



Considering Instructional Appropriateness of Technology Integration into Early Childhood Education

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Introduction

In a research context, the very nature of how one defines technology and technology integration into an early childhood (EC) classroom takes on different meanings that can complicate the national discussion. In an early childhood education (ECE) context, there are multiple concerns about technology integration that go beyond access and classroom management of student use. McMannis, Nemeth, and Simon (2013) point out that lack of research on technology integration in EC classrooms could be contributing to common misconceptions in the discussions about affordances and translation of theory into practice.

In order to keep with the changing educational landscape of preparing pre-service teachers (PSTs) to effectively integrate technology into classrooms, institutions of higher education have previously required standalone educational technology courses. However, due to changing accreditation requirements or programmatic restructuring, there is migration toward the elimination of the standalone course in favor of technology integration into methods and content courses.

Technology integration in an EC classroom is critical to prepare and provide students with the evolving 21st-century skills that are recommended and essential for operational success in a technology-reliant society. While technology standards for both students and teachers (ISTE Standards, 2008) have been identified, standards for teacher educators who model initial knowledge and application necessary for PSTs to carry out those standards are still in development. Without national standards and with many teacher education programs no longer providing a specific course on technology integration to instruct PSTs on how to navigate working, learning, and teaching in an increasingly connected digital society, the questions then become --- What do PSTs know and believe about ECE technology integration? How well are instructors effectively modeling the knowledge PSTs need? And, if there is no room in programs for a standalone technology integration course, what messages about technology integration are PSTs receiving and how is instructionally appropriate technology integration being modeled by faculty instruction?

Context

This exploratory study used a researcher-created survey to identify the current state of PSTs' knowledge and attitudes about technology integration in EC classrooms. Survey and follow-up focus group results were used to re-examine the impact teaching foundations without formal technology training (due to a national trend to cut out standalone technology courses) has on PSTs in teacher preparation programs.

Re-examination allowed the researchers to surmise what next steps should be taken in order to best prepare PSTs within the confines of sharing technology practices only through integrative course instruction. This study is informed by the following guiding questions:

1. What are the contributing factors to pre-service teachers' current perceptions about technology integration practice in early childhood classrooms?
2. What do pre-service teachers' current perceptions about technology integration practice in early childhood classrooms mean for instructors in teacher education programs?

Related Literature

Current theory on approaches for integrating technology into instruction emphasizes the importance of choosing technology tools that compliment content and pedagogy. Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) adds the role of technological knowledge to Shulman's (1986) Pedagogical Content Knowledge (PCK) theory that effective instruction is dependent upon choosing pedagogies that compliment content- specific needs. Pierson (2001) further contextualizes this theoretical concept by explaining that technology integration exemplifies pedagogical expertise and each tool that an educator chooses to integrate into classrooms has direct connections to specific content and pedagogy needs of lessons being taught. Often times in ECE contexts, choices to implement technological solutions relies on what is viewed as developmentally appropriate practice (DAP) as defined by PSTs' usage and training in such practices. Drawing upon Shulman, Mishra & Koehler, and Pierson, authors for this current project argue that DAP is of important concern in an EC classroom; however, PSTs' awareness of instructionally appropriate technology integration is paramount.

Developmentally Appropriate Practices

In ECE contexts, technology integration is primarily viewed through the pedagogical lens of developmentally appropriate practices (DAP). DAP is an educational philosophy that requires educators to evaluate individual children's developmental stages, contexts, and desired developmental goals in order to be intentional in making curricular decisions that will further promote learning and development (Copple & Bredekamp, 2009; Finegan & Austin, 2002; NAEYC, 2009; NAEYC, 2012). Within the DAP framework, educators begin with basic knowledge of developmental stages for a certain age range and from this understanding they will have a general concept of what activities, routines, interactions, and curriculum are most effective in promoting development and learning (Copple & Bredekamp, 2009; NAEYC, 2009, p. 10). Each child within the group is then considered individually and "within the context of that child's specific family, community, culture, linguistic norms, social group, past experience (including learning and behavior), and current circumstances" (NAEYC, 2012, p. 5).

