

IPADS IN PRESCHOOLS: A COLLECTIVE CASE STUDY ABOUT TABLET
TECHNOLOGY IN SUBSIDIZED PRESCHOOL PROGRAMS

by

Dean Tagawa

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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ABSTRACT

Preschool children today will not remember a time when there were no smartphones, laptops, or iPads. The purpose of this qualitative collective case study was to develop an in-depth understanding of the challenges and benefits of implementing tablet technology for early education teachers that work in subsidized preschool programs. Tablet utilization in preschool classrooms was generally defined as how teachers from five different classrooms utilize tablet technology to enhance the instructional programs for children in subsidized preschool programs. The setting for this study was five early education centers in a large urban school district. Data were collected through semistructured interviews, audio-visual recordings, and observations. Data were analyzed by applying within-case analysis, cross-case synthesis, and direct interpretation of the evidence. Issues of trustworthiness were addressed through triangulation, member checks, and clarifying researcher bias. The primary research questions were: (a) How do sociocultural learning theory and developmentally appropriate practice apply to a preschooler's use of tablet technology? (b) What do early education teachers need to understand so iPads can be successfully utilized in a preschool classroom? (c) How do early education teachers describe their experience as they implement iPads into the instructional program? The results of the study revealed that children benefit the most from technology when it is used in conjunction with interactions that are commensurate with socio-cultural learning theory and developmentally appropriate practices. Devoid of these interactions, children can use the technology but this does not always translate into meaningful learning. The study also revealed that teachers who systematically plan for how the devices will be implemented in their classrooms also experienced greater successes while mitigating their initial fears and challenges.

Keywords: early education, preschool, mobile technology, tablets, computers, iPad, early education teacher

Dedication

This research study is dedicated to my mother, Georgia, who has always believed in me even when I did not believe in myself. To my father, Gene, who loved me and was the greatest dad a son could have asked for. To my wife of 22 years, Fanny, who encouraged me every step of the way. If it wasn't for her love and absolute brilliance, I would never have finished this journey. To my sons, Samuel and Nathan, who remind me every day of what resilience looks like. You are children who deal with so much more than I could ever imagine, yet you guys are kind, courageous, and amazing gifts from God. To all of the people that I have worked with and all the students that I have ever taught because each of you has helped me become the educator that I am today. To Jesus Christ, because there is no way I could have completed this without the peace only you can give.

Acknowledgments

Since I began this process, the years have flown by. Over the last three years, I paused my doctoral efforts to make sure the staff, families, and students I serve got my full attention as we made bold endeavors into early education. Throughout this time, I have been blessed by personal and professional encouragement from my family, friends, and colleagues.

Thank you to my professional mentors and professors who have helped me at every step of the way. To Dr. Alan Wimberley for your tireless encouragement and helping me to always think out of the box. To Dr. Randall Dunn, who inspired me during one intense week that digital technology was critically important to working with young children. To Dr. Patricia Yeldell, who has been the biggest cheerleader and confidant that any person could ask for. To Maribel Zuniga, who has been there since the beginning of my administrative career. Without all of your acceptance and friendship, I don't know where I would be.

Additionally, I am forever grateful for all of my professional colleagues that are like a second family to me when I am "on duty." I work with an amazing array of administrators, principals, teachers, staff, and I am truly honored to serve with all of you on a daily basis as we work to change the life trajectories of our families and students.

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List of Abbreviations

Applications (Apps)

Committee on External Research and Review (CERR)

Dematerialization and Digital Consumption (DDC)

Desired Results Developmental Profile (DRDP)

Fred Rogers Center for Early Learning (FRCEL)

Institutional Review Board (IRB)

International Society for Technology in Education (ISTE)

Los Rubios Unified School District (LRUSD)

National Association for the Education of Young Children (NAEYC)

Preschool Collaborative Classroom (PCC)

Socioeconomic status (SES)

CHAPTER ONE

Joaquin's preschool is only three blocks from the projects he calls home, yet his preschool is where he would like to live. At home, he shares the one-bedroom, 500-square-foot apartment with six other people and is not allowed to play outside or close to the window. Joaquin leaves a locked home, comes to school in a locked car, and returns home to a locked house without ever having the opportunity to interact with other kids outside his home. He repeats this process every day. However, when he arrives at school, Joaquin experiences freedoms that he has nowhere else. His classroom is colorful, with student work adorning the walls and clearly defined play areas. There is a giant tree made of butcher paper that has all kinds of jungle animals hanging from it. There is a fully stocked library with a small padded blue sofa and two huge beanbag chairs. An art center with paint is waiting for him as well as a science center with some new things he has never seen before. Joaquin is really excited this week because the kitchen area has been transformed to look like a mechanic's garage with a race car theme. Spread out on one of the tables are colorful math counting bears, while crayons and letters sit on another table. However, the activity area that is his favorite is the one with the iPads. Maybe this week, he will get to use the video camera in the iPad to record his friends showing their different emotions, or take pictures of things that are red, or play a new learning game with his teacher. "Come on friends, let's have a seat on the rug to see what we are going to do today," calls his teacher. He immediately runs and sits next to Daniel and Sofia without even saying goodbye to his dad. He can't wait for class to start!

Within the boundaries of Los Rubios Unified School District (LRUSD), 100 percent of the students who attend early education centers qualify for subsidized preschool care because they are low income. In addition to being low income, families may be eligible for services

because they are monitored by child protective services, parents are seeking employment, the family is seeking permanent housing, or a parent(s) are enrolled in education programs themselves. While Joaquin's story is fictional, it is a reality for many of the 31,000 preschoolers in the district's early education programs.

Background

At one time, being literate mean that a person had the ability to read and write (Beschorner & Hutchison, 2013; McLean, 2013), but this definition no longer holds true. Literacy in the 21st century is much more complex than what the previous definition describes. According to Beschorner and Hutchison (2013), being literate today means a person has the ability to read, write, communicate in various electronic forms, and access information through multiple means. As a lifelong educator in schools that serve low socioeconomic families, I want every student I work with to have those skills. Later, these skills will be necessary as the student competes with their more affluent peers for college entrance or jobs.

Unfortunately, the literacy gap begins long before students enter formal education in kindergarten. Children from low socioeconomic backgrounds are already at risk for literacy failure by age three (Cabell, Justice, Logan, & Konold, 2013; Neuman & Kaefer; 2013). A few years ago, I had the opportunity to join a large urban school district's early education division and discovered that our early education programs were on par with some of the best National Association for the Education of Young Children (NAEYC)-accredited preschools. Since digital literacy is becoming increasingly important for students, I strongly believe that all children in subsidized preschool programs need the opportunity to interact with technology as a matter of access and equity. This ensures that they will begin formal education in kindergarten with the ability to embrace technology and discover how it contributes to their overall literacy.

New advancements in mobile technology like smartphones, tablets, and iPads are perfect introductory tools for preschoolers (Couse & Chen, 2010; & Geist, 2012). Touchscreen interfaces are developmentally appropriate for even the youngest of learners. To take full advantage of the opportunities these pieces of technology present, early education teachers need to be trained in their use and see the benefit they offer to our neediest kids.

Situation to Self

A recent study found that 90% of educational applications created for tablet devices were designed for children between the ages of four and nine (Hernandez, 2014). With so many educational applications being developed for young children, why are we not taking advantage of them in our early education centers while simultaneously developing digital and traditional literacy skills for our students? Many early childhood advocates believe that technology devices do not belong in the hands of preschoolers (Healy, 1998, 2011; Olfman, 2003), but these studies and pedagogy were built around previous beliefs regarding technology use. It is this exact reasoning that caused this nation's largest early education proponent to issue a program statement about the benefits of technology use in preschools today. In 2012, NAEYC and the Fred Rogers Center for Early Learning (FRCEL) published a position paper about the use of digital media with preschool students. NAEYC, in conjunction with the Fred Rogers Center for Early Learning (FRCEL) stated, "Children's experiences with technology and interactive media are increasingly part of the context of their lives, which must be considered as part of the developmentally appropriate framework" (NAEYC & FRCEL, 2012, p. 2). These organization are organization is largely respected and followed by early education professionals, I agree that interactive media needs to part of any quality preschool program. In my current position, I have the opportunity to write grants, influence instructional practice, and bring change to over 30,000

students in the preschool programs across the school district. My desire is to see the district's early education programs close the digital literacy gap for our youngest learners while developing the cognitive and social skills that will make them successful over their lifetime.

Problem Statement

In addition to the academic gap that already exists at kindergarten, the lack of technology implementation is creating a digital literacy gap for young learners that are already at risk for failure because of their current circumstances (Neuman & Kaefer, 2013). With regard to digital technology, the gap may be attributed to the newness of the tablet technology or the investment costs of purchasing tablet devices. For a family living in poverty, tablets, smartphones, wireless connectivity, and data plans are luxuries they may not be able to afford. There is also a lack of training for early education professionals to help them understand how to implement the technology in their instructional programs. Whatever the case, tablets have been proven to be effective instructional tools that could potentially build a young child's emergent literacy skills (Couse & Chen, 2010; Lentz, Seo, & Gruner, 2014; McManis & Gunnewig, 2012; NAEYC & FRCEL, 2012; Neumann & Neumann, 2014). However, the leveraging of their benefits is highly dependent on the type of scaffolding and efficacy of the teacher (Beschoner & Hutchison, 2013; Neumann & Neumann, 2014).

In an early mixed methods study, Couse and Chen (2010) "found that the use of tablet technology had positive effects on early literacy specifically in the areas of print concept, alphabet knowledge and emergent writing" (p. 92). However, the majority of the preschool subjects in the Couse and Chen (2010) study attended private preschools and came from two-parent homes with average family incomes of over \$50,000. In addition, 73% of the families had computer technology in the home (p. 82). Unlike the subjects in the Couse and Chen study

(2010), this study examined a much poorer segment of the preschool population. Specifically, this study considered how tablet implementation in subsidized preschool programs can be accomplished or designed.

The research is important because developing communication, literacy, and social skills in the 21st century require students and adults to be digitally literate. For young children who are already deemed at risk, subsidized preschool programs offer an opportunity to acquire digital literacy skills that may not be available at home. Interactive media is part of the society we now live in (Geist, 2014; Hernandez, 2014; NAEYC & FRCEL, 2012), and the NAEYC and FRCEL 2012 position on technology and interactive media states that children “are growing up at ease with digital devices that are rapidly becoming the tools of the culture at home, at school, at work, and in the community” (p. 2).

If not already, tablet computers will likely be a norm for society (Geist, 2014; NAEYC & FRCEL, 2012; Parnell & Bartlett, 2012; Verenikina & Kervin, 2011). Unfortunately, their usage may not be the norm for young children growing up in poverty, as they do not have the same access to high-quality tablets or smartphones as their more affluent peers. Hence, the introduction of tablets to children in subsidized preschool programs is a crucial piece of their cognitive and social development (Beschoner & Hutchison, 2013; Neuman & Wright, 2010).

Purpose Statement

The purpose of this case study was to develop an in-depth understanding of how to design professional development that will help teachers utilize tablet technology to enhance their instructional programs for children in subsidized preschool programs. For the purposes of this study, the educational use of tablet technology is generally described as a mobile touchscreen device that is used to support cognitive and social emotional growth in a preschool classroom.

The touchscreen interface is a key component of tablet technology that will be described later in the study. Subsidized childcare programs include any preschool programs that receive federal or state funding because they service low-income families or children in protective services.

Significance of Study

The iPad is a relatively new tool to preschool instruction, and therefore, past research in this area has investigated how desktop computers have been used in classrooms (Geist, 2011). Findings generally indicate there is inadequate teacher preparation and lack of understanding around developmentally appropriate practices with technology use in early education settings (Beschoner & Hutchison, 2013; Blackwell, Lauricella, & Wartella 2014; Lentz et al., 2014). This research challenged the ideals that some hold about technology in preschool classrooms. The study was also conducted to add to the body of knowledge within the early education community so all can benefit from current research utilizing tablet technology. Additionally, the literature review and study show how current forms of tablet technology are both instructionally sound and developmentally appropriate. Finally, the use of technology in preschool classrooms is now crucial to the long-term success of preschool students and needs to become a critical component of preschool instruction. Findings of this study benefit subsidized preschool programs because teachers are better informed about what constitutes literacy in the 21st century (Lindahl & Folkesson, 2012; McManis & Gunnewig, 2012). Furthermore, the study will have impacts on how funds are appropriated and used within federally or state-subsidized preschool programs.

This study should be of interest to early education professionals, as the issue of iPad implementation in preschool classrooms will impact the instruction that takes place on a daily basis. The impact will be felt in how teachers design their lessons, arrange classroom

environments, or challenge themselves to find new ways to prepare their children for the 21st century. The iPad phenomenon and touchscreen technology has affected the way we read news, access information, and communicate with others, so teachers must understand how to leverage their use in the classroom. While there has been some qualitative inquiry, it has been concentrated to very small studies, and none have addressed how the early use of technology can specifically help preschool students in subsidized care programs.

Research Questions

In this study, the implementation of tablet technology into preschool instructional programs is viewed as a vital in ensuring children in subsidized care are developing the early literacy skills (both cognitive and social) that will be needed as they enter formal K–12 education (Arnott, 2013; Neumann & Neumann, 2014). As such, the primary research questions are: (a) How do sociocultural learning theory and developmentally appropriate practice apply to a preschooler’s use of tablet technology? (b) What do early education teachers need to understand so iPads can be successfully utilized in a preschool classroom? (c) How do early education teachers describe their experience as they implement iPads into the instructional program?

Definitions

1. *At risk* - At-risk preschool students are in danger of academic failure because they are living in poverty, homeless, or under protective services (Neuman & Kaefer; 2013; Title 5 California Code of Regulations, Funding Terms and Conditions)
2. *Developmental appropriate practice* - Developmentally appropriate teaching practices provide suitable matches between the capabilities and interests of children and the expectations of the curriculum and teaching methods (Bredekamp, 1997; Elkind, 2001).
3. *Early education* - The period between zero and eight years of age (McLean, 2013)
4. *Play-based pedagogy* - A Vygotskian approach that suggests how young children master necessary prerequisites of academic skills through engagement in mature make-believe play (Vygotsky, 1978)
5. *Preschool* - The period between three and five years old (not counting five-year-olds in kindergarten)
6. *Preschool Collaborative Classroom* - The Preschool Collaborative Classroom (PCC) program provides special education services for children three to five years of age who have been identified with one of the federal- and state-defined special education eligibilities. Children in the PCC program are served in this least restrictive environment. There are 24 children in the classroom, 16 general education students and eight children with special needs. There is a general education teacher, a special education teacher, one or two general education aides, and a special education aide. Emphasis is placed on the development of language and social-emotional, motor, and preacademic skills through activities and materials that are concrete and relevant to

- students' lives. Families and staff work together to develop an individualized education program that guides the service delivery for each child.
7. *Scaffolding* - The constructivist educational theory of instructional scaffolding, where a teacher provides support to students on an as-needed basis and decreases support as the student's competence grows, is evaluated. Scaffolding is defined as providing assistance to students when needed and fading the assistance when the competence of the student increases (Molenaar, Roda, Van Boxtel, & Slegers, 2011)
 8. *Sociocultural learning theory* - A concept that human activities take place in cultural contexts that are mediated by language and other symbol systems (Bodrova, 2008; John-Steiner & Mahn, 1996; Vygotsky, 1978). It is also a perspective that these contexts serve as the foundation for learning to occur (McLean, 2013).
 9. *Tablets* - Are light, mobile, handheld computing devices with a user interface based on a touch screen (McManis & Gunnewig, 2012; Neumann & Neumann, 2014).
 10. *Technological content knowledge* - Knowledge of the relationship between subject matter and technology, including knowledge of technology that has influenced and is used in exploring a given content discipline (Tokmak, 2013).
 11. *Technological pedagogical knowledge* - Knowledge of the influence of technology on teaching and learning as well as the affordances and constraints of technology with regard to pedagogical designs and strategies (Tokmak, 2013).
 12. *Touchscreen* - A touchscreen interface allows a child to directly manipulate a tablet by touching the screen directly instead of manipulating a cursor via a mouse (Blackwell, 2013; Geist, 2012)

13. *Zone of Proximal Development* - The distance between the actual development level, as it is determined by autonomous problem-solving, and the level of potential development as determined by the problem-solving under an adult's guidance or in collaboration with one's own more capable peers. It is the area of learning that is situated between what one can do individually, in terms on knowledge and abilities, and what one cannot do even with the help of someone. (Gestwicki, 2009; Vygotsky, 1978)

Summary

After spending a year in his preschool program, Joaquin will attend his local elementary school and compete in a culturally diverse community of learners. Many of these children have been using technology since they were two years old as a form of entertainment, but also as a learning tool (Blackwell, 2013; Blackwell et al., 2014; & Geist, 2012). Parents with higher socioeconomic status will have been buying different educational apps for their children to help them understand shapes, letters, numbers, and problem-solve. Some of these kids have even used FaceTime to communicate with their parents and friends. All of these advantages give Joaquin's more affluent peers a head start, as many of the assessments Joaquin will have to take are computerized. In addition, many of the projects and assignments he will have to do will be completed online or in learning management systems. Fortunately, Joaquin is equally capable as his peers because technology investments were made in his preschool program to ensure Joaquin would be ready for 21st century learning. The early exposure will also help give him the confidence he will need to navigate through technology issues as he progresses through his educational career. A review of the research literature explains why this fictional story is not that different from the realities that preschool children face. As shown in the literature review,

the lack of technology only widens the achievement gap for four-year-old children who are already at-risk for academic failure. However, with understanding and proper professional development for preschool teachers, this study shows what can be done to address digital achievement gaps before they begin.

