentional and focused on specific skills-based, attitudinal, and conceptual outcomes with technology. In order to leverage the affordances of the WDT Framework, the authors suggest mapping the *watch*, *do*, and *teach* components to specific areas of the teacher preparation curriculum.

For example, lower-level courses in a teacher preparation program typically focus on building background knowledge and conceptual understanding. These courses may include an introduction to teaching as a profession, child and adolescent development, and a basic educational technology course. These courses often include video-based case studies and observation in schools, which make them ideal for introducing and modeling effective technology integration.

Educational technology courses are also well suited to help pre-service teachers learn and master technology skills and strategies specific to the teaching profession. With the basic educational technology course as the springboard, these projects and strategies can be revisited and refined throughout upper-level coursework. Technology-based projects can be adapted for content-specific and age-specific learning experiences. Drawing upon the content and developmental expertise of methods instructors, pre-service teachers learn strategies for appropriately scaffolding and differentiating technology-based lessons for particular students.

Upper-level courses also include intense time spent in the early childhood classroom, which provides an opportunity for pre-service teachers to practice using technology with students. Pre-service teachers can start with teacher-centered models of technology use, such as presentation tools, interactive whiteboards, or document cameras. Instructors can help teacher candidates to steadily transition to small group lessons that involve student participation with technology, such as cooperative learning, Webquests, or learning stations. Eventually, instructors can guide pre-service teachers through technology-based projects with students, such as digital storytelling, creating slides for a presentation, or monitoring vampire energy consumption with an energy monitor. By designing and implementing student-centered projects with technology, pre-service not only continue to hone their own skills at making things with technology, but they also learn to navigate the complexities of making a technology project fit within an authentic learning environment.

### *AREAS FOR FUTURE RESEARCH*

The WDT Framework has been proposed as a possible way to strategically structure field-based technology experiences into an early childhood teacher education program. In order to assess the efficacy of this approach, the authors suggest several areas for future research in this area.

First, more evidence is needed on the effect of structured technology-based field experiences on pre-service teacher skills, attitudes, and instructional decision-making at different intervals throughout a teacher preparation program. Pre-service teachers could be assessed with the TPSA (Christensen & Knezek, 2008), or a similar instrument after the *watch*, *do*, and *teach* components of the framework in order to see which constructs each component interacts.

Another area of possible research is to follow up with teachers who have gone through a WDT program and evaluate the effect of this framework on their instructional decision-making as in-service teachers. A longitudinal study would provide evidence of the long-term effects of the WDT Framework.

Finally, the WDT Framework can be applied to pre-service teacher preparation and evaluated in terms of changes in teacher’s technological pedagogical content knowledge (TPACK) (Mishra & Koehler, 2006). Research could look specifically at technological pedagogical knowledge and technological content knowledge, and how those two domains interact to influence instructional decision-making with technology.

## CONCLUSION

Field-based approaches to modeling technology integration for pre-service teachers create several possibilities for early childhood teacher education programs. Technology integration projects grounded in authentic teaching contexts, such as those described in this article have positively influenced self-efficacy, instructional decision-making, and understanding of developmentally appropriate practice among the pre-service teachers with whom we have worked. These experiences have challenged early childhood teacher candidates to experiment and refine their understanding about how to effectively balance technology with other developmentally appropriate teaching practices.

As digital literacy and technology integration in the P-5 classroom continue to gain importance in our society, teacher education programs will feel increased pressure to graduate teacher candidates skilled at using technology in the classroom. Systematically implementing developmentally appropriate instruction with technology within early childhood education programs provides a worthwhile challenge which can assist pre-service teachers in creating learning experiences that prepare their students for success in a technology-rich society.

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