Given that children are being exposed to technology at progressively earlier ages and are becoming increasingly proficient at using technology to accomplish developmentally appropriate tasks, the context of technology and interactive media must also be considered factors within the DAP framework for educators when selecting instructional materials and facilitating learning environments (NAEYC, 2012). Because of this cultural phenomenon, attention and awareness is being brought to phrases such as "digital natives" (Prensky, 2001a) and "net generation" (Kumar & Vigil, 2011; Oblinger & Oblinger, 2005; Tapscott, 1998) that refer to individuals who have grown up around and are frequently using technology (Parette, Quesenberry, & Blum, 2010). There has been significant increases in uses of technology in EC classrooms and home settings; yet, there are still many EC teachers who are not tapping into this potential educational resource due to various concerns about what role technology should play in EC curriculum, as

well as lack of knowledge on ways to successfully integrate technology into developmentally appropriate instructional practices (Blake, Winsor, Burkett, & Allen, 2011; Finegan & Austin, 2002; NAEYC, 2012; Grunwald and Associates, 2010; Parette, Quesenberry, & Blum, 2010; Wartella, Blackwell, Lauricella, & Robb, 2013).

DAP with Technology

It is easy to see why EC educators might be hesitant to jump on board the technology bandwagon. Many people fear the potential hazards presented by technology mis-use to children's physical, emotional, social, and cognitive development (Grunwald and Associates, 2010; NAEYC, 2012). To combat these potential harms and ensure safe and secure learning environments for young children, it is pertinent for teachers to understand what is developmentally appropriate and effective when monitoring and restricting the amount of time that children spend using technology. Even more essential, though, should be the significance placed on *how* that time is actually spent using chosen technology (Barron et al., 2011; Christakis & Garrison, 2009; NAEYC, 2012; Parette, Quesenberry, & Blum, 2010; Tandon et al., 2011). "Early childhood educators who are informed, intentional, and reflective use technology and interactive media as additional tools for enriching learning environments. They choose technology, technology-supported activities, and media that serve their teaching and learning goals and needs" (NAEYC, 2012, p. 10). Informed and effective EC teachers practice what these researcher's call "instructionally appropriate" technology.

Instructionally Appropriate Technology Integration

While DAP still appears to be the primary guiding force for making most decisions regarding EC curriculum, when specifically considering technology integration into EC curriculum it may be more correct to focus on "instructional appropriateness" to guide pedagogical decisions. Instructionally appropriate technology focuses on the best way to teach what needs to be taught; and while that may take into consideration children's learning preferences and developmental abilities (just as DAP does), primary concerns should be about determining whether or not technology will simplify, amplify, extend, or transform children's ability to learn and then choosing those programs, apps, and hardware that improve teacher instruction by purposefully aiding student understanding and application of content knowledge. When approached from an instructionally appropriate perspective, student learning takes priority instead of allowing technology to take center stage. Rather than allowing national or school district demand for "more technology in the classroom" to drive classroom instruction, instructionally appropriate technology practice encourages teachers to consider the instructional purpose and place of technology. With this practice, technology becomes one of many tools in teachers' instructional toolkits.

The problem is that too often EC teachers are entering classrooms from their undergraduate education and PST experiences and are ill-prepared to successfully navigate the waters of effectively incorporating technology within their instructional practices (Ertmer, 2005; Kumar & Vigil, 2011; Moursund & Bielefeldt, 1999; Parette, Quesenberry, & Blum, 2010; Williams, Foulger, & Wetzell, 2009). While some PSTs are simply unaware of technology tools at their disposal, it appears that many more are familiar with technology in their personal lives, but lack necessary training for effectively transferring that tool knowledge for maximum benefit into an EC classroom.

Early Childhood Pre-service Teacher Preparation for Technology Integration

While there appears to be a high use of technology in PSTs' personal lives (Kumar & Vigil, 2011), there is a general lack of transferability to classroom settings in part due to PSTs' attitudes, values, and beliefs

in regards to educational technology (Ertmer, Ottenbreit-Leftwich, Sadik, E. Sendurur, & P. Sendurur, 2012; Lei, 2009; Williams, Foulger, & Wetzel, 2009), as well as a lack of effective modeling and practice applied during their pre-service educational experiences (Blake, et.al., 2010; Kumar & Vigil, 2011; Lei, 2009). From this research the following questions were pursued: 1) What factors contribute to PSTs' current perceptions about technology integration practice in EC classrooms and 2) What does that mean for instructors in teacher education programs?