CHAPTER TWO: LITERATURE REVIEW

Overview

Few studies discuss in depth the use of technology with at-risk preschool students, whereas numerous studies exist on implementing technology with elementary, secondary (Blackwell, 2013; Hargis, 2014; Hutchison & Reinking, 2011; Parette et al., 2013), and special education students (Lindahl & Folkesson, 2012; O'Malley, Lewis, & Donehower, 2013; Özgüç & Cavkaytar, 2014; Ryokai, Farzin, Kaltman, & Niemeyer, 2013). Many studies have been done on integrating technology in K–12 classrooms, but none of these studies focused on preschool students (Burnett, 2010; Edwards, 2013; Hutchison & Reinking, 2011; McManis & Gunnewig, 2012; Shifflet, Toledo, & Mattoon, 2012). Since the iPad has only existed since 2010 (Geist, 2014), it is important to understand how the touchscreen capability of tablets makes them a developmentally appropriate learning device for preschool students (Geist, 2012; Hernandez, 2014; NAEYC & FRCEL, 2012). The theoretical framework review begins with an analysis of the related literature and theories that underpin the ways preschool children develop cognitively, socially, and emotionally. The literature review will make connections between key ideas and describe the current voids that warrant further research.

The first part of the review will provide a historical overview of early education technology uses in preschool classrooms and how these perspectives have affected the belief systems of many teachers. The second part of this literature review tells us how current forms of technology are being used with young children to support new forms of learning and play that are commensurate with 21st-century learning skills. The final part of this literature review will focus on how current tablet technology could be used to reduce the digital achievement gap among low-income preschool students.

Current instructional technology through computers has been implemented in early education classrooms since the early 2000s (Alexander, Langub, & Rosen, 2014; Chen & Chang, 2006; Donohue, 2003; Gialamas & Nikolopoulou, 2010; Healy, 1998). Since then, various studies have identified some of the variables associated with the lack of technology use in early education. The lack of use has also impacted the way technology has been used to enhance student learning (Couse & Chen, 2010; Edwards, 2013; McLean, 2013; McManis & Gunnewig, 2012; NAEYC & FRCEL, 2012). There have been a few research studies and high education endeavors that have attempted to build the competence and capability of early education professionals so technology can be better integrated into preschool classrooms (Blackwell, 2013; Blackwell et al., 2014; Parette et al., 2013). These recent but narrow studies encourage further research on what needs to be done in teacher preparation programs at the university and site levels. These types of investments will prepare preschool teachers so they will understand how to integrate technology into their lessons for very young children. As discussed in the previous chapter, the focus of this study was to develop and observe ways that technology can be integrated into subsidized preschool programs to reduce digital achievement gaps for at-risk preschool populations. Multiple case studies and a variety of data collection tools were used to develop an in-depth understanding of how to design professional development that will help preschool teachers utilize tablet technology to enhance their instructional programs for children in subsidized preschool programs. To accomplish this goal, this chapter provides an overview of the literature in this area and is structured on the concepts of early childhood learning, technology integration in schools, and technology use with preschool children in subsidized care. The chapter will also include descriptions of variable levels of technology integration,

professional development, the interrelationships of adult-child interactions with technology, and the benefits of technology use.

Why Teachers Integrate Technology

In order for students to be ready for the 21st century, they must be able to thrive in a global society that is technology-driven (Arnott, 2013; Geist, 2012; Tucker, 2014). For students who are at risk because of their economic background and living conditions, they must have equal access to resources that current technology offers (Tucker, 2014). Educators have the awesome responsibility of preparing students for life outside of school. In order to do this, they need to understand how current technology is being used outside of the classroom and develop lessons that will give students the foundation they need as they leave school (Abbitt, 2011; Cheung & Slavin, 2012). Within the field of early education, research has shown there is a growing disparity between affluent children and children living in poverty with regard to access to educational applications (apps) and digital technology skills (Edwards, 2013; McLean, 2013; Verenikina & Kervin, 2011).

There have been some studies that explored technology benefits in early education classrooms (Beschoner & Hutchison, 2013; Burnett, 2010; Cheung & Slavin, 2012; Couse & Chen, 2010; & Toki & Pange, 2014), but these have been relatively small and summarily found that many teachers were not using emerging technologies in their teaching practices even though they believed there were benefits for the students (Beschoner & Hutchinson, 2013; Blackwell, 2013, Blackwell et al., 2014; Couse & Chen, 2010; Neumann & Neumann, 2014; Yilmaz & Alici, 2011). According to a research study by Szmodis and Columba (2013), 100 percent of all public schools have access to computers and the internet, but this is not the case in subsidized early education programs. Despite the creation of technology standards and emphasis on them

by the United States Department of Education and the International Society of Technology in Education (ISTE) little progress has been made in preschool classrooms (Radetic-Paic & Ruzic-Baf, 2012). Similarly, NAEYC set forth guidelines for the use of technology in early education settings in 2009 and revised them in 2012 in conjunction with FRCEL. With all of these groups looking at how educational technology could impact the way teachers teach and how students learn, it seems that early education teachers would have the impetus to change practice. However, a few research studies have identified key issues causing a lack of technology integration at the early education level (Beschoner & Hutchison, 2013; Blackwell, 2013; Hutchison & Reinking, 2011). The findings and corresponding suggestions are often discussed in more recent studies of technology integration. Common findings include a need for: (a) ongoing professional development, (b) an understanding of how to integrate technology as part of daily lessons, (c) more time to experiment with technology, and (d) the introduction of technology during preservice training or college coursework (Abbitt, 2011; Alexander et al., 2014; Blackwell, 2013; Hutchison & Reinking, 2011; Parette et al., 2013).

In particular, NAEYC and FRCEL (2012) recommended that teachers leverage new forms of interactive technology and digital literacy formats for learning and development. This revised policy statement also supported current research, which states that children benefit more from the interaction of age-appropriate apps than from older forms of technology such as DVDs and CD-based listening centers. Given that ISTE (2008) recommends that basic technology operations should be mastered by age five, early childhood education settings for low-income students should provide opportunities for equitable access to technology before the children start kindergarten. In particular, Beschoner and Hutchison (2011) found that technology use in two privately funded preschool classrooms could supplement traditional approaches to developing

early literacy skills. Their study was designed to experimentally examine how technology could enhance word knowledge and conceptual development over a seven-week period. During the first two weeks of the research period, prekindergarten children were introduced to four apps that were literacy based to determine if digital stories helped emergent print concepts, story comprehension, and verbal articulation after listening to the story. Their findings led to recommendations for further research about the use of technology in the classroom. One of the key recommendations pointed out that future research should focus on technology integration with a more diverse group of children and with more reluctant teachers. Their recommendations build a case for a larger study that would take a deeper consideration of the types of students and teachers being observed. It would also set the stage for investment into technology upgrades and teacher professional development in subsidized care early learning environments.

During the same year, Project Tomorrow (2011) and ISTE administered a survey to 35,525 K–12 teachers which found that 58% of the teachers were using technology in didactic ways either for homework or practice (Blackwell, Lauricella, and Wartella, 2011). Similarly, they found that despite increased access to mobile technology, actual use was almost nonexistent in 1,234 surveys amongst early childhood education professionals. Their findings indicated that all teachers struggle with time to learn the new technology whereas early education professionals also struggled with pedagogical and personal beliefs around technology use with preschool students. The combination of personal and pedagogical beliefs around technology was seen as a potential barrier by the researchers even though many of the preschool educators understood that technology use would be a critical component for children in the 21st century (Blackwell, Lauricella, & Wartella, 2011). There were similar findings in other studies that pedagogical beliefs and institutional practices had not changed in step with technology developments

(Burnett, 2010; Edwards, 2013; Hutchison & Reinking, 2011; & Lindahl & Folkesson; 2012). In summary, teacher preparation programs and professional development were not adapting quick enough to keep up with the growing demand for classroom technology integrations.

The researchers identified a couple key concepts that reduced pedagogical and technical barriers for teachers that included: (a) concrete examples of how instructional technology was integrated and (b) how technology use in a preschool classroom was developmentally appropriate. Tokmak's (2013) study included "heavy doses of technology-rich" courses in early education teacher preparation courses. His study included a purposive sample of 12 preschool teacher candidates who all displayed negative beliefs about preschool technology use in an open-ended survey administered prior to beginning the Technological, Pedagogical, and Content Knowledge (TPACK) class.

This qualitative single case-study design investigated how preschool teacher candidates' perceptions about technology integration changed during the technology-rich course. The research study made the aspiring preschool teachers develop their technology skills first and then apply them in actual preschool settings. By the end of the semester, researchers reported that most of the negative perceptions about technology had changed to positive (Tokmak, 2013). They discovered the relationship between technology integration and successful instructional practice was predicated upon effective modeling and intentional lesson design for preschool students.

As stated earlier, another reason that technology integration has not been largely implemented in preschool settings is related to how technology integration is used as an instructional support. Parette et al. (2013) identified operational competence as a key indicator of whether or not a preschool teacher would use instructional technology. They found,

“Practitioners must acquire both operational competence, familiarity with the basic features of a particular technology, and functional competence, the ability to use the particular technology create specific classroom activities” (p. 179). For instance, Parette et al. (2013) discussed that most early education professionals receive little or no preservice training in the implementation of instructional technology, which is a major reason why it is not evident in their classrooms. To explore this idea further, the researchers created eight technology user group sessions and participants were provided with \$250 stipends if they attended six out of eight two-hour sessions. The questions that were developed for the study were designed to determine the degree to which teachers were using the technologies that had been provided to them. In this case, the eight participants that were chosen were not using any of the technology that was provided to them. During each of the sessions, technology toolkits were reviewed, and the teachers had opportunities to discuss how easily the technologies could be incorporated into their lessons with their existing curriculum. At the end of the study, seven of the eight participants reported that they had developed instructional presentations and visual schedules and incorporated the technology into classroom activities (Parette et al., 2013). The researchers concluded that “user group sessions were effective because they allowed time to practice newly acquired skills, facilitated collaboration amongst professionals, and allowed for support in natural educational settings” (p. 176). Their findings concluded that when early educational professionals understand the pedagogy around investments of instructional technology and how to employ them, they are more likely to use them in their classrooms.

In addition to understanding how technology supports early education instruction, the research has also centered on the various forms technology in classrooms and early education teachers’ attitudes toward their use. In preschool settings, technology may be considered the use

of a CD player, a digital camera, or an electronic cash register (Geist, 2012; Parette et al., 2013). For the purposes of this review, technology is identified as the use of a computer in the form of a desktop, laptop, or touchscreen device. Yilmaz and Alici (2011) administered two surveys of technology use to 215 freshman and senior early childhood teacher candidates in Ankara from two different universities. The first instrument was the “Demographical Questionnaire” and the second was the “Scale of Attitude towards Computer Based Education.” One of the key purposes of the study was to determine the status of preservice early childhood education teachers’ attitudes toward using computer-based education. Their preliminary report provided data that indicated the number of years in the program and prior experiences working in a preschool made a significant difference in a teacher’s attitude towards computer-based education. Another key finding in the study was the existence of a lack of effective instructional technology courses at the university level. Participants also shared that all early education teachers should be trained on how they could use computers and computer-based applications in the learning environment.

Even though there have been recent insertions of technology into the instructional process, the majority of research findings indicate that technology use remains uneven across preschool settings. As a result, early education teachers may not understand how to integrate technology effectively in their instructional programs. The reasons seem consistent from one study to the next, which has implications for the kind of technology opportunities that preschool children in subsidized care may be receiving. While preschoolers and early education professionals are expected to use technology more effectively, there is a lack of both the technology itself and the ability to meet students’ needs. Furthermore, computers, tablets, and

applications all cost money, and subsidized care programs often lack the funding to make these a reality for those that attend or work in these facilities (O'Donnell, 2016).

Early education professionals have also identified the need for preschool students with low-income backgrounds to use technology effectively so they will not be behind their more affluent and English-speaking peers (Blackwell et al., 2014; Cheung & Slavin, 2012; Geist, 2012). To facilitate the development of these technology skills, early childhood educators need to create developmentally appropriate activities so very young children from at-risk backgrounds can develop the technology skills that will serve as a digital foundation for subsequent teachers to build upon. Intentional activities and interactions around technology that allow young children to experience success help them build the confidence they need to access technology and various computer applications. Through the thoughtful integration of multiple technologies, children in subsidized care programs can find success similar to what their affluent peers have found as shown by other preschool research studies (Arnott, 2013; Couse & Chen, 2010; Verenikina & Kervin, 2011; Wu et al., 2014).

Many small studies yielded benefits for preschool students who used various forms of instructional technology. Although the researchers did not generalize the findings, each described key elements that warranted further study to ensure the effective use of technology. Couse and Chen (2010) conducted a study that was on the cutting edge of tablet technology, as their research included a first-generation tablet that required the use of a stylus. This made fine motor movement difficult for some of the children, but they found that the children adapted quickly to the new writing medium. In that same year, Apple would introduce the iPad, which was touchscreen activated with just a finger (Geist, 2011). Using a mixed-method approach, the researchers were able to gain a deeper understanding of the children and teachers who used the

devices in a preschool setting. One of the ideas that guided their work involved the quality of drawings and journal entries using a stylus-interfaced device instead of the traditional crayons and paper. The study was done in four phases, but it was the second phase that revealed a great deal of information to the researchers because it involved the training for teachers and students. The teachers were trained over a period of one week, and two weeks were set aside to teach the children how to use the devices. What the researchers found was that the children were ready to use the device after one 20-minute session! Couse and Chen's analysis of the data led to the conclusion that the children see the devices much differently than do adults even though only 13% of them had ever used a touchscreen. A simple toolkit that supported the teachers through planning and use also made them feel more at ease when they introduced the devices to the students. By the end of the study, 98% of the children had reached the highest level of use, and "20% of the children were providing drawings that were above expectations for what they usually produced in the classroom with traditional drawing tools" (Couse & Chen, p. 90). Couse and Chen noted the because of the small sample of students from a universitybased child development center.

Theoretical Framework

Case study research is dependent on a variety of data collection methods therefore this study is framed around various philosophical assumptions that use qualitative data collection methods. To begin with, the study of iPads is based upon the ontological assumption that multiple realities exist (Creswell, 2013) and "evidence of multiple realities includes the use of multiple forms of evidence in themes using the actual words of different individuals and presenting different perspectives" (p. 20). The epistemological and methodological beliefs will

be addressed through the collection of real data from the observations done in early education centers, interviews with teachers, and focus groups with the participants.

Philosophical Assumptions and worldview

The study's epistemological assumption also means that the researcher is deeply vested in the study. According to Creswell (2013), "It becomes important, then, to conduct studies in the field, where the participants live and work" (p. 20). Due to the nature of the case, the study will place the researcher in a position as an observer amongst the participants while data were being collected. The theories that are best applied to this study are sociocultural learning theory (Vygotsky, 1978) and post-positivism theory. These constructs allow for logical sequenced events to be examined from multiple perspectives (Creswell, 2013). It is also important to understand Piaget's perspectives around preschool instruction. Piagetian thought has affected all of early education, and it is important to understand how his perspectives have influenced research, theory, and policy. Identifying key components of the perspectives establishes the learning foundations that can be applied to technology integration in early education environments. Piaget's child-centered approach has been the most widely accepted theory in the field of early childhood education (Mahoney, 2013). Within this approach, early education environments are viewed as safe places for emotional, cognitive, physical, and social emotional growth. Early education professionals who believe in the child-centered approach employ strategies that are often characterized by exploration and play (Mahoney, 2013). Developmentally appropriate practice is another useful theory because it is founded on a set of 12 practices that utilize child-centered approaches to teaching and learning (NAEYC, 2009; Wilson, 2012).

Child-Centered Models

In addressing what is the ideal education practice for young children, early researchers such as Rousseau (1762), Pestalozzi (Rusk & Scotland, 1979), and Wilson (2012) believed that a child learns best in a natural environment. With this in mind, Pestalozzi (as cited in Rusk & Scotland, 1979) deemed teachers to be critical components to this learning as they create learning conditions that foster a child's investigative nature. In a similar fashion, Friedrich Froebel felt that children learn best when engaged in playful environments (1974). This learning also requires teacher guidance and the use of curriculum that involves sensory experiences for children. For example, children were allowed to touch, smell, and manipulate objects in playful manners that helped foster their learning. By embedding sensory experiences, children could learn to discuss shapes, quantify objects, and discuss their findings. Froebel was also the first person to use the term *kindergarten* which translates as to "children's garden" (Froebel, 1974). Froebel suggested, "Play is the highest phase of child development - of human development at this period; for it is a self-active representation of the inner representation of the inner from inner necessity and impulse" (as cited in Russell & Aldridge, 2009).

John Dewey (2009) later capitalized on the idea of child interest by developing the concept of a child-centered curriculum. His curriculum was designed around the interests of children with an intentional focus on the environment. Dewey believed in pragmatic ideas that would create environments intentionally designed by the teacher that would lead to unconscious learning by the child: "We never educate directly, but indirectly by means of the environment" (Dewey, 2009). His findings concur with those of Froebel (1974), who agreed that children learn best when they are engaged through play. Adults were critical in the use of calling his indirect method of teaching a curriculum.

However, Dewey strongly believed that learning for very young children was maximized in an intentionally designed environment filled with involved adults. Dewey promoted classrooms that often had different content areas that were known as centers (Dodd-Nufrio, 2011). In Dewey's model, skills were not directly taught, nor was their achievement seen as the end product. Centers were often based on themes that were interesting to children, and the manipulatives in the center reflected the theme. For example, a table may have objects for counting such as beads, acorns, or colorful tiles. As children played with these objects, they interacted with adults who helped the children develop early math skills such as counting, classifying, or sorting. Classrooms organized around Deweyian philosophy lacked formal instruction but were rich with materials that allowed children to explore their interests and learn through intentional interactions with adults (Dodd-Nufrio, 2011).

Ideally, learning manipulatives in the art, science, and language arts areas would also be included in the classrooms as part of an interdisciplinary process that involved exchanges or transactions between the children and their environment (Dewey & Bentley, 1949). In this type of approach, young children's different encounters with nature are therefore understood as transactional experiences. Dewey compared a preschooler's interactions with a puddle of water, in which both the water and the child both undergo a change. In his analogy, as a child plays with the water he learns the concept of cause and effect while learning that his actions caused a change to the water. Similarly, this study will take Dewey's transactional perspective and intentional learning environment concept to develop an understanding of how tablet technology can be integrated into student learning. Dewey and these other early researchers influenced what current early education programs look like.

Skill-Based Models

On the other end of the early education development spectrum is the idea that children should be taught academic skills as they prepare for more formal schooling like kindergarten. A skills-based approach refers to the direct and intentional teaching of subject content material. In skills-based classrooms, teachers lead the children in a more structured way, planning the activities, then guiding the children in doing them. This design is aimed at preparing kids for the kindergarten setting. For the most part, classroom time is devoted to learning letters and sounds, distinguishing shapes and colors, telling time, and other skills (Hamre et al., 2012).

Proponents of this approach view preschool as the optimal period of time for children to learn these academic skills because learning them increases opportunities for achievement in the future (Barnett, 1998; Hart & Risley, 1999). Proponents of the child-centered model have difficulty embracing the skills-based approach with preschoolers. They view explicit teaching of skills in the early years as a forcing of kindergarten skills upon children who are not socially ready for them. On the other hand, those who embrace the skills-based model often view childcentered approaches as wasting precious time for learning.

The concept of a skills-based model of instruction in early education is very difficult for educators who believe in Froebel, Dewey, or Piaget. The two models are very different from one another and approach instruction from two completely different and opposite perspectives. The most extreme example of this can be seen in the two approaches to literacy instruction. In the child-centered model, Pestalozzi and Froebel (Froebel, 1974; Rusk & Scotland, 1979) exposed children to literacy through reading stories, role plays, discussions, and songs because those were activities that children enjoyed. Hence, early childhood advocates did not encourage formal reading instruction until the child was ready to read. Instead, they taught children to appreciate

reading and would begin teaching them as the child showed interest in learning to read.

However, early civil rights movements led a push to make children read earlier, which was in direct contrast to child-centered approaches to early literacy (Dowd, 2005).

Publishers capitalized on the idea of a skill-based theory of reading readiness and began creating materials that would make children ready to read. These lessons were often built around auditory and visual discrimination such as directly instruction on sound-symbol relationships and letter recognition (Morrow & Dougherty, 2011). The lessons often included writing and copying letters in lieu of fine motor activities, and teachers became focused on skill mastery at the expense of student interaction. According to Morrow and Dougherty (2011), “Instead of waiting for a child’s natural maturation to unfold, educators focused on nurturing that maturation through instruction with a set of skills identifies as prerequisites for reading” (p. 7). In Deweyian philosophy, this type of literacy approach was not child-centered and was therefore unwelcomed.

For the purposes of this study, the research about technology integration will be a combination of child-centered approaches and skills-based instruction. Since child-centered approaches are guided by the belief that young children acquire knowledge by interacting with the environment around them, it is important that the participants understand that technology is part of the environment that children will grow up in. Likewise, the use of technology does require some basic skills, and preschool educators need to understand how to use the devices so they can model their use within a child-centered environment. Ultimately, a child will be able to develop their technology aptitudes as the adult models engagement in well-designed settings. Within the classroom setting, teachers would develop learning opportunities for children in very natural settings. This is very similar to what Pestalozzi or Froebel would have created in their classrooms if technology was available during their era.

Piagetian centers had intentional learning components such as language development, classification, seriation, and representation (Morrow & Dougherty, 2011), and similarly, I propose tablet devices would also help preschool age children develop problem-solving strategies related to technology use. Since successful technology integration in early education classrooms is not an area that has been deeply explored, there is very little research on adult-child interactions around the use of a tablet device, nor is there a great deal of research around how tablets are utilized in preschool activity centers.

Although technology integration was not a concern for educator Maria Montessori (1965), her method offers insight into how technology could be successfully integrated into subsidized preschool programs. While she was not a skills-based proponent, Montessori believed that “children needed early, orderly, systematic training in mastering one skill after another” (p. 8). Montessori was a strong believer that well-designed learning areas allowed children to acquire concepts quickly. The systematic changing of learning areas was a critical component of Montessori’s philosophy, so that children were challenged to learn new concepts in math, literacy, or science. In the case of tablet integration there needs to be some systematic training just given the cost of the devices. In addition, there needs to be adult supervision to ensure that the devices are being used safely. In Montessorian philosophy, the environment is supplied with materials and equipment that allow specific learning objectives to be met (Dodd-Nufrio, 2011). Teachers model the use of materials and children unknowingly accomplish goals under the guidance of carefully planned lessons with corresponding manipulatives. There is little unstructured play in the Montessori system but children find the tasks engaging and playful because of the manipulatives and adult interactions. Similarly, the tasks and applications (apps) that will be displayed on the tablets need to be well-thought out by the teacher so they are also

playful and engaging. Well-planned instruction using a tablet will give children enjoyable opportunities to self-correct and enhance their own knowledge.

Noting the struggles with technology integration in the formal grades (Chou, 2013) an approach to integrating technology into subsidized early education programs that requires an understanding of both child-centered and skills-based approaches. Similar to the developmentally appropriate practices used by teachers when they create activity areas, these practices can also be applied to the use of technology integration. The role of adult-child interaction remains a key component to successful technology integration (Plowman, Stevenson, Stephen, & McPake, 2012).

Integration should be well considered and built into a classroom environment. Using a tablet as an electronic worksheet would not be an activity that is educationally sound nor developmentally appropriate. Remembering the teachings of Vygotsky (1978) and Piaget (1951) that children learn when they are engaged with peers and adults will also help remind preschool educators that the use of technology cannot be a passive activity. As part of this study, it will also be important to understand that some preschool educators may be also digitally illiterate. According to NAEYC (2012), understanding the digital literacy levels of preschool teachers is important as it can affect how the tablets are integrated into the classroom.

Finally, as an educator that feels technology is integral to helping students rise out of poverty, I understand that my axiological assumptions have personal biases that may influence my analysis of the data. Bracketing, peer reviews, and member checks will be used to diminish potential bias as well as reduce actual bias (Creswell, p. 83).

Related Literature

Only a few studies touch upon how touchscreen technology is used with at-risk elementary students and there are no existing studies on how it is used with at-risk preschool students. Fortunately, there are both quantitative and qualitative research studies on how K-12 education has attempted to use technology as an intervention tool in both general and special education settings (Blackwell, 2013; Hargis, 2014; Hutchison & Reinking, 2011; Lindahl & Folkesson, 2012; O'Malley et al., 2013; Özgüç & Cavkaytar, 2014; Parette et al., 2013; Ryokai et al., 2013). These studies helped my research because they gave examples of what unsuccessful attempts at integration look like and strategies to ensure that they are not repeated with early education technology integration. The literature review focuses on the gaps in current research and information from other studies that helped inform my study. It is also important to understand how advancements in tablet technology like touchscreen interfaces make them a much more viable option as a learning tool than previous forms of technology like desktop computers, DVDs, or listening centers (Geist, 2012; Hernandez, 2014; NAEYC & FRCEL, 2012). However, to better understand why tablets have the potential to greatly improve instruction in preschool classrooms, this literature review has been divided by various learning theories.

Vygotsky's Sociocultural Learning Theory

Sociocultural learning theory has been the foundation for many of the early education professionals since Vygotsky first published the theory in 1978. The theory posits that people learn through their interactions with one another. This is especially true for young children. A key concept of Vygotsky's (1978) theory is the zone of proximal development. The theory is best summarized as "the ability of what a student is able to accomplish without assistance, and

what the child can do with assistance” (Vygotsky, p. 33). In the case of young learners, dependence begins with reliance on their caregivers. The child is dependent on the experiences of older adults who can bridge and scaffold a child’s learning to a more challenging skills or concept. This principle describes a process of social interaction whereby in the beginning of an activity, the learners depend on others with more experience. As time progresses, the young child takes more responsibility for their own learning and participation without the assistance of an adult (John-Steiner & Mahn, 1996; Vygotsky, 1978). The facilitated interaction by an adult that takes place between preschoolers as they play with one another or interact with adults helps them learn new habits and skills. For example, when a young child is first learning to build sand castles in the sand box, an adult can model the use of wet sand to build a structure. Then, the adult interacts with the child through play in a way that she now learns to independently construct her own sandcastles. Vygotskian approaches provide adult child interactions in preschool that are prerequisites for cognitive, social, and collaborative growth that are foundational for all learning. In addition, these skills are uniquely suited for preschool learning environments where children learn through play. Vygotsky (1978) describes the zone of proximal development (ZPD) for children as, “The functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow” (p. 33). Vygotsky’s theory was a pivotal turning point for psychologists and educators as it gave them a tool to help understand the complex development of young children. Understanding the interaction and the role an adult plays is important because it is this same type of interaction that takes place as children learn to use technology. The ability for children to learn how to use technology in meaningful ways means that adults also have to understand how to use it.

Since early school experiences shape a child's behavior, it is vital that positive interactions lead to learning and prosocial developmental outcomes (Bulotsky-Shearer & Fernandez, Dominguez, & Rouse, 2011). Vygotsky realized how positive interactions worked in concert with a child's future development, so he promoted high-quality preschool and believed that culture defined a child's whole course of development (Bodrova, 2008). High-quality preschool programs are often identified by an examination of two areas. The first dimension of quality is usually based on the instructional nature of the program. The interactions, activities, materials, learning opportunities, and health and safety routines are observed and rated as a measure of process quality. The second dimension is based on the operational qualities of the programs. Indicators within this dimension often include adult-child ratios, educational levels of the staff, and management of student files (Espinosa, 2002; Ikegami & Rivalland, 2016; La Paro et al., 2012).

Vygotsky's (1978) sociocultural learning theory operates under several assumptions that are critical for understanding young children: (a) children's learning begins long before they start school, (b) children create meaning about their community while interacting with adults, (c) instruction should be matched with the child's developmental level after their actual level is determined, and (d) intentional teaching requires an understanding of a child's actual developmental level and their level of potential development. Preschool teachers and district administrators must learn to recognize the ever-changing influences of a child's environment and how they affect the overall development of a child. Then, they must design programs to address the individual needs of the child in a contemporary cultural setting.

Policy makers, school boards, districts, and schools must encourage high-quality preschool programs that recognize the cultural context in which students live. As society is

changing, students are being exposed to new forms of literacy. Essentially, literacy can no longer be described as the ability to read and write. Literacy in the 21st century requires students to be able to communicate in ways that previous generations have not faced (Lindahl & Folkesson, 2012). Subsidized preschool programs should layer sociocultural learning theory with meaningful learning experiences to maximize student learning. When doing this, early education teachers also need to create learning opportunities so preschool students can be challenged within their zones of proximal development.

In summary, the sociocultural learning theory acknowledges the interactions that influence early childhood development. The theory assumes young children start learning through interactions with adults even before their formal education begins (Lindahl & Folkesson, 2012; Vygotsky, 1978). Therefore, this research investigated early childhood preschool environments as a framework for the acquisition of digital literacy skills based upon a teacher's ability to understand a child's current level of technology development and challenge them at appropriate levels such that a child reaches his or her potential.

Edwards's Digitization and the Dematerialization of Consumption Theory

Edwards's (2013) digitization and the dematerialization of consumption (DDC) theory is based upon Vygotsky's work. According to Edwards (2013), in "Vygotsky's theory, the development of human personality takes place during its upbringing and teaching, and has a specifically historical character, content, and form; therefore, in different historical eras, we see different types of individual psychological development" (p. 202). Building from the idea that development may change based on the time period the child lives in, Edwards (2013) took an in-depth look at how digital technology affects the way children play. Her seminal work centers on equality of access to digital play, comparisons of how children played during different time

periods, and how digital consumption changes the contexts for how children play. According to Edwards (2013), “The evolution of solid state physics and the availability of digital technology necessitated new forms of development and hence newly emerging types of play” (p. 206). As an example, Edwards (2013) described how a *Toy Story* application on a tablet illustrates how consumption and play now go hand in hand:

From the perspective of the sociology of consumption, an important aspect of the DDC focuses on the difficulties associated with separating children’s technology from the dialectically related elements of consumption. It is increasingly difficult to separate children’s technology use from the elements of consumption because the technology enables the consumption (i.e. of the *Toy Story* game) whilst consumption promotes the use of technologies like watching the *Toy Story* movie necessitates the use of a DVD. (p. 206)

Edward’s DDC theory is an important piece of research because it looks specifically at the ties between play, digital consumption and learning, in addition to how each of these ideas is being used in daily life. Edwards argued that digital play needs to be understood in the context of how children use technology to engage with their peers or form relationships (p. 203). However, Fler (2011) described how play and technology are often separated within early education. He argued, “The historical position of play in early childhood education is one of the reasons why play is most often described as a basis for learning, and yet continues to be separated from digital technologies” (p. 18). His description captures the idea that technology is often viewed as a way of skill acquisition and not part of a play-based approach.

Subsequent research by Edwards (2014) further emphasized that play-based learning should not be separated from technology use. Her argument for the concept of digital play

includes the arguments that stem from Vygotsky's (1978) sociocultural learning theory and her early works on DDC theory (Edwards, 2013). The concept of sociocultural learning theory stems from the interconnectedness between cultural practices found within particular time periods. As a community develops within an era, so do the cultural practices of that specific time period. Edwards (2014) suggested, "As cultures and communities develop over time they carry with them the practices, knowledge and technologies that come to characterize that time" (p. 220). She posited, "This convergence of technologies, media, and popular culture represents a new emerging historical era as a context for understanding children's development" (p. 221). The combination of technology, play, and culture are creating a unique type of social interaction and play that has not been seen before. The use of tablet technology in schools and among very young children is an area that needs to be further explored within the context of digital consumption use and play-based learning theories.

From a sociocultural learning perspective, the opportunities for very young children to interact with adults gives children an opportunity to practice social skills that will later help them interact with others successfully. Edwards (2014) found that this type of adult interaction is changing because of the role technology plays. She stated, "Traditionally, children have connected with reality through imagination such that their play has been characterized by activity which involves the assumption and maintenance of adult roles and interaction, including the different rules associated with these interactions" (2014, p. 223). She believes that the way children play is rapidly changing because the types of interactions with adults is also changing due to the important cultural role that technology now plays. In one instance she found that children interacted with one another via online characters while changing costumes or environments. She cited Marsh's (2010) work, which researched virtual play amongst older

children as they engaged one another in virtual worlds that are created through internet gaming. While this type of interaction is becoming commonplace in teen culture, she expressed concern that digitization and consumerism will affect how games will be targeted toward very young children, who will be seen as a “(1) a primary market, (2) a secondary market, influencing parental spending, and (3) a future market for, representing potential adult consumers” (Edwards, 2014, p. 224). Given the interconnectedness between technology and play found in children, she is wary that there is a potential for children to lose the problemsolving and meaningmaking that is found when play is real and not virtual.

Edwards (2014) theories highlight the dangers of consumerism and how it affects play but she also brings forth a concept that involves a new form of play for very young children. She suggests that these new forms of play also create opportunities for early education professionals to engage students. She states, “A contextual orientation towards the problem of digital play in the early years might better support teachers to effectively engage children in the range of critical thinking skills that are associated with the ‘new learning’ and ‘new literacies’ movements” (p. 199). Her theory is also applicable to early education professionals because they can build early digital problemsolving skills with their students so they will have them as they enter their formal years of education.

Related Research: iPad Implementation and use into Preschool Programs

In the previous studies and theories, Vygotsky (1978) laid the foundation for learning through his work on sociocultural learning theory (SLT) and how children learn through interactions with their adults and surroundings through a concept he called the zone of proximal development (Vygotsky, 1978). In the current research by Edward’s (2013), she raises questions about how children will learn given that virtual environments create new forms of play with different types of interactions. While these studies provide a great deal of background for older

students, they are also relevant to this research because Edwards's theories are being "played out in real time" (p. 220) in subsidized preschool programs across the nation.

Leaders within the early education profession have the opportunity to advocate on behalf of children in subsidized care programs. Their advocacy can be directed so children in subsidized care programs gain access to current forms of technology and interactive tools at school. Unlike their more affluent peers who have exposure to these early media experiences, low-income students need opportunities provided in school so they can develop the technology skills and digital literacy skills prior to them entering kindergarten. Several studies have shown that preschoolers from disadvantaged backgrounds may have little or no access to the latest technologies in their home or neighborhoods (Common Sense Media Research Study, 2013; Vigdor, Ladd, & Martinez, 2014). These preschoolers need technological experiences that help them develop the early skills connected with digital readiness. The International Society for Technology in Education (ISTE, 2008) recommends that all five-year-old children have basic skills in technology operations and concepts, but those who are poor have a disadvantage in this area.

When properly equipped, subsidized preschool settings can give students digital opportunities to use tablets to connect to the internet, practice academic skills, create movies, take pictures, and listen to audio files. Each of these experiences gives low-income children technology and accompanying technology problem-solving experiences that they may not have access to in their home environments. Early educators should skillfully combine developmentally appropriate practices, intentional adult-child interactions, and thoughtful creative lessons that allow children to develop the concepts and skills they will need. Through the use of technology, preschool teachers can narrow the digital achievement gap between low-

income children and their wealthier counterparts (Common Sense Media, 2013; NAEYC & FRCEL, 2012; Vigdor et al., 2014). Unfortunately, some early educational professions face the same challenges as their students because so little has been done to ensure that they are digitally literate (Lindahl & Folkesson, 2012; Parette, et al., 2013). Research and awareness of the value of technology tools and interactive media in early childhood education need to be shared with policy makers who are interested in issues of access and equity for children, parents, families, and teachers. This presents challenges, as preschool teachers and administrators are expected to make informed decisions about how technology and interactive media are being used to support the development of the whole child.