Methodology

To discern how EC PSTs think about instructionally appropriate technology integration, this exploratory study used mixed methods, including a survey that combined quantitative and qualitative methods (Marsland, Wilson, Abeyasekera, & Kleih, 2001) and a retrospective focus group (Wallen & Frankel, 2011).

Participants

Eighty-eight EC PSTs from a large urban university in the southwestern United States participated in this study. The study took place during the spring 2014 semester, in which participants were enrolled in a Human Growth and Development course required within their teacher preparation program in the College of Education. Ranging in age from 18 to 34, these participants were in the early semesters of their program and were demographically representative of undergraduate PSTs enrolled at the university. Their participation was voluntary; however, all 88 participated in the survey and follow-up focus group.

Survey

The survey was designed by the research team and consisted of 35 questions that included 30 questions with four Likert scale levels (strongly agree, agree, disagree, strongly disagree) and 5 questions with open-ended response. In line with Bandura's (1997) theories of socio-cultural impacts on self-efficacy, this survey was crafted to look at influences on attitudes, motivation, and self-efficacy beliefs toward technology integration, including technology use in personal life (mastery experience), current models of technology integration (vicarious experience), awareness of related theories and perspectives (social persuasion), and psychological impacts on motivation (physiological state). Additionally, the survey included a 6th factor that focused on future intended use. Although Bandura does not theorize about the validity of participants' projections into the future, these glimpses into future intentions are important for this study's context. The survey was administered by hardcopy (pen and paper) at the end of one of the face-to-face class meetings.

Focus Group

The focus group with all 88 participants immediately followed the completion of the survey. The research team guided participants through a series of semi-structured questions that were based upon items on the survey. The entire 45-minute focus group was audio recorded. Participants were encouraged to feel free to speak up and comment or ask questions whenever they desired. In typical dialogic style, the research team asked questions and participants indicated agreement and/or elaborated by voluntarily voicing personal opinions.

Validity and Reliability

This study used purposive sampling to target EC PSTs in a large urban university teacher preparation program. This specific group of participants was purposefully chosen based on relevant knowledge and experiential history (Berkowitz & Donnerstein, 1982) with regard to shared phenomenon (i.e., knowledge and attitudes about technology use for EC classrooms). The sample size for this study (n=88) constituted

the entirety of the target population with 100% of the sample population fully participating in both the survey and focus group. In terms of qualitative validity, the researchers crafted measures (i.e., survey and focus group) that allowed participants to share individual interpretations of lived experiences with regard to shared phenomenon (Maxwell, 1992). Additionally, while the researcher-created survey is currently undergoing a validity study, the focus group provided exploratory confirmation of construct validity by providing multiple data sources and methods of collection (McGrath, 1982; Scandura & Williams, 2000). Further construct validity is found in that results from this study continue to be in line with other studies' results (including Blake, et al., 2010) thereby inferring that there is convergence across data sources, methods, and researchers (McGrath, 1982). Finally, construct validity is confidently inferred for this study due to the involvement of multiple researchers with varied expertise, experience, and knowledge in the fields being studied (i.e., EC practices and technology) (Jick, 1979; McGrath, 1982; Scandura & Williams, 2000).

Data Analysis

The research team collected surveys and then analyzed each factor using descriptive statistical procedures involving one-way tables and cross-tabulations. The focus group audio recording was transcribed and coded. Coding analysis procedures ranged from descriptive coding to more explicit "in vivo" codes of exact participant wording for an emic (insider's) perspective (Saldana, 2009).

Results

Guided by Bandura (1997), six factors were explored to examine self-efficacy toward technology integration for early childhood educational contexts, including 1) awareness, 2) confidence, 3) value, 4) current practice in personal life, 5) current models, and 6) future practice. The results of both the survey and focus group are woven together throughout each factor in order to explore each disposition below.

Awareness of and Attitudes toward Technology Integration Issues

Five items on the survey prompted participants to rate the level to which they had been exposed to issues related to instructionally appropriate technology integration within EC classrooms. Since exposure to related theories and perspectives can heavily influence PSTs' attitudes toward technology integration (Williams, Foulger, & Wetzel, 2009), these items draw upon whether or not participants have received encouraging messages from faculty and peers, or "social persuasions" (Bandura, 1997).

DAP with technology

Initial questions gauged connections between awareness of theories related to EC instructional practices and technology integration. When asked if they were aware of theories related to DAP, 87% of participants answered affirmatively. Participants elaborated on their survey affirmations by indicating need for "hands-on activities" and "active" learning experiences in EC classrooms (open-ended survey response). However, when asked about their awareness of how DAP directly related to technology integration, there was a near even split between 52% of participants who indicated awareness and 48% of participants who indicated that they were not aware of theoretical connections. It should be noted that when probed further during the focus group, many participants revealed that they struggled with an accurate understanding of both DAP and technology integration.

As expected, a majority of participants indicated awareness of many general uses of technology for teaching and learning, including 94% awareness of hardware that could be used for classroom instruction and/or learning (i.e. computers laptops, iPads, projectors, interactive whiteboards), 95% agreed that technology is most effective when used to support content and instructional strategies, and 96% agreed

that technology is most effective when presented as active learning. This was confirmed during the focus group in which participants voiced positive perspectives that technology had great potential for teaching and learning in EC classrooms. Table 1 shows participants' self-reported awareness levels and attitudes toward technology integration issues.

Table 1.
Awareness of and Attitudes toward Technology Integration Issues

Item	Strongly Agree	Agree	Disagree	Strongly Disagree
Awareness of Developmentally Appropriate Practices (DAP)	6%	81%	10%	3%
Awareness of DAP & Technology Integration	2%	50%	43%	5%
Technologies Appropriate for Teaching & Learning	33%	61%	6%	0%
Technology Should Support Content & Pedagogy	41%	54%	5%	0%
Technology Should Be Presented as Active Learning	38%	58%	4%	0%

Confidence with Technology and Technology Integration Issues

Six items on the survey asked participants to rate the level to which they felt confident in performing tasks or what Bandura (1997) identifies as the “physiological state.” Self-assessment of current levels of confidence in these tasks is an important consideration for PSTs' own self-efficacy, but also a predictor of their ability to confidently perform the task in EC classrooms. Table 2 shows participants' self-reported confidence with technology and technology integration issues.

Personal technology skills

Despite some participants who indicated that they are “horrible with technology,” many participants indicated need to embrace technology integration. As one participant reported, “children in this generation use so much technology every day, they are used to it so it will be beneficial for teachers to use it also” (open-ended survey response). Others shared this thought with 75% of participants indicating that they felt confident taking risks to try out new technologies and 62% of participants indicated that they were confident in their ability to troubleshoot their own technical problems.

Technology and others

Despite generally positive perspectives of their own individual technical abilities, only 44% of participants indicated that they were confident in their ability to explain to others how to troubleshoot technical problems. In general, respondents felt that young students already know how to use technologies, “my nephew is even more knowledgeable in using an iPad than I am” (open-ended survey response). This creates an interesting juxtaposition between participants' confidence in their own troubleshooting ability versus their ability to facilitate someone else's troubleshooting, which is a very important factor for facilitating student use of technology in classroom settings (Lei, 2009). Similarly, 76% of participants indicated that they felt confident operating technology in front of other people. However, upon further discussion during the focus group, two-thirds of participants revealed that they had personal experiences when technology did not work as expected as they were presenting to their peers in class --- “it seems to take forever because they are staring at you while you're waiting for it to work” (student communication, focus group interview, line 108).

Communicating about technology

Though it was expected that participants would be confident in their own technical abilities, the researchers were surprised by the levels of confidence they reported with regard to communicating key issues of technology integration with others especially given the evenly distributed levels of awareness they indicated in the previous section. Despite only 53% of participants reporting that they were aware of DAP and technology integration theories, 61% indicated that they felt confident explaining to others how to integrate technology to support student learning in the grade level and content area that they plan to teach. Similarly, despite their awareness of related theories, 60% of participants felt confident about their ability to explain to others why technology integration is essential to student learning.

Table 2.
Confidence with Technology and Technology Integration Issues

Item	Strongly Agree	Agree	Disagree	Strongly Disagree
Confidently Take Risks by Trying New Technologies	22%	53%	22%	2%
Confidently Troubleshoot My Own Technical Problems	10%	52%	35%	4%
Confidently Explain to Others How to Troubleshoot	6%	38%	48%	7%
Confidently Operate Technology in Front of Other People	16%	60%	22%	1%
Confidently Explain to Others How to Integrate Technology	7%	54%	35%	4%
Confidently Explain to Others Why Technology Integration is Essential	6%	54%	36%	4%

Value of Technology Integration

Ten items on the survey asked participants to rate the level to which they perceived the value of technology for teaching and learning. Guided by Bandura (1997), these items were based on literature regarding affective and/or emotional beliefs held toward technology. An overwhelming majority of participants indicated that they highly valued technology. Table 3 shows participants' self-reported attitudes towards the value of technology integration.