Developmentally Appropriate Practice

As exposure to tablets has increased for the general public, tablets are also quickly finding their ways into the hands of very young children because of their touch capability. Unlike older forms of technology that were often cumbersome and developmentally inappropriate for preschoolers, tablets interface very well with young children because they are touch-activated. For example, older computer technology required the use of a mouse and a keyboard and did not allow for a great deal of independent choice once the child sat down in front of it. Its wieldy hardware and requirements for fine motor skills for the mouse and letter recognition for the keyboard often limited access to older students. Geist (2012) wrote that the use of a computer or laptop “requires a certain level of physical and motor development” (p. 26). Current developments in technology have made tablets such as the iPad and Samsung Galaxy Tab easy for young children to use because they are touch activated and controlled. Since tablets utilize touch technology, they are well suited for use with preschool children because they have a natural desire to touch things (Geist, 2014; Hernandez, 2014; Neumann & Neumann, 2014). In

addition, an app is touch activated so young children do not have to maneuver a mouse, select the proper clicking mechanism, or use a keyboard. The use of a keyboard-based device also requires “a level of cognitive development so a child could understand the symbols of the keyboard” (Geist, 2014, p. 58), which most preschoolers do not possess. The statement by Geist (2014) illustrates the difficulty for many children, as they would first need to match symbols (letters or numbers) if they are to perform a computer-based activity (Geist, 2012). On the other hand, an app is identified via an icon (picture) and activated by a touch, thus eliminating the difficulties a desktop computer presented.

Newer forms of technology like tablets present enormous learning opportunities for students because they are portable, lightweight, and easy to manipulate. With easy navigational features like a “home key,” preschool students can also develop independent choice with proper supervision. Other features that make tablets a better instructional tool than traditional computers are their built-in cameras, wireless connectivity, and opportunities for instructional support. Tablets offer another effective instructional tool that can be used to promote independent learning. As a result, early childhood education professionals should be looking for instructional apps that will promote cognitive and social growth in their classrooms via their use.

Integrating technology into K–12 education has been a subject of many studies in the past, and early education is no different (Edwards, 2013; Hutchison & Reinking, 2011; McManis & Gunnewig, 2012; Shifflet et al., 2012). For many years, the cumbersome nature of computers was cited as a reason technology was not being used, but tablet technology eliminates this excuse. The nation’s largest recognized early education organization, NAEYC, published a position statement about technology in 2012. In concert with FRCEL, they stated,

When the integration of technology and interactive media in early childhood programs is built upon solid developmental foundations, and early childhood professionals are aware of both the challenges and the opportunities, educators are positioned to improve program quality by intentionally leveraging the potential of technology and media for the benefit of every child. (NAEYC & FRCEL, 2012, p. 1)

NAEYC's (2012) statement with FRCEL clearly points out that the early childhood professionals can improve, not just sustain, program quality when they integrate technology appropriately.

Despite the benefits of tablet use, they are rarely observed in early education classrooms because of teachers' personal attitudes that often affect their implementation. Researchers have found teacher pedagogy and personal discomfort with technology integration into their classrooms as key reasons for their poor implementation (Hutchison & Reinking, 2011; Lindahl & Folkesson, 2012; Yilmaz & Alici, 2011). Blackwell et al.'s (2014) study looked at school resistance to implement technology in early education programs and found teacher attitudes were at the core of the resistance. Even though a large percentage of the study highlighted the rapid growth of tablet technology and its benefits to young children, they concluded that previously held belief systems affected teachers' current positions on tablet use.

As stated earlier, pedagogy on the use of technology in preschool settings vary from teacher to teacher, with the biggest difference concerning how the idea of play is involved. Edwards's (2013) study on play in the early years identifies how technology integration and play-based pedagogies often seem at odds with one another. As described earlier, her DDC theory is designed as a way to bridge the gap between play as a basis for pedagogy and the contextual use of technologies and digital media in the early years. Edwards (2013) believes that play has evolved as a result of the way children interact with digital media. Unlike television,

children interact with one another and negotiate learning activities on devices such as an iPad. Edwards states, “A child playing with an avatar is likely to have a fairly sophisticated grasp of how to separate meaning from object because she needs to know that ‘symbolically’ she herself is represented on the screen by the digital image” (2013, p. 203). While interacting with a computer-made character may not seem like a traditional form of play-based learning, Edwards believes it qualifies as play because the child is fostering language, motor skill development, and cognitive understanding.

Verenikina and Kervin (2011) found similar results as preschoolers used iPads in digital forms of play. The study was conducted with three families and their three children, who lived in close proximity to the researcher. All of the children had access to family-owned iPads, and all of the households had wireless internet connectivity. Each family was framed as part of a multiple case study, and the three children were of preschool age. The researchers found that the children used iPads and other portable devices to play educational games and watch short videos while their parent(s) interacted with them. Their findings captured some positive experiences that showcased the potential for imaginative play with the iPad, as 79.5% of the apps are educationally based but appear in game-type formats (Verenikina & Kervin, 2011). Verenikina and Kervin’s (2011) study defined play as “an essential and integral part of all children’s healthy growth, development and learning which has the potential to advance children’s cognitive and socio-emotional development” (p. 6). Similar to other early childhood theorists like Piaget (1951) and Vygotsky (1978), they described play as being spontaneous and self-initiated. They collected data through observation, semistructured interviews with the parents, and videotaping the children using selected software.

While all the parents limited their child's screen time on the electronic devices, they all observed their children extending the play after the devices were put away. Each of the children acted out or imagined themselves as characters from the games. These included acting like Buzz Lightyear or imitating counting activities from educational apps. One of the apps, Puppet Pals, was not considered an educational app but was one of the most developmentally appropriate because it built on the natural interactions that took place between the child and the parent. It allowed the child and parent to engage in a make-believe play as they each chose a puppet. In addition, the app allowed for features such as voice recording, choice of characters, and recording personalized make-believe stories. Similar to earlier findings amongst early education teachers, parents needed to have the capability to use the app efficiently and explain how to use it to their child.

For implementation to be effective, the importance of improved teacher understanding about current forms of technology has also been a reoccurring theme in research (Couse & Chen, 2010; Guo, Sawyer, Justice, & Kaderavek, 2013; NAEYC & FRCEL, 2012; Parette et al., 2013). Fortunately, there have been a couple of studies that revealed how an iPad can be a beneficial tool for both adults and young children. When teachers understood how to use tablets to benefit their students, the tablets quickly became an integral part of their instructional program (Couse & Chen, 2010; O'Malley et al., 2013; Parnell & Bartlett, 2012).

Benefits and the Early Development of Digital Literacy

Another theme that arose from the review of existing literature was how the use of tablet technology helps young children develop early social, literacy, and technical skills. As society is changing, students are being exposed to new forms of literacy. As mentioned earlier, literacy can no longer be defined as being able to read and write. Lindahl and Folkesson (2012) argue

that children must also have a basic understanding of technology and how to use it to be considered a “literate” person in the 21st century.

In the Couse and Chen (2010) study, the researchers used a mixed-method study (both qualitative and quantitative) to determine if children, after a three-month period of using literacy games, had developed more literacy skills than children that did not use a tablet. Their study found that “four and 5-year old children increased their ability to recognize letters and sounds” (p. 93), but they also noted that teachers reported that children drew themselves more accurately and developed resiliency strategies as they found self-correction easier on a tablet than with regular paper.

In addition to the cognitive benefits that Couse and Chen (2010) found, Arnott (2013) identified social benefits as children interacted with technology devices. Arnott’s article describes the formation of three- to five-year-old children’s interactions when technology devices were introduced. She examined the use of 24 different types of technology over a nine-month period using systematic and used observations, cluster mapping, interviews, and researcher-led activities with children to collect data. Her findings revealed that preschoolers often interact differently and take on different status roles to gain control and influence over technologies and their peers. She noted that the interactions changed as some children were able to quickly learn how to use various pieces of technology. Some of the social status roles that Arnott identified were leader, interacting members, and non-interacting members. Within the leader role, for example, she noted that there were two types of leaders, one that was dominant and one that was more diplomatic. In the case of the dominant leader, she found that the child would display characteristics similar to a bully. On the other hand, some leaders were very diplomatic and ushered in concepts like sharing and taking turns. Arnott believes her findings

demonstrate a new complex social structure that occurred as children interacted around technology.

Arnott's findings also concur with Edwards's (2014) findings that technology introduction among older children does create a new type of play. Arnott's finding may also help early education professionals explore the possibility that this may also occur as very young children interact around technology. Arnott (2013) wrote,

It is useful to begin to understand the factors that contribute to children's social interactions around technologies because it helps establish how to best integrate technologies into educational institutions in order to maximize their contributions to children's social development. (p. 211)

Given the deep interconnectedness between play and learning, Arnott's research could provide insight as early educators navigate the space between traditional forms of play and digital forms of play.

Summary

While there is a great deal of research around technology integration in K–12 settings, there is very little research done in early education settings. In addition, there seems to be a lack of effort to understand why early education professionals are not taking a more active approach to enhance their classrooms with current forms of technology. The digitization and the dematerialization of consumption theory provides a unique perspective into how “digital play” is a completely new form of play that did not exist until recent times (Edwards, 2013). While Arnott (2013) did not refer to the interactions amongst children as “play,” she did observe how children created status roles as they interacted around pieces of technology.

Reviews of recent research also revealed that professional development programs have not been designed to impact how technology is being implemented in the early education setting. The varying levels of integration can be attributed to the lack of preservice preparation programs in university coursework and pedagogical misunderstandings about how technology is used in the preschool classroom. Outcomes of these studies on technology use provide evidence that there is a great need for further research to understand how the benefits of technology use can be brought to children in subsidized care programs. The research that has been done, combined with the many theories about how young children learn, demonstrates the ongoing need for additional research to determine how early education professionals can enhance technology use. Furthermore, it is highly important that any use be aligned with developmentally appropriate practices and strong adult-child interactions.

Choosing an appropriate research method to determine an effective format for professional development may be a challenge when early educational professionals do not have a clear understanding of why technology integration in preschool settings is important. The studies included in this literature review and the theories about child development form the basis for explaining how various learning theories can apply to a preschooler's use of tablet technology. The theories and current research about the technology integration training that early education teachers currently receive guided this study as I sought to understand the experiences of preschool teachers as they implement iPads into their instructional programs.

CHAPTER THREE: METHODOLOGY

Overview

There are many qualitative designs that have been used to study tablet technology and how it benefits young children (McManis & Gunnewig, 2012; Neumann & Neumann, 2014; Samuels, 2013; Verenikina & Kervin, 2011). Some studies employed a mixed-methods approach (Couse & Chen, 2010; Neuman & Wright, 2010), while other studies utilized an independent case-study approach with special education teachers (Özgüç & Cavkaytar, 2014). Despite the number of different studies, there have been no studies that utilized a collective case-study approach.

Design

A qualitative collective case study (multiple-case) approach was used because it allows for different perspectives on a single issue and cross-case analysis when there are multiple cases involved in the study (Creswell, 2013; Yin, 2009). Creswell (2013) described a case study approach as an “in-depth understanding of a single case to explore an issue or problem using the case as specific illustration” (p. 97). The inquiry into the tablet implementation in five classrooms involved actual cases observed over a three-month period. The integration of tablet technology at various early education centers in a large urban school district was bounded by location and time.

Collective case study research is a valid approach to find meaningful themes across early education centers from various parts of the district, and the data can yield greater confidence in a study’s findings (Yin, 2009) than a single case study. By interviewing teachers and observing their experiences with the iPads in their classrooms, the early education community can learn from itself and determine best practices for how to integrate tablet technology into instruction.

In-depth semistructured interviews done with participants also provide valuable information (Creswell, 2013). The interviews provided specific details about the experiences the teachers went through as they implemented the tablets into their instructional practices. The interviews also allow the researcher to follow up with participants during the study to capture their thoughts. After the experiences are documented, they can be divided into categories so both the *what* and *how* of their summative experiences can be examined. Each case study helps provide an understanding of how teachers are connecting the technology with developmentally appropriate practices while investigating the factors that cause successes and challenges to the implementation.

Research Questions

In order to improve the process of implementation of iPads in early education centers for cognitive and social purposes, one must first understand the belief systems, technology challenges, and benefits of early education teachers. Both the outdated belief systems and perceived technological challenges held by early education teachers must be changed in order to improve the implementation of iPads in the classroom. The first research question; (a) How do socio-cultural learning theory (SLT) and developmentally appropriate practice (DAP) apply to a preschooler's use of tablet technology? is important because any implementation has to be founded on these two constructs. Understanding the relationship between these two foundational theories will provide evidence about the challenges that early education teachers face as they design lessons with these theories in mind. These challenges may be pedagogical, time constrained, or management related. The following research question will provide understanding of ways to address the issue of implementation; (b) What do early education teachers need to understand so iPads can be successfully utilized in a preschool classroom? The final research

question addresses the beliefs, experiences, and acquired knowledge of the early education teachers as they participated in the study, (c) How do early education teachers describe their experience as they implement iPads into the instructional program? The combination of all three of the research questions helped frame the study as it moved forward.

Setting

Large early education centers (EECs) in central, east, north, south, and west regions of Los Rubios (pseudonym) will be used because each area is unique and often serves different student populations. The district serves as the local educational agency responsible for their instructional and operational oversight. They are all operated through a combination of federal, state, and district funds to serve low-income students. All of the schools are located in areas with high populations of poverty and low access to licensed childcare programs. Within each of the centers, the families that attend are eligible for subsidized preschool care because of low socioeconomic status, familial concerns, or protective service status. In addition, 65 percent of the students are English Learners (ELs) of Hispanic descent, and the other 35 percent of the students are Standard English Learners (SELs). The students that will participate in the study are preschool age 4-year olds that will be leaving the centers and going to kindergarten the following year. The schools must also have wireless internet connectivity because teachers will need the ability to download apps used on their iPads during the research period.

The data for the following schools were downloaded from the district's website and are reflective of the 2015–2016 school year. The school from the northern region of the district is 99% Latino with 45% of students being English learners. In addition, 100% of the students qualify for subsidized care programs because of their low-income status. This is reflective of the community at large, as the elementary school reported that 96% of the students qualify for free-

or reduced-lunch programs because of their low-income status. The second early education center is from the southern region of the school district is 43% Latino and 57% African American, with all of the students qualifying for subsidized care programs. In addition, 9% of the students within this center have been identified as having special needs. The third center, in the downtown central area of the district, is 98% Latino, and 63% of the students are English learners. Additional information shows that 93% of the children are eligible for subsidized care as low-income students, while the other 7% of students are eligible because the parent is seeking employment, going to school, or has an active Department of Child and Family Services case. The east school is slightly different, as 21% of the students are Asian and 79% are Latino. In addition, 47% of the students are English Learners and 100% of the students are eligible for subsidized services because they are low income. The center in the west area of the district is comprised of 90% Latino students, 8% African American students, and 2% Asian students. In addition, 60% of the students are English learners, and all of the children qualify for the subsidized care programs because of low family income. In addition, 10% of the student population has special needs.

Based on information gathered from the district's website, LRUSD is the second-largest district in the nation and is the largest single employer in Los Rubios County. The district's website reports more than 640,000 students in kindergarten through 12th grade at over 900 schools, and 187 public charter schools and its boundaries spread over 720 square miles. Currently 10,583 of the 31,034 preschool students receive full-day services in 86 different early education centers across the district that serve children from ages 0–5. The district is the largest licensed provider of preschool programs in the state.

Participants

Participants and participant sites will be chosen because they could purposefully inform the research problem (Creswell, 2013). A purposive sample (Guba & Lincoln, 1984) was utilized; I selected participants who met certain criteria. A maximum variation sampling approach (Creswell, 2013) was used because it allows for the advanced determination of some criteria that differentiate the sites or participants.

Eliciting Participants

Collection of data began with the identification of the pool of participants, who teach at the various early education centers. The selection process of early education teachers began when I contacted the principals to obtain their assistance in the process. The principals were asked for a list of teachers who were working with the pre-kindergarten students. Following the identification of prekindergarten teachers, an email was sent to each teacher with an explanation of the goals of the study and an invitation to meet with me. At the same time, an email was sent to the principals, who acted as gatekeepers to ensure there was no bias based on my current role in early education. During the initial meeting, the preschool teachers were given preliminary information about the study, which included a formal consent letter that explained the purpose, time commitments, and participant safeguards.

Following the initial meeting, a second email was sent to each of the teachers that had signed the consent form and had chosen to participate in the study. The email will give the participant the date, place, and time of the first 45–60-minute interview. The email will also include the interview questions to give the participants an opportunity to review and reflect upon their uses with technology. The reason for sending the questions ahead of time allows us to maximize the time during the interview should other questions arise.

Ultimately, five early education teachers with different levels of education and years of experience will be specifically chosen for the inquiry. Each of the participants will be a part of the multiple-case study, and their classroom experiences were viewed as individual cases; purposive sampling allows for each case to be studied individually while allowing for multiple perspectives to be analyzed following data collection.

The district allows principals and teachers to work collaboratively to adapt their instruction to the different age groups within an early education center. Furthermore, the district requires the instructional program to be based on the state's standards and objectives for preschools California Preschool Learning Foundations. For the purposes of this study, the following expectations were in place for all the sites:

- All students would be receiving subsidized care based on financial eligibility or other at-risk factors such as being under protective services.
- All of the sites would have internet access via a wireless network.
- The classrooms chosen would have not experience using tablet technology in their instructional program.
- All of the classrooms chosen would be prekindergarten (four-year-old) classrooms.
- All five teachers would have a bachelor's degree or higher.
- All of the classrooms would maintain an 8:1 adult-to-child ratio as recommended by NAEYC and Title 22 regulations.

There was also the expectation that the early education teachers would have varying levels of experience, degree completion, language capabilities, and technology skills. The teachers were at five different full-day preschool programs located in central, east, north, south, and west Los Rubios. The data regarding their degrees, years of experience, and language

abilities were verified through the human resources branch of the district. The principals were also considered participants, as they served as the gatekeepers to help explain the study as needed. Since all of the early education centers are open year round, the employees form a very close community (Creswell, 2013); therefore, having a principal serve as a gatekeeper was a way for me to access the group in a safer and less unobtrusive manner.

Procedures

While this collective case study was being conducted, attention was given to adhering all guidelines set forth by Liberty University. There are several steps that needed to be followed that included getting authorization from my school district and ensuring the privacy of the study participants because they are also district employees. Anyone wishing to conduct research within the LRUSD must obtain approval from the Committee for External Research and Review (CERR) housed in the Research Unit of the Office of Data and Accountability. The CERR gives preliminary approval, but the candidate may not start the research until university institutional review board (IRB) approval has been authorized. In addition to the district's submission process, this study requires IRB approval because it requires eliciting participants and putting safeguards in place to protect information and personal anonymity. Following approval from the IRB, the district was notified of the approval. Only following IRB approval did data collection begin.