Technology for teaching and learning

With regard to practical instructional strategies, 95% of participants felt that technology could be integrated in a variety of ways to support teacher-centered instruction. In open-ended survey responses, participants suggested this could be accomplished by using common didactic instructional tools, such as videos and PowerPoint presentations. Though 94% of participants indicated that they felt that technology could be integrated in a variety of ways to support hands-on, student-centered instruction, no examples of developmentally appropriate technology tools were given through open-ended survey responses or during the focus group. When probed further in the focus group, participants revealed that they could not think of specific examples, but felt there had to be some technologies that could support this type of active

learning. Acknowledging “technology comes with its malfunctions,” 70% of participants still indicated they believed technology use in EC classrooms would not require teachers to spend too much time troubleshooting technical problems (open-ended survey response).

Impact on students' behavior

Eighty-eight percent of participants indicated that they felt the use of technology in EC classrooms would not result in behavior issues; however, 33% of participants believe that it could result in students developing poor attention spans. One participant expounded upon this by stating, “kids are always on technology and don’t know what to do without it” (open-ended survey response). Similarly, 68% of participants believe that technology use causes students to neglect traditional learning resources, which many participants seem to feel would lead to an abandonment of “real books, writing, or spelling” or “libraries, art, or outside play/learning” (open-ended survey responses).

Generally perceived as adding value, 96% of participants felt that technology could add engagement to instruction and student learning. This was reinforced with 93% of participants who indicated their agreement that technology could transform teaching and learning. Acknowledging the necessary role of teacher facilitation to promote successful student use of technology, one participant stated, “teachers should also teach students how to use it effectively for learning,” while another participant added “if it is not used properly it is just a distraction. But it is important to make sure students know how to use it to their benefit” (open-ended survey responses).

Impact on students' creativity

Despite these optimistic perspectives, interesting divisions between positive and negative views of technology integration appeared more prevalent when participants were asked about their perceptions of technology’s possible impact on student abilities. Forty-one percent of participants believed that technology stifles student imagination and creativity, which one participant explained by using the following example: “when children are in younger grades they need to be creative with their minds not through a computer. Also children should not have to be stuck depending on technology. They should come up with ideas on their own” (open-ended survey response). In contrast, another participant indicated the importance of teacher facilitation to support technology use by stating, “technology can open many doors for learning but it must carefully be utilized” (open-ended survey response).

Ultimately, 89% indicated they felt that technology integration is essential to 21st-century learning. Despite overwhelming positive value perceptions, a small percentage of participants consistently indicated negative views of the general value of technology integration, resulting in 1% of participants “strongly disagreeing” with the value statement. Though a small percentage, it is important to ascertain what contributes to such perspectives. Some of the open-ended survey responses illuminated these negative views with responses, such as “21st-century technology is the norm; however, I am not a supporter of using technology to teach a classroom. I think a lot of time is wasted and it doesn’t promote actual learning. It also burns my eyes” (open-ended survey response).

Table 3.
Value of Technology Integration

Item	Strongly Agree	Agree	Disagree	Strongly Disagree
Technology Can Require Too Much Time Troubleshooting	3%	27%	65%	5%

Technology Can Support Teacher-Centered Instruction	25%	70%	5%	0%
Technology Can Support Student-Centered Instruction	21%	73%	6%	0%
Technology Can Result in Behavior Problems	0%	22%	73%	5%
Technology Can Add Engagement to Student Learning	23%	73%	4%	0%
Technology Can Transform Teaching and Learning	25%	68%	6%	0%
Technology Can Stifle Student Creativity	16%	25%	54%	5%
Technology Can Cause Poor Attention Spans	5%	28%	58%	9%
Technology Can Cause Neglect of Traditional Resources	19%	49%	30%	3%
Technology Integration is Essential to 21 st Century Learning	28%	61%	10%	1%

Current Practice in Personal Life

According to Bandura (1997), perceptions of one's mastery experiences are important factors for measuring self-efficacy. It appears that the majority of college students use technology throughout their personal life for a variety of academic, social, and personal purposes. The five questions in this category asked participants to indicate the level to which they felt they could *effectively* use technology in their personal life. The overwhelming majority of participants (> 98%) indicated that they felt confident in their use of hardware, applications, as well as the use of various technologies to communicate, research, and create multimedia for academic, social, and personal purposes. Table 4 shows participants' self-reported current practices of effective use of technology in their personal lives.

Table 4.
Current Practices: Effective Use of Technology in Personal Life

Item	Strongly Agree	Agree	Disagree	Strongly Disagree
Effectively Use Hardware (i.e. computer, smartphone, tablet device, etc.)	70%	28%	1%	0%
Effectively Use Applications (i.e. web-based applications, apps on smartphone/tablet, software, etc.)	65%	35%	0%	0%
Effectively Communicate (i.e. texting, email, social media, blogs, etc.)	77%	23%	0%	0%

Effectively Research & Investigate Topics (i.e. Internet, search engines, online databases, etc.)	69%	31%	0%	0%
Effectively Create Multimedia (i.e. cameras, microphones, record audio, take photographs or videos, etc.)	64%	33%	2%	0%

Current Models of Technology Integration

Vicarious experiences, such as observation of exemplars and models, are very important to self-efficacy development (Bandura, 1997). Particularly in the field of education, PST development is most successful when preparation programs provide opportunities to not only observe best practices, but also dedicate time for discussion and reflection with instructors and peers thereby creating reflective practitioners (Ertmer, 2005; Kumar & Vigil, 2011). Unfortunately, participants overwhelmingly reported a lack of consistent technology integration being modeled and discussed by professors. As one participant indicated, “in all five of my classes I am not taught about ways to use technology in a classroom, which I think would be helpful since technology is growing in schools and among students” (open-ended survey response).

Encouraging examples

Despite the lack of modeling of technology specifically for the context of EC instruction, participants indicated that they are generally encouraged when they observe their professors successfully using technology throughout instruction. And even when professors experience technical difficulties, it only discourages approximately 28% of participants from attempting technology integration on their own. Focus group discussion further revealed that the majority of participants find these instances more comical than discouraging and most participants indicated that they would be willing to get up during class to help professors in need of technical assistance. Above all, the focus group highlighted discussion about the generational gap and perceptions that their professors are not as tech savvy as they are. As one participant eloquently warned, “we’re going to get outdated too. In 15 years the technology will be completely different” (focus group discussion).

Discouraging examples

Amidst participants’ individual descriptions of in-class experiences with professors being confused by Mac and PC operating systems or having too many Internet browser windows open, a resounding 50% of participants recounted similar stories about professors canceling class because instructors’ technology (e.g., computer, PowerPoint) was not working properly (focus group discussion, lines 132-141). One participant emphasized the importance of having a “plan b” by asking, “what do you do when the batteries run out or the computer isn’t working” (focus group discussion)? This laughable contradiction of modeling a dependence on technology for teacher-centered instruction was pointed out as an inaccurate representation of real-world EC classrooms. Table 5 shows participants’ self-reported attitudes towards current models of technology integration that professors model for them in their teacher education courses.

Table 5.

Current Models of Technology Integration

Item	Always	Frequently	Sometimes	Never
Professors Model Grade Level Specific Technology Integration	5%	25%	59%	11%

Professors Model Teacher-Centered Technology Integration	6%	28%	49%	16%
Professors Model Student-Centered Technology Integration	4%	16%	49%	31%
I Am Encouraged By Professors' Successful Technology Use	28%	43%	27%	1%
I Am Discouraged By Professors' Unsuccessful Technology Use	14%	14%	37%	36%

Future Practice

Five questions on the survey asked participants to indicate the level to which they would like to engage technology integration in their future classrooms. Though projections of future use have inconsistent validity, it is important to consider participants' current thoughts on how and if they can apply this knowledge in future contexts in order to better inform teacher educators' practices. Ninety-one percent of participants indicated that they can think of ways that everyday technologies can be integrated into teaching, though much like in the "value" section, they did not provide specific examples. The focus group revealed participants' general concern over access to devices and district policy on common social media tools such as Facebook, Twitter, and YouTube.