Recording Procedures

Collective case studies require multiple methods of data collection. Interviews were digitally recorded and were kept with audio-visual recordings on a password-protected tablet. Each 60-minute session that was being audiotaped helped guarantee accuracy of records and

allowed me to focus on the responses from the participants. The interview protocol and questions are included in Appendices B, C, and D.

Participants were informed about how the data were to be collected, secured, and stored. In this case, each of the semistructured interviews and observations were also digitally recorded to guarantee accuracy. The recordings were transcribed and secured on a protected laptop to ensure that all confidential information was protected. All information was stored in a locked filing cabinet in the researcher's office. Each of these transcriptions was also member checked to ensure their accuracy.

The Researcher's Role

An important factor in the data collection and analysis portion of this research study is that in addition to being the researcher, I am also a district employee. As a result, I must make extra efforts to limit any bias that may exist. Eliminating bias was a key challenge because of the qualitative nature of the study. To minimize the impact of bias while providing levels of accountability, the study participants were allowed to review and clarify any statements made during interviews or focus groups.

As an educator with a biblical worldview, I have worked in public and private education for over 27 years. During that time, I have been the principal at an early education center (preschool), a primary center (preschool, preschool special education, and kindergarten) and an elementary school (preschool through sixth grade). As a teacher, I spent 10 years in various K–5 classrooms, and I have witnessed the dramatic difference between children that had preschool experiences and those that did not. As the Executive Director of the Early Childhood Education Division, I have a responsibility in the quality of the education of the 31,000 preschoolers in our

subsidized programs. I truly believe this is why God has allowed me to be in this special position.

I have been working in early education for almost three years and have witnessed the lack of technology in preschool programs. My understanding of early education programs gives me professional knowledge that is only gained from working with others having similar training and depth of experience. This understanding also makes me question how early education programs can close a digital literacy gap for at-risk preschoolers when they have so little technology in place. Based on my role, I want to identify technology implementation themes amongst early education teachers so appropriate professional development can be designed to correct this injustice.

Data Collection

Collective case study research requires a great deal of data collection to ensure valid and trustworthy interpretation as the experiences of five teacher participants are recorded. To ensure that the multiple sources of data collection are relevant to the research, a table was created that addresses the research questions and the types of data collection techniques (Figure 1).

Semistructured interviews were the primary form of data collection and allowed me to learn about the participants' previous experiences with technology and collect evidence about their pedagogical beliefs about technology.

Since the study required multiple forms of data collection, interviews were scheduled at times that were convenient for the teacher, and observations were done at times that had been prescheduled with consent from the principal and the teacher. The following forms of data collection were also be used so triangulation could be achieved (Creswell, 2013). Beginning with interviews, participants were given the questions ahead of time, as mentioned earlier. This

gave the participants the opportunity to reflect on their use of technology and their feelings about it. In addition, receiving the questions early gave the participants the opportunity to make connections to the questions being asked and consider how technology is used in their instruction. Following the initial interview and meeting, observations were only scheduled when approval by the principal and the teacher at each of the five locations is given.

Data collection strategy	Research Question 1 Challenges	Research Question 2 Understanding	Research Question 3 Beliefs & Experiences
Interviews	✓	✓	✓
Audio-visual collection	✓		✓
Observations	✓	✓	
Researcher reflection/memoing	✓	✓	✓

Figure 1. Matrix of data collection strategies and research questions

Semistructured Interviews

Semistructured interviews were conducted with the five teachers. They were conducted in stages and progress as rapport was developed with the participants. Questions were piloted to ensure that they elicited responses that were relevant to the study and determine if there were teacher barriers to the implementation of technology (Blackwell, 2013; Blackwell et al., 2014) that needed to be addressed prior to beginning the study. Five to seven open-ended questions were asked during the 20–30-minute taped interviews with the different participants. The size of the sample is important for transcription so data saturation can be achieved (Creswell, 2013). This sample size also allowed for a word array to be developed (Yin, 2009) to identify individual themes and cross-case analysis. Using a maximum variation sampling, interviews were chosen and scheduled in a location that was comfortable for the participant. Interviews will be

conducted after being scheduled through each school's principal. I conducted the interviews after school or during the children's naptime when child-to-adult ratios change and the teachers had time to talk without worrying about supervision. Two different recording devices, a digital voice recorder and a tablet, were used to ensure that there is a backup device should one of the devices have failed. In addition, notes were taken so accurate recordings can be verified through the transcription process. These interviews were conducted in the school office or in a setting in which the participant felt most comfortable.

The first interviews with the participants were conducted in person, and an interview protocol or interview guide (Creswell, 2013) was used. To help understand, "How do early education teachers describe their experience as they implement iPads into the instructional program?" the iPads were distributed with a pretraining class given to all participants. The direct instruction model was also used by Couse and Chen (2010) as they studied the use of touchscreen interfaces and assessed how children drew. In a similar fashion, the participants in my study were given direct instruction about the applications that were used during the research study to ensure that all of the participants were able to access them. This also gave the research participants the opportunity to preview the applications and consider ways they might be used in their preschool classrooms. Additionally, I interviewed each person three times over the three-month period, which included an interview prior to disseminating the iPads, a midpoint interview during the second month, and a post interview following the end of the study. As the Executive Director, I needed to be very mindful of my influence during the teacher interviews and school visits. I needed to respect potential power imbalances and build trust with the participants (Creswell, 2013). I met with each of the preschool teachers prior to the interview and again during data collection periods to remind them about the purpose of the study and how the data

would be used. I assured them that their responses would be anonymous and reminded them that they were free to drop from the study without any fear of reprisal. Creswell (2013) also suggests that researchers in this position should also avoid leading questions, and withhold sharing personal impressions. I made sure that the participants understood how thankful I was for the work they were doing because their participation helped answer questions about integrating developmentally appropriate practices with tablet technology. Furthermore, they were reminded how the data would be used to inform professional understanding that will eventually help their colleagues successfully implement technology into their classroom instruction.

Audiovisual Collection

Photo and video release forms (assent and consent) needed to be submitted, signed, and collected so video data could be collected during the research period (Appendices A–D). Video is another way to analyze the nonverbal responses of children and teachers as they implement tablets into their instructional programs. According to Pawar (2013), “Words may not be sufficient to express the human emotions or feelings” (p. 1), so the use of audio-video recordings is another way to collect data. Since preschool children may not be able to verbally articulate their responses to tablet use, it was important for me to capture their responses by also analyzing their physical responses.

Audio-visual recordings were scheduled in collaboration with the principals and teachers to ensure that technology was being utilized during morning visits or when core academic instruction was taking place. Because preschool activities change frequently, each recording lasted between 15 and 30 minutes to allow me to observe at least two transitions. The video recordings also helped determine if there are were barriers affecting the integration of tablets into the instructional program. These barriers may be pedagogical, operational, or environmental.

The recordings helped capture how teachers were using the tablets and what kids were doing with them to identify any barriers. The concrete audio-visual evidence was able to be transcribed and used in the development of an array to identify potential themes. Again, audio-visual recordings are key in understanding the responses of very young children because they may lack the language to express themselves. In addition, teachers move around the room to frequently interact with children, so it is also important to capture the challenges they face during iPad implementation and the role they play as children interact with the devices and other adults. The ability to record an entire classroom gave me the opportunity to address research questions about different forms of digital play and teacher-child interactions.

Specifically, observations help uncover how developmentally appropriate practices apply to a preschooler's use of tablet technology and why teachers describe their experiences in the ways that they do. This aspect of observation also provides challenges because the setting within a preschool classroom involves many different interest areas, multiple activities happening at the same time, and a great deal of interactions between the teacher and the students. Since the preschool environment has so many things going on at one time, using a recording device helps capture information that a single observer may miss. Even though I took notes using an observation form (Appendix I), I wanted to make sure that I minimized the loss of data due to physical limitations such as memory or the ability to write notes quickly enough.

Observation

As suggested by Creswell (2013), I expected my role to change from a nonparticipant to a participant role as the observations progressed. Observations were a critical component in the data collection process because they help answer the research question, "How do early education teachers describe their experience as they implement iPads into the instructional program?"

Through the power of observations, I was able to script everything that I heard and make notes about the interactions between the teachers, students, and the tablets being used.

Observations also allowed me to witness the reactions of success or frustrations that were not captured in quantitative forms of research. I obtained permission via a gatekeeper, each school's principal, to communicate dates and times of observations to ensure minimal disruptions to the school. An observation protocol (Appendix F) was designed and piloted at a site that was using some technology so I could practice conducting thick and descriptive observations. This helped me understand some of the potential difficulties with observational data collection prior to beginning any official observations with the participating early education teachers and classrooms.

Data Analysis

Since this is a collective case study design, the data analysis also requires detailed descriptions of the individual cases and their settings. Since this research was about the implementation of iPads, the cases will be presented "in a chronological order with multiple sources of data being analyzed at each phase" (Creswell, 2013, p. 199). The detailed descriptions also ensure that the researcher is capturing thick descriptions of the entire setting so all of the information can be considered in relation to the research questions.

I began analysis by organizing narratives and words into relationships and arrays (Yin, 2009). These words can be organized into tables called arrays to represent the narrative data collected during the interviews and focus groups. The groupings of words allow for different analytic techniques, such as pattern matching, explanation building, and time-series analysis to be applied. Multiple-case studies follow a replication logic that that allows for cross case-case analysis based upon the finding from each individual study to determine if repetitive themes

emerge (Yin, 2009).

Within-Case Analysis

Each case was described and analyzed at length. The in-depth analysis allowed for “thick descriptions of each case and possible identification of themes within the case” (Creswell, 2013, p. 101). The in-depth context that is revealed is vitally important because the ensuing cross-case analysis is dependent on a strong within-case analysis. The cross-case synthesis then becomes the systematic comparison of these within-case studies.

Cross-Case Synthesis

Yin’s (2009) cross-case synthesis analytic technique is important because it allows the researcher to analyze each case individually but also sets the stage for comparative analysis when studying multiple cases. Yin’s analytic technique uses a word table called an array to display data in a uniform framework so the researcher can identify similarities or differences between the cases (Creswell, 2013; Yin, 2009). In this case, this technique was helpful because participants were from five different classrooms, each with a different teacher. In addition, the ability to look for similarities and differences helped me identify particular themes as the case evolved.

Direct Interpretation

If there is a single instance that has significant meaning to the study, it may be analyzed to see if it establishes another pattern that may not have been identified. Creswell (2013) describes direct interpretation thus: “The case study researcher looks at a single instance and draws meaning from it without looking for multiple instances” (p. 199).

Reflection and Memoing

Reflection and memoing are opportunities that follow a data collection period. The researcher reviews the transcriptions while making reflective notes called memos in the margins

(Creswell, 2013). Reflection and memoing also allow the researcher to make written notes that include speculations, puzzlements, and ponderings, but, as Stake (2010) cautions, this point in the process is not the time to make recommendations because the entirety of the data has not yet been analyzed. Eventually, these memos are analyzed to see if major themes appear that can be developed into initial categories.

Bracketing

Bracketing is a method used to lessen the potential effects of unacknowledged preconceptions that the researcher may bring into the study related to the research. Given my close relationship to the research topic, I needed to make sure that my personal assumptions about iPads are not brought into the study. Bracketing my personal beliefs from the personal experiences of the participants is a way to delay theme development. Since this is a lengthy multiple-case study, I could not allow my perceptions to skew the results and interpretations. According to Tufford and Newman (2012), bracketing also gives the researcher the opportunity for deeper levels of reflection across all stages of qualitative research. This reflection can be found as a researcher selects a topic and population, designs the interviews, and collects and interprets data. For example, I may really believe that it is important for preschool children to have access to tablet technology because this will remove later fears. Eliminating fears by giving young children early experiences with technology will help them later on when they take standardized tests on the computer. By bracketing this belief, I can move forward with the study while keeping these preconceptions at abeyance.

Coding

Once the interviews have been transcribed, the process of coding can be used to look at the data. Coding often begins with aggregating the data from the text into categories and

assigning labels to them. There are two approaches: one limits the number of categories and expands on them as data reveals itself (Creswell, 2013) while the other questions if the number of codes should even be counted (Huberman & Miles, 1994). Creswell suggests that beginning with five to six categories and expanding them is the best method for the beginning researcher. Wolcott (1994) also described a technique called a “think display” that is useful because it helps to visually see if findings are consistent. Wolcott (1994) stated, “For the finding oriented researcher, graphic presentation offers an alternative to prose not only for conveying information but for dramatizing or emphasizing particular aspects of a study. Tables, charts, diagrams, and figures are one way to do it” (p. 31). Through the use of in-vivo coding, the words from participant interviews and observations helped develop categories that led to themes. Identifying potential themes helped me understand some of the potential challenges and benefits that teachers may experience as they implement tablet technology into their classrooms.

Trustworthiness

Establishing trustworthiness within qualitative research is critical. Guba’s constructs help researchers satisfy the four key criteria to a quality study: credibility, transferability, dependability, and confirmability (Guba, 1981; Shenton, 2004).

Credibility

One of the critical components of trustworthiness to be addressed by qualitative researchers is that of credibility or internal validity. Credibility is necessary to ensure that the case study tests what is actually intended (Shenton, 2004). Lincoln and Guba (1996) argued that ensuring credibility is one of most important factors in establishing trustworthiness.

Expert peer review. As suggested by Creswell (2013), a trusted faculty advisor assisted me through ongoing reviews of interviews, transcriptions, and data analysis to provide feedback.

The peer reviews also ensure that interpretations, meanings, and questions are clarified at each juncture of the research process. Peer reviews also increase the credibility of the research.

Triangulation. Since a case study approach was used, credibility was established through triangulation. As Creswell (2013) suggested, I made “use of multiple and different sources, methods, investigators, and theories to provide corroborating evidence” (p. 251). The process of triangulation develops as different themes emerge as evidence appears from different data sources, thus providing additional evidence to provide validation. Stake (2010) described four categories of data that do not necessitate triangulation. The first category is description that is trivial or beyond question. In this case, there is little need to triangulate. The second category is description that is relevant but debatable; in this situation, there is some need to triangulate. The final category is a statement that is a person’s interpretation; in this case, there is little need to triangulate the validity of the statement. Triangulation ensures that each piece of evidence is supported by another piece of evidence.

Transferability

Transferability describes whether the findings from a study are generalizable to a wider audience (Guba & Lincoln, 1996). Transferability was attended to through rich, thick descriptions and clear descriptions of the boundaries of the study. Instead of using the term *transferability*, Yin (2009) used *replication* in relation to multiple-case designs because the principle is similar to that used in multiple experiments. Hence, the individual cases from a multiple-case study may be replicated, similar to the way a science experiment can be repeated multiple times to see if the same results can be achieved.

Rich, thick descriptions. The study provides full descriptions of each preschool classroom and teacher’s background in addition to student demographics and descriptions of the

activities surrounding the implementation of the iPads. The descriptions and data reporting of the entire classroom environment are critical to the qualitative analysis process (Patton, 2002) because they provide holistic details about what the children and teachers are doing in a naturalistic setting.

Clear boundaries of the study. For the audience to accept the transference of findings, the researcher must specifically state the boundaries of the study. By descriptively listing the parameters of the study, the researcher allows the readers to make their own judgments. Parameters can include the participants, data collection methods, length of data collection, and time period of the study. (Cole & Gardner, 1979; Marchionini & Teague, 1987)

Dependability

Dependability refers to the idea that if a study were repeated, it would yield the same results (Guba & Lincoln, 1996). Direct quotations and member checking were used for data analysis.

Direct quotations. Direct quotations are a basic source of raw data in qualitative evaluation and also increase the dependability of the findings. In my research study, direct quotations were heard during observations and interviews. They revealed the respondents' emotions, thoughts, and experiences while providing elaboration on their basic perceptions (Creswell, 2013). Using the transcripts of recorded interviews, participant quotes can support findings and reduce the possibility for misinterpretation.

Member checking. Member checks give the participants the opportunity to review the researcher's documentation for accuracy while giving the researcher feedback to ensure that everything is documented. This technique also increases the reliability and dependability of the

study because it ensures that both parties agree that the thoughts and inferences are accurately conveyed.

Confirmability

Confirmability refers to whether a study, upon accurate replication by another person, would reach the same results (Lincoln & Guba, 1996). Confirmability was promoted through member checks and intercoder reliability.

Intercoder reliability. High intercoder reliability is required in qualitative content analysis for assuring quality when more than one coder is involved in data analysis. According to Burla, Knierim, Barth, Liewald, Duetz, and Abel (2008), coding in studies with large amounts of data is most often done by more than one person for efficiency reasons. Since the study is a collective case study where each classroom is, in essence, its own case study, there will be a large amount of data collected and having multiple coders will be helpful. For example, when identifying word arrays and drawing out potential themes, having different coders will increase reliability or illustrate the differences within the findings.

Clarifying Researcher Bias

As the researcher, I need to understand my own personal bias toward the need to integrate technology into preschool programs. This is important so I do not allow my bias to slant my research or lose the ability to make objective inferences during data collection or analysis.

Ethical Considerations

Research with young children poses a number of important ethical issues that need to be addressed. Although the children, four to five years old, were not able to give fully informed consent, consent was gained from the parents/caregivers. In addition, care was taken to explain to the children, in terms that they could understand, what was being observed and to make clear

that at any time they could ask not to be observed. I also looked for nonverbal indications that children were withdrawing their consent.

Confidentiality

Confidentiality is important, and aliases needed to be applied, as the anonymity of the participants is important, especially in the case that some “negative themes” arose during the study. Therefore, all the schools and participants were given pseudonyms.

Full disclosure of the study is also important because of my current position in early childhood education since my position could be influential over later tablet initiatives. Being aware of my position, I also wanted to make sure that none of the school leaders or teachers felt pressured to participate in the study. I worked directly with the school site principals to ensure that their teachers were aware that they could exit the study without any fear of reprisal. As such, the research also gained ethical approval from Liberty University and the district’s Committee for External Research Review (CERR) housed in the Research Unit of the Office of Data and Accountability.

Summary

The employment of qualitative case study research is dependent on a variety of data collection methods, so it only serves that the study is also framed around different philosophical assumptions that use qualitative data collection methods. As such, the study of iPads is based upon the ontological assumption that multiple realities exist and “evidence of multiple realities includes the use of multiple forms of evidence in themes using the actual words of different individuals and presenting different perspectives” (Creswell, 2013, p. 20).

CHAPTER FOUR: FINDINGS

Overview

The purpose of this qualitative collective case study was to develop an in-depth understanding of the implementation challenges and benefits of tablet technology for early education teachers that work in subsidized preschool programs. The following research questions informed this study: (a) How do sociocultural learning theory and developmentally appropriate practice apply to a preschooler's use of tablet technology? (b) What do early education teachers need to understand so iPads can be successfully utilized in a preschool classroom? and (c) How do early education teachers describe their experience as they implement iPads into the instructional program?

During in-depth interviews, study participants described their perceptions of and experiences with using the iPads and integrating them into their daily instruction. They also discussed how the devices helped them build their own technology skills while supporting student success and social engagement in their classrooms.

While visiting the classrooms, observations were done to see how the students were interacting with the tablets. Video recordings of the observations were taken so they could be reviewed later or discussed with the teacher as part of the interviews. Children were observed using the tablets in a variety of settings that included indoor and outdoor activity areas. Inside the classroom, the children could be observed using them primarily in a tablet-dedicated area with adult supervision. However, teachers self-reported that the children were also seen using the devices in dramatic play areas, library areas, and in quiet areas. Children used them to draw, take pictures, sing, make videos, and play learning apps outdoors. The research findings in this

chapter are based on analysis of the following data sources: semistructured interviews and the researcher's observations within the classrooms across the five geographic regions of the district.

Participants

The participants in this study were comprised of five early education teachers from an urban PreK–12 district in Los Rubios, California. They ranged from 37 to 61 years old; all five of them were female. On average, the participants had 21.4 years of teaching experience. One participant reported fewer than 15 years of teaching experience; two teachers had 15 to 20 years of experience, and two teachers had 27 to 31 years of teaching experience. All five early education teachers had previous teaching experiences in early education prior to teaching with the LRUSD. In addition, two participants reported having worked as early education aides or early education substitute teachers. This time was not counted in their years of experience; only the time spent as a classroom teacher was counted. In addition, two early education teachers possessed special education teaching experience, and one of them had worked as an elementary teacher. All of the teachers reported having children with individualized education plans in their classroom, and two of them teach in a Preschool Collaborative Classroom (PCC). The PCC program is defined by the district as:

The Preschool Collaborative Classroom program provides special education services for children three to five years of age who have been identified with one of the federal and state defined special education eligibilities. The program is designed to promote a partnership between professionals and families to help meet the child's individual needs and increase future school success. Children in the PCC program are served in this least restrictive environment. In general, there are 24 children in the classroom; 16 general education students and 8 children with special needs. There is a general education

teacher, a special education teacher, one general education aide, and one special education aide. Emphasis is placed on the development of language, social-emotional, motor and pre-academic skills through activities and materials that are concrete and relevant to their lives.

As an observer, I did not know which children had special needs and which students did not. However, all five participants informed me that there were children in each of their classrooms that had an active individualized education plan.

Each teacher self-reported as the only person in their early education center to currently use more than one iPad as part of their instructional program, although two teachers reported that a colleague used her own personal device in another classroom. Furthermore, all of the teachers used the same district-wide curriculum and progress-monitoring assessment. Each of the teachers was working with four-year-old students who would be progressing to kindergarten for the upcoming school year. As per the guidelines set forth for this multiple-case study, each participant was assigned a pseudonym. The assigned pseudonyms also to protect participants' identities in this report and other publications that may be drawn from this study. The teachers in the study will be referred to as Katya, Patty, Elise, Ellen, and Tanya.

At the time of the study, none of the five early education centers were systematically implementing the use of tablet technology to enhance their instructional program. Furthermore, this study required approval from Committee on External Evaluation and Research (CERR), as it was conducted with district employees and students. In addition, approval for the study was needed, as the preschool programs being researched were funded with state subsidies designed to support low-income families.

In the 2015–2016 school year, a \$20.1 million bond was invested into technology upgrades to the district’s 86 early education centers. These upgrades included replacing servers in each of the centers and adding wireless hubs which did not exist prior to the upgrades. This research could not have been conducted if the district’s early education centers did not have wireless internet capabilities. This study provides valuable data in the form of observational and narrative data of how five teachers were able to benefit from the technology upgrades as they implemented the iPads into state-subsidized preschool programs. When this study was conducted, all of the centers had the ability to connect wireless devices like iPads to the internet, but none of them were doing so because tablets were expensive and implementation of devices into instructional programs had not yet been explored. During their interviews, several study participants expressed how excited they were to pilot a technology initiative for preschool students.

In addition to this study, there were two other initiatives taking place in the district at the time of data collection. While they are not expected to, they could impact or influence study results. The two initiatives are also technical in nature. First, the district’s Instructional Technology Division began to implement wireless devices in some of its preschool special education classes. Second, the district itself has been through many implementation phases of computer technology and wireless devices in its K–12 programs and is proceeding with a second phase of 1:1 devices projects for its middle and high school students. Hence, there is some experience on the part of this district with how to implement a technology pilot and scale up for future iterations.

During the semistructured interviews, the participants added information to each of three emergent themes. A couple of the participants spoke a great deal on two or three themes, while

others added information that was applicable to more than three themes. As outlined in Chapter Three, each participant's data were collected in a manner consistent with case study research. Thus, each participant's perceptions, experiences, and voices are captured in this study. As such, individual participants and the corresponding observations will be treated as individual case studies.

Data Collection

Teacher Katya: Case Study 1

Teacher Katya is passionate about working with young children. She felt the call to teaching when she was eight years old and assisted her mom in the preschool class at her church. She would help teach the preschool children different songs and the hand movements that went with them. As she grew older, she helped her mom grade papers and volunteered in classrooms through college. Although her mom taught kindergarten, Teacher Katya became a preschool teacher because she really enjoyed working with very young children. She stated, "This is what I am going to do; it was kind of a DNA thing that I would also become a teacher." Katya began teaching in 1986 and has worked at three different schools within LRUSD. Over the past 33 years in education as a preschool teacher, she has taught the 2, 3, and 4-year old classes. All of the schools she has worked for were state subsidized full-day full-year preschool programs. By definition, the children from these families demonstrated a need additional to being low income. As referenced earlier in this chapter, these needs include parent incapacitation, protective service status, single-parent status, parent(s) going to school, and/or parent(s) seeking employment.

Teacher Katya has been at her current school of employment for four years and has seen the community changing in the short time she has been here. Although the school is in the

central area of Los Rubios, she that the apartments and houses in the area have gotten much more expensive and not as many families are qualifying for subsidized care because they are not low-income. This has caused a slower rate of enrollment into her classroom and she is worried about how this will impact the iPad implementation as new students enter. Currently, the school has capacity for 120 students but only has 96 preschool students enrolled, range from two years old to five years old.

Teacher Katya is familiar with technology in her personal life and uses a tablet, a smartphone, and a computer on a regular basis. She uses her computer or tablet to purchase items, pay bills, and do research. She uses her smartphone on a daily basis to check weather, retrieve directions, download music, text, and make calls. She is happy that her school has wireless, which was added in April 2017, but is bothered that the school has no wireless devices for the children to use.

Prior to the implementation of the iPads into her classroom, Katya described the previous ways she used technology in her classroom. She used DVDs on a desktop computer or in a DVD player so children could watch and listen to stories. However, she stated that she very rarely used the DVD player because it was not developmentally appropriate. She also rarely used the desktop computer because “it is hard for the kids to get that mouse thing.”

She also described various challenges with the larger desktops. She felt that the old computers did not always work and were not serviceable by the district after a couple of years. In addition, she stated, “They are outdated and kids don’t want to do the mouse or keyboard thing.” She also added that the older desktop computers actually do not work well enough for the children to watch any of the online videos that come with the new curriculum.

Katya's responses helped answer the first research question, (a) How do sociocultural learning theory and developmentally appropriate pedagogy apply to a preschooler's use of tablet technology? In addition, her responses provided insight into the second research question, (b) How do early education teachers describe their experience as they implement iPads into their instructional program? Following the transcriptions of the three interviews with Teacher Katya five categories emerged: (a) perceptions of implementing tablet technology, (b) perceptions of developmentally appropriate apps and activities, (c) perceptions of the interaction between children while using the technology, (d) engagement at varying levels, and (e) developing independent choice.

Perceptions of implementing tablet technology. Teacher Katya's implementation began with a very structured approach. All of the iPads were placed at a kidney-shaped table, and the children began by rotating through the activity center. Her use of this technique was strictly for monitoring reasons and to ensure that all children had an opportunity to use the devices as they were introduced into the classroom. "I hope that they will learn how to use it independently, but I needed an adult to sit there and help with that," she stated. She strongly believed that the implementation needed some adult guidance, and she established time limits to ensure that all the children had an equal amount of time with the devices. She would remind the students as they came to sit with her, "'Okay, here's the timer; when the timer rings, it's somebody else's turn.'" It was a big step in right direction to help them become self-directed where they could choose to use the iPads on their own." Initially, she planned daily for particular groups of students to rotate through iPad activity areas on selected day but she realized the kids enjoyed them so she began using them on a daily basis so they would have multiple opportunities to access the devices during the week.

Perception of developmentally appropriate apps and activities. Teacher Katya used many different apps in her iPad activity area but self-selected them to make sure they were developmentally appropriate. Initially, she liked the apps that supported the skills the kids needed to use the iPads via touch or swiping. For example, she stated, “I like to have the new kids use the doggie run app, where they can brush the dog, put soap on the dog, and it’s funny. Oh yeah, they’re learning to swipe.” As the iPad use progressed in her classroom, her discussions around the iPads also changed. She later explained how the iPads were promoting problem solving, literacy development, numeracy, and art. For example, she discussed how her students figured out how to close multiple apps in one swipe or find recent apps that they enjoyed. “I think the problem-solving aspect is . . . kind of critical because those skills transfer to many other areas in life.”

Perception of the interaction between children while using the technology.

Interaction around the use of the tablets was a repeated theme that Teacher Katya noticed. “The kids like the singing app, that’s what I call it. The kids love it; I mean they just love to sing along with one another. It encourages language and it encourages singing at the same time.” As the children became independent users of the iPads, she observed them taking the iPads into other areas of the classroom together. For example, she stated, “They’ll pick them up and I’ll say, ‘Remember to be careful.’ And they’ll go and take them to the library area and read stories with one another.”

In addition to the interviews, observations were conducted as outlined in Chapter Three. Following the three observations within Teacher Katya’s classrooms, two additional concepts emerged.

Engagement at varying levels. During every observation, the iPads engaged the attention of an individual student or groups of children while the device was in use. The kids were eager to choose them, and when they were finished using them, either by choice or teacher direction, they stopped using them and went to another preferred activity. During one observation, a little girl used a letter game within an online app called ABCMouse. She took puzzle pieces and moved them together until they formed a particular letter. If she moved a piece unsuccessfully, the piece would move back to its original location. Sometimes the teacher would help and point out characteristics that might help join the letter together and sometimes she would not. The interactions that took place were good examples of how a teacher let a child use an app that was developmentally appropriate and utilized the concept of zone of proximal development (Vygotsky, 1978) to help the child learn. As the pieces were placed correctly, the little girl would look up to her teacher and give her a thumbs up and say, “I did it” (Figure 2).



Figure 2. Interaction with teacher as the child uses a puzzle recognition app. The teacher began the process by taking turns with the little girl to get her started on the puzzle. The little girl then moves a puzzle piece in the first frame to complete the top of the A. As the piece falls successfully into place, the little girl shows her joy by giving her teacher a thumbs up after the interactions with the teacher helped her achieve a successful outcome.

Eventually, the little girl put the puzzle together and the app gave her immediate feedback by saying, “You got it!” followed by displaying a series of flashing stars on the screen. Upon hearing the acknowledgment, I watched her smile and look to Teacher Katya who responded, “You’re amazing.”

Developing independent choice. One of the most important factors in Teacher Katya’s room was helping the children move from heavy teacher scaffolding to independent learning and decision-making. Controlling the time that the children could use the devices may have helped her initially with directing student learning, but giving the students choice on how and where to use them later helped them explore beyond directed activities.

Teacher Patty: Case Study 2

Teacher Patty reported that she is a resilient individual who has always looked for ways to improve herself. She began teaching preschool children in 2002 and has continued on her educational journey. Since entering her first assignment, she has completed her associate arts degree, her bachelor’s degree, and her master’s degree. She is currently taking classes to complete her Early Childhood Special Education Credential so she can work with preschool children with special needs. She feels that she is best with infants and toddlers but feels well-rounded enough to work with all types of children. Over the past 16 years in early education, she has taught at multiple sites in LRUSD, with the majority of time spent in the southern part of the district. All of the schools that she worked in were state-subsidized preschool programs, which means that all of the students qualify for free preschool services because their families are low income and they have a demonstrated need besides being low income.

Teacher Patty stated that she uses a desktop and smartphone in her personal time. Through the urging of her husband, she has recently been learning how to use a tablet. She

explained, “My husband would always tell me, ‘Honey, you are in the 21st century, so you should know this stuff and teach it to your kids.’” She stated her primary uses for computer technology involve research, word processing, and occasional “perusing of the internet for current events.” Besides using her smartphone for texting and calling, she likes to play games on it. She has also expanded her smartphone use to include the uploading of pictures, documents, and researching information.

When asked about the types of technology she has used in her classroom, she admitted that she does not use it very often other than to input her Desired Results Developmental Profile (DRDP) progress monitoring scores for her students. As for utilizing the computer as a classroom tool with the children, she has never really done so because her desktop is “a little bit older than a dinosaur.” At one point, she did try to use it with the children but found it difficult because “the children have to move that cursor, and sometimes they can’t see the little arrow and where it goes. It’s a little bit too difficult.”

Her interviews helped answer questions about how a teacher could embed adult-child interactions when an iPad was used. Teacher Patty’s ability to plan ahead helps answer the second research question, (b) What do early education teachers need to understand so iPads can be successfully utilized in a preschool classroom? Following the transcriptions of the three interviews with Teacher Patty, four general themes were identified: (a) experiences with technology and classroom management, (b) perceptions of implementing tablet technology, (c) perceptions of developmentally appropriate apps and activities, and (d) observations of cognitive growth.

Experiences with technology and classroom management. The tablets were a new introduction to the classroom for Teacher Patty, so she spent time planning for their management

and use. She explained that she spent a great deal of time to make sure the kids understood the “rules and regulations” for their use. She stated, “I’m laying down their foundation, so the first thing is dealing with the rules and regulations. So, which includes the tablets, so all of this is inclusive of, ‘How do we take care of them responsibly?’” Her efforts were twofold because she wanted the children to understand how valuable the tablets were and she wanted to set a standard for their implementation in the classroom.

Perceptions of implementing tablet technology. After establishing classroom routines and procedures, Teacher Patty found the iPads very easy to use. Her general approach to learning was to open the box, try to figure out what to do, and ask for help when she needed it. She also relied on older students who had some experience with using an iPad or smartphone. By sharing her experiences, she helped answer the second research question and provided insight into what teachers would need to know to implement iPads successfully. Based on her experiences, she found that teachers need to get advice and learn from their colleagues, and she also joked that her kids could teach her if she got stuck. When compared to using the computer, she stated that using an iPad was easier: “Opposed to a computer, they just use their finger and they can kind of find anything. They figured out what the ‘X’ is. It was really quick for them.” She felt that if the tablets were available to all of the kids at the center, they would be able to learn how to use them quickly. Just as she learned about technology from her colleagues and husband, she believed that the older kids would be able to show the younger students how to use them. She stated, “There is a difference between the age brackets; the younger ones had a hard time but the older kids, like the four-year-olds who turned five, showed them how to use it.”

Perception of developmentally appropriate apps and activities. Teacher Patty also began by limiting the access to particular apps or ones that mirror activities that would happen in

other activity centers. To ensure that the children were using the iPads appropriately, she listened carefully to what the children were saying and watched closely what they were doing. She said, “We know they [the kids] can do neat things as long as they have someone that’s gonna guide them, show them, and demonstrate to them while having fun.” For the children who were uncomfortable using the technology, she allowed them to use the computer as long as they like or just allowed them to observe until they were ready to try one of the devices. She noted about one little girl:

She tried it, but then she didn’t like it. Then she went back to it and then she tried a game at her own pace. I would encourage her to just try a little bit and we would color a picture together.

Teacher Patty’s ability to use play and adult-facilitated interactions gave the girl the opportunity to engage the devices successfully. Her approach to helping the little girl was a direct application of Vygotsky’s sociocultural learning theory, as she engaged the child at a point that] challenging for the child while allowing for interactions that led to the child’s success.

During the three observations within Teacher Patty’s classroom, another key concept was observed. As the observations were being conducted, Patty explained the cognitive growth that she was seeing in her children. Teacher Patty provided access to a limited number of apps on the iPads to ensure that particular cognitive goals were met. She used alphabet apps to support letter recognition and writing. She used numeracy apps to build number recognition, encourage counting, and develop one-to-one correspondence skills. During one of the observations, all four of the students were using a letter matching app. The children had used the apps prior to the observation, but two of them enjoyed working together while the third and fourth children

preferred using the app by themselves. If a mistake was made, the effort was easily corrected by simply touching another letter and matching it to the correct counterpart.

Teacher Tanya: Case Study 3

A veteran of 27 years in early education, Teacher Tanya is constantly willing to try new things that will improve herself and her instruction. She became interested in teaching after taking a child development class in high school. When the opportunity arrived for students to volunteer in an early education center, Tanya was first to sign up. Upon graduating from high school, Tanya got a job as a four-hour early education aide. Eventually, she enrolled in college and began as an early education teacher in 1990. She recently completed her elementary teaching credential but has made the decision to stay in early education at this point in her career.