Despite the overwhelming majority of participants proclaiming an affinity toward hands-on student use of technology, only 70% indicated that they would actually like to encourage students' hands-on use of technologies during class time in their future classroom (which is 20% less). The percentage returns to 90% when measuring how many participants would like to encourage students to use technologies outside of class to support their learning. Likewise, 90% would like to encourage parents of their future students to use everyday technologies outside of class time to support their child's learning. The results show that despite seeing uses for everyday technologies to support teaching and learning, many participants feel that student use of technology is better suited for out-of-class time rather than during class time. Table 6 shows participants' self-reported visions for technology integration as part of their future practice in their future EC classrooms.

Table 6.

Visions for Technology Integration in Future Practice

Item	Strongly Agree	Agree	Disagree	Strongly Disagree
Everyday Technologies Can Be Integrated Into Classroom	21%	70%	9%	0%
Encourage Students To Use Technology During Class	11%	58%	29%	1%
Encourage Students To Use Technology Outside Of Class	16%	74%	9%	1%
Encourage Parents To Use Technology Outside Of Class To Support Student Learning	20%	70%	9%	1%

Include Student Opinion When Choosing Technologies To Integrate	33%	64%	2%	0%
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Discussion

Despite personal affinity toward technology in their personal lives, participants in this study verbalized numerous potentially problematic misconceptions about --- and in some cases even a total lack of conception about --- instructionally appropriate technology integration in ECE. The results indicated that these misleading perceptions could be formed by a general lack of awareness and inconsistent modeling of best practices by professors. Corroboration between survey results and the focus group revealed varying levels of misconceptions about technology integration in an EC context, including the instructional nature of technology integration itself, as well as hands-on, playful, and social affordances of technology tools.

Disconnect/Misalignment of Theory and Practice

While most participants initially responded positively concerning their knowledge about current theories of DAP and technology integration on the survey, open-ended responses during the focus group revealed significant disconnect between participants' understanding about such topics. At best, participants' focus group responses revealed surface-level knowledge about DAP, while their knowledge of how to effectively and appropriately apply technology in EC classrooms was nearly nonexistent. Since foundational courses in technology are quickly becoming a luxury for most colleges of education, teacher education programs will need to take amplified steps to dispel myths and correct misconceptions so as to ensure that instructionally appropriate messages can be received.

General Misconceptions of Technology in an Early Childhood Context

One of the recurring themes throughout this study was participants' view that technology use is a passive activity in which students are in-actively consuming information from technology tools or the teacher-centered use of tools for didactic instruction. Though 96% of participants agreed that technology could engage students, often their view of engagement was equal to "consumption" or being babysat by technology absent of actual learning. Similarly, it was alarming that 41% agreed that technology would stifle student creativity. These misconceptions could be related to interpretations of how "play" is defined within ECE because perhaps participants do not feel that technology translates into an active definition of play. Results show that despite seeing uses for everyday technologies to support teaching and learning, many participants feel that student use of technology is better suited for use in settings outside of class rather than during class time.

ECE + Technology can be a hands-on, playful learning tool

During the focus group, participants were quick to identify examples of commonplace technology, such as computer, laptop, projector, and PowerPoint; yet none of them mentioned ways in which students could use those tools for hands-on learning, nor did they mention other tools that lend themselves to individualized artifact creation. Much like there are didactic teacher-centered instructional strategies, there are in-active and consumptive uses of technology tools. Successful technology integration that supports development is not solely about teachers showing PowerPoint presentations on projection screens, nor is it about students merely replacing paperback books with reading e-books on iPads (NAEYC, 2012).

As facilitators of learning, teachers can empower students to see how to use technology to support their own learning and creativity (ISTE Standards•T, 2008). More than just portals to view videos through, technology can be placed in the hands of children to reinforce content and developmental growth. As one participant pointed out, “when done correctly, using a computer influences inquiry and improves fine motor skills (i.e. typing /mouse control)” (open-ended survey response).

When placed in the hands of students, these technology tools can be used to actively create personally meaningful artifacts (ISTE Standards•S, 2008). For example, they could give children a digital canvas to explore letters and color as they “type” their own expressive story or let children swirl the mouse to create digital drawings or paintings for story reflections. Students can use video cameras to capture peers' reenactment of read-alouds or use digital cameras to take photos of geometric shapes throughout school. Each of these hands-on creations can be printed and displayed as evidence of their personal expressive inquiry.