In her personal life, she is an avid user of technology. She regularly uses a tablet, laptop, and smartphone. In fact, she recently networked her house so her air conditioning can be used from a thermostat that is the size of a mini-tablet and can be adjusted remotely via an app on her phone. She uses technology to do her banking; buy, sell, and trade stock; and play games. Her avid appetite for using technology in her home is only matched by the excitement of using more technology in her classroom. She finds lessons on YouTube and uses digital technology in her classroom. Her love for technology could be seen as she took photos of her students and their work on her smartphone. During the course of the interviews and observations with Tanya, her perception of technology integration and comfort with its use became very clear. Blackwell et al. (2014) found, “Individual attitudes and anxiety about using technology are correlated with actual use, such that those more in favor of technology are likely to adopt technology in their classroom” (p. 88). In accordance with the findings, Teacher Tanya was very eager to implement the iPads into her instructional program.

Following the transcriptions of the interviews with Teacher Tanya, her perceptions of using iPads in early education emerged in four areas: (a) experiences with classroom management and technology, (b) perceptions about the implementation of tablet technology, (c) utilization of developmentally appropriate practices, (d) perception of the interaction between children while using the technology, and (e) observing observations of cognitive growth.

Experiences with classroom management and technology. Teacher Tanya expressed that she put a lot of thought into the iPads before implementing them. She considered how they were going to be charged, where they were going to be kept, and how they would be shared amongst her students. She also worried about what content might be accessed on the iPad and how long the students should use them. At the beginning of the implementation period, she had all of the iPads being used in one area and set a timer because she was afraid of the children being unable to self-monitor how long they were on the devices. “They’d have a timer set for 15 minutes. Then someone else would have to come on. I haven’t let them use the tablet as much because I am a little afraid,” she said. The many questions that she thought of also helped her to think of ways to help other teachers that were apprehensive about trying iPad technology in their classrooms. Her experience with asking critical questions and planning ahead provided possible answers to the study’s research questions.

Perceptions about the implementation of tablet technology. Teacher Tanya had a very methodical approach to introducing the children to the iPads. At first, she only allowed six children or fewer to access the devices and this was done at the end of the day. She monitored the devices and had them begin with very short periods of use. Some of these periods were only five minutes long. The children could watch a preset video, sing a few songs, or use a couple of pre-selected apps. She showed the group how to access the home key, which she called the

“bellybutton.” She also taught them how to swipe and exit programs by touching the “X” key. She felt these were good things for the kids to know but would be helpful for colleagues that needed to learn the basics of iPad use.

Over the course of the next couple of months, she shared how she modified her initial implementation to let the kids experiment more with the tablets. Her primary reason for the change was the ability of the kids to grasp the tablets use very quickly. Besides the educational apps she discovered that the children enjoyed using the camera on the iPad. She said, “A couple of them were really interested so I showed them how to slide to video. And then two girls got up and said ‘Look teacher’ and sang while someone else took a little video.” Similar to child-centered models, Teacher Tanya let the child lead into the play and then she supported their learning through carefully timed adult child interaction.

Utilizing developmentally appropriate practices. Tanya allowed activities that were developmentally appropriate—the listening of music, game-style learning apps, and educational videos. After Teacher Tanya began with the music app, she quickly realized that the children were figuring out how to use other apps. Through independent exploration, the children discovered that they also enjoyed using the camera within the iPad and began taking the tablet to other activity areas. For example, rather than rotating through a computer area, the students began taking the devices to the library and dramatic role-play areas to take photos or video record themselves. This type of support is both developmentally appropriate and helpful in answering the study’s first research question.

Perception of the interaction between children while using the technology. Part of being in preschool is learning how to socialize with other children. In the second and third

interviews with Teacher Tanya, she pointed out that the devices were creating a great deal of social interaction between children. She shared that with this exchange,

They start off with something easy and then they watch the others, so they will often start off with Feed the Animals or Doodle Buddy apps. Then, I will hear another child ask, “Where are you? Can you show me?” So they are learning from one another.

She also talked about how this usage was developing the vocabulary between students when she overheard a short conversation between two students.

“How did you get there?” asked Student 1.

“Press this star,” said Student 2.

“Okay slide over, now go for the little boy and press the plus,” responded Student 1.

Teacher Tanya feels strongly that there is a great deal of interaction that takes place as the children use the tablets with one another. Eventually, the social and technical skills are something she wants her students to learn because she has seen too many adults who are fearful of interacting with technology. She shared, “I have known office managers and teachers that retired because they were afraid to connect to things like electronic banking because they are afraid that they would screw things up.”

Similar to Teacher Patty, Teacher Tanya experienced different types of communication growth as the children used the iPads. During the three observations within Teacher Tanya’s classroom, two additional concepts emerged.

Observing cognitive growth. By giving the children the opportunity to use simple apps in the beginning of the implementation period, Teacher Tanya scaffolded the children’s learning so they would be more successful later on. Her planning ensured that her students later had the confidence and desire to try new apps. In addition, Teacher Tanya played a critical role in

helping the children learn new concepts and reinforce academic skills because she often served as an adult who facilitated the children’s learning. During one of my observations, she said to a child, “Okay, can you slide over the star and go for the plus sign?” The little boy responded, “Do you mean, touch that one?” Teacher Tanya did not respond, and the child was able to figure it out and open a new screen for an app called Math Journey. Then the child responded, “I’m going to the matching one.” She explained to me during the observation that this was a child who was hesitant to speak (Figure 3). She strongly believed the use of the iPads has made him more confident to speak. As the observation continued, she turned from observing the child and stated to me,

See, he knew which one was four. And he was watching and then he pressed four, but I see how he is counting aloud. So now, he is learning. He wouldn’t have done that before, and he wouldn’t have used vocabulary like *count* or *touch* before, so this all added to his vocabulary.

Her commentary during my observation also helped me understand how the use of the iPads was supporting social and cognitive growth for this child.

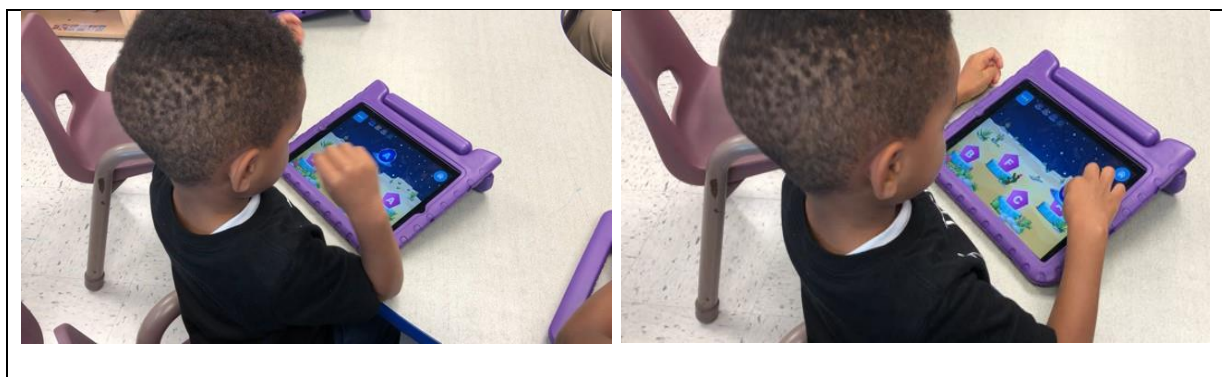


Figure 3. Little boy using letter matching app to support pre-literacy skills. A little boy would count the number of rockets and then match the number in a flying saucer to the number in the pentagon.

Self-regulation and independent choice. During another observation, the concept of self-regulation played out as three children were using the iPads at the table with the teacher and three children were sharing one iPad in the library area. The children taking the iPads to the library are examples of children taking ownership of the iPads and choosing to use them independently. One of the three children in the library could be seen sitting on a little red couch and repeating sentences that were associated with different letters. A letter would appear on the screen and then a picture of an alligator with a sentence below it. The words for the sentence would light up as a narrator would read the sentence. Then the sentence would light up again without the narration. At this point the child would repeat the sentence. Although there were three children watching, only one of the girls was reading, but she could be heard saying, “There is an alligator in the water.” The teacher explained to me that “reading is for her, and some of the other kids just watch; whether they choose to read or not is their choice.” Providing children a variety of apps and opportunities to make personal choices fostered independent learning for the kids. The opportunity for choice is consistent with Froebel’s (1974) theory on how child-centered learning takes place. He strongly believed that children learn best when they are engaged in play.

Teacher Elise: Case Study 4

Teacher Elise is the newest teacher of the participants but has been an early education teacher since graduating with her bachelor’s degree 15 years ago. After completing a master’s in psychology, she recently transitioned to a PCC which has 24 children. Within the classroom, 16 of the children are general education students, and eight are children with special needs. She coteaches with a certified preschool special education teacher, one early education aide, and one special education aide. She recently made the switch to the PCC room to get experience with

preschool special education students, as she wants to return to school to pursue an Early Childhood Special Education Credential.

Teacher Elise has never considered working outside of early education as she began volunteering at an early education center when she was in high school. The school that she works in is in the northern part of Los Rubios and is a predominantly Hispanic community. Approximately 96% of the students at her school are Hispanic, and all of them are low income. Currently, the school has capacity for 106 students and maintains a waiting list, as there is a high demand for licensed care in the neighborhood.

Teacher Elise is very familiar with technology and uses many forms of technology in her personal and professional life. Within her house, she has three tablets, a smartphone, and a computer, which are all used by her on a regular basis. In addition, she purchased a tablet for her classroom prior to the study and uses it take photos and record videos of the children. She also uses her tablet to play music, stream videos, and show pictures to the students as part of her classroom instruction. Furthermore, she documents student learning with her iPad to help her with her DRDP assessment information. However, she has not let the children use the tablet on their own because it was purchased with her own personal funds. Similar to Teacher Katya, she is happy that her school now has wireless internet access and is hoping that the district will eventually invest in wireless devices for the children.

Prior to the implementation of the iPads into her classroom, she described the previous ways she used technology in her classroom. She downloaded a lot of children's songs and music and played them through a Bluetooth speaker from the iPad. She often played the music as part of her daily opening routine, as part of the music area, and during nap time. However, she stated that she was the person who controlled which songs were played.

Similar to other participants, Teacher Elise described the various challenges with the larger desktops. She was the third person that referred to the desktop as the “dinosaur computer” and commented that it did not work. She added that the district’s Instructional Technology Division would no longer be servicing it because it was too old and should be sent to salvage. This has made it difficult for her to embed technology in her classroom because there were a few websites that the children liked to use and were supportive of her instructional program. Unlike some of her colleagues, she felt that the children could learn to use the mouse and the keyboard.

Following the transcriptions of the three interviews and observations with Teacher Elise, five key concepts emerged. They are (a) utilizations of developmentally appropriate practices, (b) perception of the interaction between children while using the technology, (c) opportunities for assessment, (d) engagement at varying levels, and (e) self-regulation and independent choice.

Utilizing developmentally appropriate practices. From the very beginning, Teacher Elise was focused on how the iPads would be used. She would use them to support literacy and math skills but was very focused on how they could be used to develop a child’s social skills. She strongly felt that the use of tablets would tap into the learning modalities of her visual and tactile learners. She shared,

I think they actually learned, because, I mean, every child is different. Some learn by visualizing; some learn by sensory; some learn by just talking with them. I think it’s good for some of the children that need the visual. It helps them all.

While none of the research questions were designed to look at children’s academic results, all of the participants commented that they believed that the iPads helped accelerate a child’s learning. In Teacher Elise’s opinion, the iPads represented learning option that questions and reciprocal interactions promote learning different types of learning opportunities for children. She also

talked about how the iPad use was developing the vocabulary and social skills between students. During the second observation, I overheard a similar conversation between two students (Figure 4).

“Okay, it’s my turn now. When I’m done, it’ll be your turn,” said Student 1.

“When will you be done?” replied Student 2.

“Maybe six or seven minutes; you cannot touch the tablet, but you can watch me,” responded Student 1.

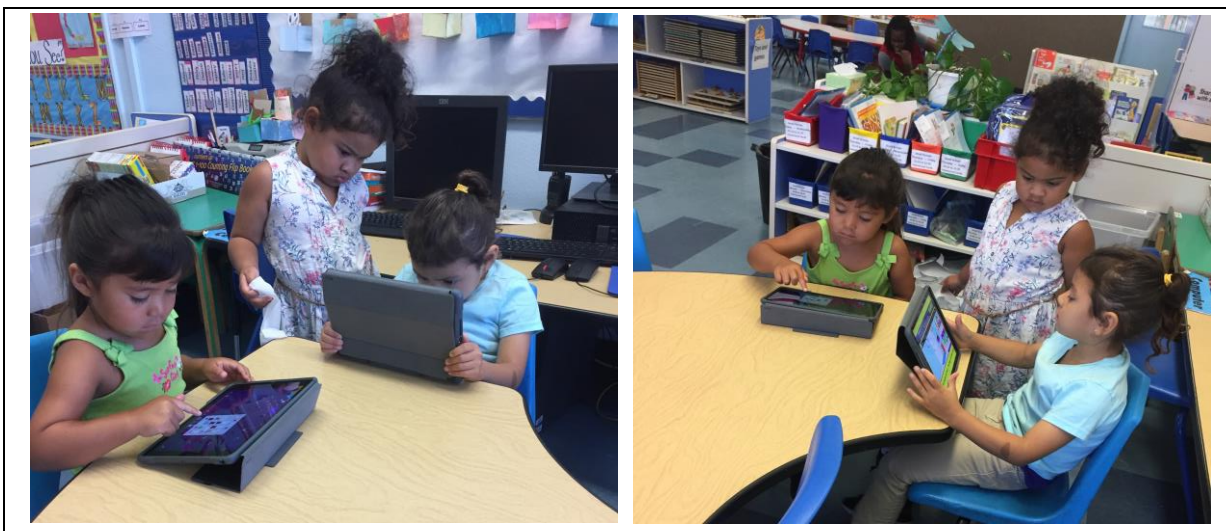


Figure 4. Interactions and conversations regularly take place between students. During one of the observations the conversation above took place as the girls interacted with one another. All of the teachers in the study found that there was a great deal of conversation and interaction that took place as the kids used the iPads in activity areas.

Opportunities for assessment. One of the benefits that Teacher Elise observed about the iPads was the ability to use them to document student progress. She discussed how the features of an iPad itself allowed her to assess a child’s progress. The kids would take pictures of their work, save a drawing on the iPad, or show a video of something they saw. “Let’s say, for example, they’re playing Legos or they built something with the blocks. They’ll take the tablet and take a picture of what they built,” she stated. In some instances, this documentation can

show how the child has grown from building things that are flat to creating three-dimensional structures.

In addition, Teacher Elise uses the iPad herself to capture what a child is doing and to create student portfolios that can be shared with the parents during conferences. This documentation can be added as evidence that illustrates developmental progress as measured by the DRDP. Although Teachers Elise and Tanya were the only two to mention using the tablets to document assessment, their comments provide implications that will be further discussed in Chapter Five.

During the three observations within Teacher Elise's classroom, I was able to witness how sociocultural learning theory and digital contexts can work together. Edwards (2013) posited that the current digital culture will create new forms of play in early education environments. Her theory examines "the context in which children's play is located and seeks to understand digital play as a response to the cultural situation in which technologies are embedded and therefore used by young children" (Edwards, 2013, p. 199). From my observations in Teacher Elise's classroom, two additional key concepts emerged.

Engagement at varying levels. The children using the tablets remained focused on the apps they were using but often changed from app to app. Whether they were solving puzzles, counting numbers, or playing matching games, the kids were engaged and solved the various problems they encountered in the educational apps. During the observations, each child had his or her own device and intermittently stopped using their device to look at that of another child. This was observed in almost every classroom that I visited. During one of the observations, a little girl said, "Look! I did letter 'C.'" Immediately, both of the children around her stopped what they were doing and began looking at her tablet. When the kids were done watching the

fireworks that indicated the problem was solved correctly, the girls went back to using their own tablets.

Self-regulation and independent choice. During the observations, it was apparent that Teacher Elise has given her students independent learning opportunities. In conversation with her during the observations, I learned she strongly believes that children need to problem-solve on their own as they make strides towards becoming independent learners. As I watched her interact with the children, it was only at opportune times that she engaged with the children. As the children were using the tablets, Teacher Elise assisted individual students by asking them questions rather than telling them what to do. When one of the children kept pointing at another child's tablet, Ms. Elise asked, "Is that the app you want to use?" The child did not verbally answer but nodded in agreement. Ms. Elise said, "Well, how are you going to get there?" This time the child responded, "Push the 'X,'" which she did. Then, Teacher Elise inquired, "Now what?" After a couple of tries with the incorrect app and similar verbal exchanges, the child eventually found the app she wanted. By Teacher Elise not finding the app for the child, the child was able to self-correct, learn, and find the app independently. Teacher Elise explained to me,

The children are good at figuring out how to use the apps, once they find them. Then they show me what they found and I ask them questions. Instead of me finding it for them and asking all of the questions. That's another reason I like them.

Teacher Ellen: Case Study 5

Teacher Ellen is a veteran teacher of 20 years. She spent another eight years as an early education aide. She uses a laptop at home and searches the internet for research, articles, and other information. She also owns a tablet and smartphone but acknowledges that she uses her

smartphone the majority of the time, especially for finding directions. However, she admits that she has never used the computer or tablet in her classroom and had mixed feelings about the benefits of using the “old desktop ones.” She shared that her past experiences were not always positive, as the games were not appropriate and the computers would break down frequently.

When asked about other challenges that she foresaw with tablet implementation, she expressed concern that the kids would find inappropriate content or break them. She was also concerned that some of the students would be more advanced than others depending upon their previous experiences with technology. Teacher Ellen said,

I don't want to say some kids are better at using them because of their age because it's really about where they're at. I would say, you got some that are more advanced and find some things that are too easy. Then they won't be challenged.