ECE + Technology can be a social learning tool

As one participant responded, “technology is cool, but it also takes away from the social aspect of a classroom environment by letting kids focus on things like screens rather than people” (open-ended survey response). According to NAEYC (2012), “All screens are not created equal” is a mantra to live by. It is pertinent for EC teachers to understand that looking at screens does not necessarily mean the absence of socialized play, when in fact students can interact with one another while using technology tools in classrooms (Barron, et al., 2011). Through our digitally connected world, not only can they share what they have created with one another, they can share it globally with students from around the world. Examples include using Skype to communicate with pen pals, using GoogleEarth for virtual field trips, and promoting 3-to-1 use of iPads to match struggling readers with more advanced students who can help model critical thinking strategies.

Lack of consistent modeling impacts confidence

The focus group revealed that participants were unsure how they could incorporate their knowledge and skills with everyday technologies into EC classrooms to support teaching and learning. As Kumar and Vigil (2011) pointed out, this concern needs to be addressed through effective modeling in PST education to help bridge the gap between technology integration in their personal life with that of their professional life.

Implications for Teacher Education

Results from this research indicate that many PSTs at this large urban institution are not, as of yet, sufficiently prepared to understand intricate relationships between DAP and technology integration, which results in instructionally appropriate technology practices. Throughout their responses about their present values and beliefs on technology integration in an EC classroom, many had conflicting opinions as to what it meant exactly to successfully integrate technology within their own teaching practices. Although a vast majority felt comfortable using technology in their personal lives and had an overall positive attitude towards technology for academic use, they did not feel confident in transferring their personal skills to their own future classroom environments. Additionally, many felt resigned to the inevitability of technology's place in their classrooms while simultaneously feeling unprepared to effectively manage this significant classroom component. While a lack of efficacious modeling through coursework by faculty did not dispel participants from at least thoughts of technology integration, many were left unaware as to what technology integration in practice actually embodied.

As colleges of education charged with preparation of tomorrow's teachers, it will be up to individual instructors' work with colleagues to determine to what extent their students' experiences parallel with those discussed in this study. Since each institution is different, with varying access to schools, varying districts to prepare student for, and varying commitments to effective technology integration throughout courses, each teacher preparation program will need to determine to what extent they are failing their PSTs in the area of instructionally appropriate technology practices so that they can then begin discussion and take action to proactively and purposefully capitalize on students' apparently positive attitudes towards technology while minimizing their misconceptions about and building up their authentic understanding of instructionally appropriate technology practices. Just as EC teacher educators have had to explain, model, and reinforce committed practice to other developmentally appropriate EC pedagogy (e.g., project-based learning, emergent curriculum), the same will need to be done to promote effective technology practices.

Conclusion

Based upon the results, participants appear to see opportunity for practical technology integration and minimal hurdles to acting upon that; however, it is their actual view of what technology integration is that is disconcerting. Open-ended responses indicated that most have already committed to uninspired, teacher-directed technology use. Without a dedicated course that explicitly and inspiringly deals with ways to integrate technology to support pedagogy and content in EC classrooms, teacher preparation programs must encourage faculty to effectively model throughout their courses in order to provide broad ranges of integration options to PSTs. As suggested by Ertmer (2005), in order for beliefs regarding technology integration to be changed, we must first provide multiple sources of real world application modeling and opportunity for practice, as to increase confidence and encourage changes in beliefs. If this is not done effectively, misconceptions will continue to manifest within preparation programs and continue to infiltrate into EC classrooms.

Due to a lack of consistent modeling by program faculty, these PSTs are less likely to try to find ways to integrate technology on their own time outside of their designated teacher education courses. It is through proper guidance and opportunity that teacher educators can facilitate hands-on explorations of technology integration to better equip PSTs with various instructional tools and strategies that can be implemented in an EC classroom to further support DAP.

Future Research

The goal of a future exploratory study is to use this data in order to generate hypotheses for identifying both pre-service and currently practicing in-service teachers' barriers to instructionally appropriate technology integration in EC classrooms. By identifying psychological barriers that prohibit one from successfully integrating technology in practice, the research team will be able to further explore those educators who comprise "threats to technology integration" category and explore the deeper cognitive and psychosocial issues that are presented towards professional development in regards to technology integration.

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