Despite prior technical challenges and the lack of use in her own room, Teacher Ellen strongly believed that the children should be using technology in the classroom. She stated, “Everything is technology, so it's helping them to stay up with society.” She laughed that her own students have helped her with her technical challenges when she began using the devices:

Actually, the kids help me figure out how to work certain games and how to find certain things on them. I will say, “I really don't know which game you need help with.” Then, they will find it or one of the other kids will help them.

Teacher Ellen's experiences offer good examples of what teachers need to know for a successful implementation. She took a great deal of time to plan ahead and considered her own ability to use the devices. With her thoughtful planning, her implementation went well even though she had never used the devices before in her classroom. Following her three interviews and three observations, two key themes emerged as her students used the iPads: (a) classroom

management, (b) perception of the interaction between children while using the technology, and (c) engagement at varying levels.

Classroom management. Similar to Tanya, Teacher Ellen expressed that she put a lot of thought into the iPads before implementing them. Her primary focus was to make sure that the children did not access any content that was inappropriate. Hence, she intentionally had all of the students work under her direct monitoring at a kidney-shaped table so she could monitor the content the kids were accessing. Rather than allowing children “exploratory time” on the devices, she had all the children using the same educational app. For Teacher Ellen and her comfort level with the devices, allowing children to begin with one app was developmentally appropriate. She would monitor how long the children were at the table with her before she rotated them out and brought in another group of students. As her confidence grew around the tablets’ use, she had changed her approach by the third interview. She said, “I learned how to close apps and hide them so now I let the kids explore so they can try the technology more.” The initial monitoring of the students, in addition to her own subsequent personal growth around tablet usage, helped Teacher Ellen develop her existing device management system.

Perception of the interaction between children while using the technology. Teacher Ellen pointed out that the devices generated new social interactions between children. She said that she spends a lot of time observing and listening to her children as part of documenting their progress. She noticed a great deal of social, emotional, and communication growth as the children interacted around the tablets. She reported, “They’re showing each other how to use them. They share videos they made or activities they chose.” She also reported that she hears them communicating with each other. “I have heard them say, ‘How did you find this one?’ and ‘Where did you get that?’” She believes that this type of communication is helping them

develop because kids who are often quiet will talk more around a device. “I know it’s good for them to have social communication while they’re playing and tracking with each other. It’s something that is going to be expected of them. So, yeah, it’s good,” she stated during her last interview.

The teacher spent a great deal of time describing the interactions she was observing in her classroom and how the tablets engaged the children. I observed different types of engagement as the children used the devices similar to what I heard the interviews. During each of the three visits, I observed how children engaged the devices by themselves, in pairs, and in small groups.

Engagement at varying levels. Similar to what occurred all of the observations in the other classrooms, the children in Teacher Ellen’s classroom who used the devices were engaged and focused regardless of the apps that were being used. By seeing all of their smiles and listening them to speak to their friends, the kids often appeared motivated. They would show their friends something on the screen, and they would laugh or smile. During one observation, a little boy watched the girl next to him and called the teacher every time she got a correct answer. He would call, “Look teacher, Maddy is doing it.” During these observations, there were opportunities for the teacher to assess the different types of peer interactions that were taking place. In addition, she could monitor what the children were doing by listening to their conversations and the comments the kids were making. This was all be done even though she was not directly involved in the activity.

Classroom Obervation Information

While the study is not designed for generalizable results, it was still important to get apurposive sampling from very distinct geographic areas within LRUSD. Table 1 offers a summary of the iPad implementation in the different classrooms

across the district.

Table 1

Description of Participants and Their iPad Implementation

Teacher	Location	Experience and qualifications	Description of iPad implementation
Katya	Central	33 years Bachelor's Children's Center Instruction Permit	Structured activities with apps Used for music Students used them indoors and outdoors
Elise	East	15 years Bachelor's Master's Child Development Site Supervisor's Permit	Structured activities with apps Children read e-books Children created drawings Children took pictures Children created videos Teacher used the iPad to document student progress
Ellen	North	20 years Bachelor's Child Development Teacher Permit	Structured activities with apps Children listened to stories Students used iPads in a specific activity area
Patty	South	24 years Bachelor's Master's Child Development Program Director Permit	Structured activities with apps Students used iPads in a specific activity area
Tanya	West	27 years Bachelor's Master's Children's Center Instruction Permit Clear Multiple Subjects Teaching Credential Child Development Site Supervisor's Permit	Structured activities with apps Children read e-books Children listened to stories Children took pictures Children created videos

Note. All data were collected via three interviews of 20–30 minutes each and three observations of 20–30 minutes each for each teacher. For Tanya, additional data were collected through one email following up on an observation.

At the conclusion of the interviews and observations, intense reviews of the interviews demonstrated consistency between the teachers even though they had no contact with one another and were spread across the district. In addition, classroom observations revealed similar actions by the teachers or the students as they used the iPads in their classrooms. Both interviews and observations provided sets of constant values that gave me insight to the many complex concepts that the participants were experiencing as they implemented the devices into their instruction program. During multiple reads of the interview transcripts, viewings of audiovisual recordings, and reviews of observational notes, I began labeling some of the ideas. Eventually, some of the initial labels became the open codes listed in Table 2. After many reviews of the open codes, trends began to appear and provide a better picture of how the codes could be categorized or grouped. Furthermore, the word arrays and code identification helped me better understand what the teachers were experiencing during the research study. During the creation of the enumeration table, particular attention was paid so that the codes and word arrays would be analyzed in the contexts they were being used. The open codes and their appearances across the case studies have been identified into themes based upon observations and interviews of the five participants.

Table 2

Enumeration Table from Individual Case Studies

Theme	Code	Occurrences
Experiences with implementation and management of the devices	Advanced planning	3
	Apprehension by teacher	11
	Classroom management while in use	14
	Concerns about implementation	16
	Identification of potential problems	12
	Management of devices while not in use	7
	Small group use	3

	Use of rotations	5
	Use of a timer	7
Assessment	Assessment capabilities of the iPad	4
	Ease of use	13
	Incidental learning by teachers as the tablets were used	6
Communication	Dialogue between students	16
	Dialogue between teacher and student	10
	Nonverbal communication	8
	One-way verbal communication	10
	Vocabulary development and language growth	14
Use of developmentally appropriate practices that leads to growth	Children's play	11
	Creative uses by students (use of camera or video)	11
	Developmentally appropriate practices	22
	Independent choice	16
	iPad use for instructional support	20
	Use of educational apps	
	Cognitive growth observed by teachers	17
	Problem solving by students about how to use the device	14
High engagement, socialization, and interaction	Engagement while using the devices	21
	Interaction between adults	16
	Interaction between children	29
	Sharing by children or turn-taking	9
	Socializing between children	25
	Support between students	7
	Support from the teacher to students	11
Perceptions about tablet technology	Difficulty with desktops	10
	Independent use without interaction	6
	Limited access by students	8
	Misconceptions about device use	1
	Prior use of technology in the classroom	3
	Professional development and support	17

Ultimately, the combination of word arrays and open coding led to the themes that will be discussed in the next section of the chapter.

Theme Development

Data Analysis

While the perceptions and themes were reported as individual, separate, and distinct, there were considerable consistencies amongst the five interviewees experiences and my observations. Furthermore, the five participants responded to interview questions that often included information that could be applied to more than one theme. In the five individual case studies, the data that are being described have been applied to the most logical themes.

Multiple-case study research consists of single cases, which were examined in the first part of this chapter. Through the collective analysis of each of the individual case studies, two themes emerged from the multiple interviews and multiple observations conducted. This part of the chapter will look at the two major themes that emerged from a cross-case analysis. As part of the analysis, I examined and arrayed the interviews and observations in the form of word tables. The following themes have been identified:

1. Early education teachers experienced children communicating in different ways.
2. The teachers experienced technological success and perceived that their students were experiencing cognitive growth.

As a reminder, each of the children in the study are eligible for these preschool programs because they are low-income students with an additional identified need. While the specific additional need cannot be identified for each child participating in this study, all of the children participate in full-day, full-year, center-based programs. Understanding the children that are

receiving early education and care in these settings is critical to the study as many of these children do not have equitable access to these types of technological devices.

Theme 1: Children Communicating in Different Ways

This theme is important because it addresses one of the experiences the teachers had while implementing the iPads into their instructional program. The understanding that the children were communicating differently around the iPads was consistently discussed by all of the participants. Every teacher experienced children communicating around the iPads in new ways. Theme 1 is described in two parts: (a) teachers' perceptions and (b) teachers' experiences. Each of the parts has been divided into sections that are based on the teachers' perceptions and experiences with their students as they used the iPads during the course of this study.

The first part of the theme was based on the perception that student communication took different forms. As part of their job to interact and observe their students, the teachers regularly observed student behavior and listened to the conversations the children were having. With the introduction of the iPads into their classrooms, they perceived student communication development in three areas: (a) nonverbal communication between children, (b) verbal one-way communication as children spoke but did not receive a verbal response, and (c) peer-to-peer communication where each child made at least one verbal response to one another. The words *watched*, *stared*, and *looked at* (Table 3) were repeated among the teachers as they described their observations of what the children were doing as they watched other preschoolers use the devices. For the purposes of this study, these terms were often associated when one child had an iPad and the other did not.

Table 3

Word Arrays on Teachers' Experiences with Children's Observations

Number of times counted	Context
1	The other kids were watching him use her iPad and staring.
2	and they'd get a turn to watch whatever they wanted
3	others, very hesitant and just would watch—wouldn't touch it for at least a week
4	She looked at it for two days, then tried it
5	And sometimes they'll look as they'll stand behind
6	And one child once wanted the tablet, but he just stared
7	The other kids were watching him use the iPad and staring
8	I really haven't had any challenges yet, besides criers who won't, or kids who just stare
9	where they're at right now like some kids just stare at them
10	then they're kinda eyeballing each other like, how do you do that
11	um, helping each other out, if one's just watching
12	and the child just likes to look at it
13	They come and they'll just look right at the table and sometimes there's a tablet available.

Note. Words are *looked*, *watched*, and *stared*

During the interviews, three teachers noted that there was a great deal of nonverbal communication that occurred as the children used the devices. Teacher Tanya set up the iPads in an activity center as an independent choice area. She would sit there and children would come and use the different apps on the devices. She began to notice that there were some children who would stand behind the others and just watch. She stated, "Some of them are right on with the screen usage and they know how to use the devices. However, there were others that were very hesitant and just would watch—wouldn't even touch it for at least a week." When asked why she thought this was so, she explained she believed that the students were communicating interest but were waiting for an invitation because they were unfamiliar with the devices. When she would notice children watching, she would invite them to join and make attempts to involve them. To help the child learn, the teacher initiated a verbal invitation to begin an adult-child interaction.

Similarly, Teacher Ellen found that some of the children quickly grasped a music app where the kids could sing children's songs that were set to animated videos. She noticed that the same children would hold the iPad because they were the ones that knew how to find the songs. This behavior is consistent with the findings of Arnott (2013), who reported that children took on different roles as they used digital devices. She stated, "Children make choices about their roles and they are not necessarily bestowed upon them, nor are they static" (Arnott, 2013, p. 109)

There were other children that would gesture signs of approval but did not want to hold or control the iPad. During an interview that took place during the third week of implementation, Teacher Ellen stated, "For this week, I saw more kids sitting, getting close to them, and seeing what the other kids were doing. It is a sign of where they are at." She speculated that the children who were observing others were also waiting for an invitation to participate or waiting to use the device on their own. She said, "I guess they want to figure out how to get to the app and then try it on their own." When she noticed a child's interest, she would engage the child and ask, "Would you like a turn?" If the child indicated an agreement, she would help immediately engage him and get him started on a device. Whether she was aware or not, she was applying Vygotsky's zone of proximal development by meeting the children where they were at and, at the same time, challenging them to learn more. In this case, the teacher challenged the student to use an iPad but also met the child at a comfortable place in their technological development.

Teacher Patty shared how she engaged some of the kids who showed interest but did not know how to express themselves verbally.

I see them watching so I call them, and the ones that are really hesitant but watching from far away. I pay attention, and I'm like this because I know this baby would never come

on their own. When they come, I go over with them hand by hand so they feel comfortable with the challenge because it is something they have never been presented with before.

She added that she watched them closely to see if they would challenge themselves or if they needed some prompting until their confidence grows.

Cases like the ones described by teachers Tanya, Ellen, and Patty illustrated how nonverbal signals by the children were forms of communication that indicated they were ready to try the iPads. However, it took trained teachers to recognize their desire and engage them. Understanding when a child is ready to engage was a critical step in helping the teachers implement the devices successfully in their classrooms. The keen observations and developmentally appropriate steps to generate student interest were also accomplished by the teacher when the children lacked the verbal or social competencies to engage.

All five of the teachers indicated they observed their students communicate nonverbally a great deal when they first began implementing the iPads in their classrooms. During the iPad introduction in each of the rooms, Tanya was one of the teachers that first observed how children who have never used an iPad went through an observation phase with limited interaction. In this case, she was speaking about a little girl named Sophia: “For her, and some of the other kids, the first step was watching. Whether they chose to come to the tablet area or not, she was watching and hearing how other kids used it.” When questioned about making all the children use the devices, Tanya shared that she believed that all the children, including those with special needs, would ultimately decide to try them. This is a critical decision that is consistent with sociocultural learning theories (Vygotsky, 1978) about how children learn. In this case, Tanya was allowing a child to make an independent choice with adult assistance.

Katya was another teacher that noticed some of the children liked to sit alongside or stand behind another child but not actually use the iPad. In the event she saw a child standing behind another student, she would invite them to sit next to their peer and say, “Do you want to sit? You can watch, but it is So-and-So’s turn and if they want to choose another app, that’s their choice.” She found that little by little the observant child would engage with the other child. In this case, Teacher Katya used peer-to-peer interaction to support a child’s learning.

Katya explained that she would regularly observe children around the iPad, but did not always engage them as she wanted to let them work together in a natural environment they created. She said, “One might be over here, but then, they [the students] are watching each other like, ‘How do I make it take pictures too?’” When she noticed children in these situations, she would determine if adult facilitation was needed to stimulate the interactions. She would ask, “Well, what is it that you are looking for?” This would help the children become more verbal with her. These simple observations by the teacher created adult-child interactions that helped children move from nonverbal to verbal with minimal adult prompting.

In other words, Tanya and Katya were acutely aware of how children were displaying nonverbal cues that they were interested in trying the iPads but did not know how to engage them. At times, these nonverbal cues were also opportunities for the teachers to facilitate an interaction to foster learning. During the interviews, two other teachers shared anecdotes about observing preschoolers whose interest with the iPads began with watching fellow preschoolers using the iPads. Together, the descriptions revealed a pattern whereby some preschoolers first observed their peers using the iPads before gradually beginning to use themselves.

Tanya, for example, reported observing children that were afraid of using the iPads because they did not have any technology at home. When questioned about how these devices

were being implemented in subsidized care programs, she responded, “I have a couple of children—these are the newer children in here who still won’t play with it.” She added that she will eventually get all of them to use it when they are ready for it. “One little girl was watching a friend take some pictures, so I showed her how to slide it to video. I showed her how to do a video and when they watched it, they just laughed. They just kept replaying it and laughing,” said Teacher Tanya. She added, “While they are not talking a lot, they are learning to enjoy the device and how to share an experience with one another.” Her effort to create an enjoyable learning environment is in alignment with Froebel (1974), who strongly believed that children learned best when they were in a playful learning environment.

Over the course of the interviews, teachers shared a second type of communication that they commonly observed. The statements they made illustrate one-way verbal communication as children used the iPads. Emphasis is placed on the word *verbal* because their stories definitely provide examples of two-way communication, but this communication did not always consist of spoken language. The stories often provided examples of verbal statements that a child made to another child or to an adult that were not reciprocated with a verbal response. The interviewees made statements about how these verbal statements by kids were used to share excitement to the teacher or their friends. Additionally, the kids made similar statements that were used to elicit feedback from their teachers. Common words that came up during the analysis of these areas were *look*, *help*, and *teacher*.

All five participants stated that children frequently said, “Look, teacher!” when they wanted to elicit a response from their teacher or show them something they found or successfully did on the tablet. This usually came as children completed a project or when they successfully accomplished a task. This was often accompanied by an app-generated statement like “great

job” or an action like stars flashing or a rocket ship blasting off that showed the child he had correctly completed a task. In addition, the teachers reported that they often heard students sharing their iPad screens with a friend accompanied with statements like “Look at this” or “See this.”

Besides these common words and phrases, Teacher Patty recalled an episode where one child asked a question to a peer, but his friend lacked the specific vocabulary to respond with verbal directions. She shared,

They are playing as parallel partners, and they’re kinda eyeballing each other. They are thinking, “How do I get to the same app as my friend?” without saying so much language. Then they’ll finally say to their friend, “How do I get there?” The friend usually takes their iPad and takes them to the app but doesn’t respond with words.

In this case, the teacher perceived that there was verbal communication on the part of one student and a nonverbal response (like a gesture) by the other student. During another observation, there was a little girl who was playing a puzzle game with the letter C. As she successfully dragged the puzzle pieces into the outline of a letter C, a bell from the app would sound. Eventually, all of the pieces were in place, and the bells rang and the lights flashed. When this happened, I observed a little girl saying to her teacher, “Look! I did it.” The teacher acknowledged to the good work of the child with a smile, which was all the little girl needed to feel a sense of accomplishment. The child then returned to the app and moved to another letter. These quick one-way verbal exchanges with a physical acknowledgment gave the child enough positive feedback to try another task.

Teacher Katya stated that the iPads have made the children more comfortable as they learn English. They would say small phrases like, “Teacher, help” or “Look, teacher.”

Additionally, Teacher Katya believed the kids were speaking more in English because they were picking up vocabulary from the songs on the iPad. She stated,

A lot of our kids are dual language learners and a lot of them are Mongolian so they don't even attempt to speak but I hear them singing the ABC Song or the Five Little Speckled Frogs. It has increased their language, and the behavior has changed because they have empowered themselves to try to talk now. Now they ask me, "Teacher, how do you turn off?" or "Teacher, new song."

She says she does not always engage them in a conversation because that would only lead to frustration since their language comprehension skills are not ready yet. However, Teacher Katya discussed how these were opportunities for her to engage students and teach them how to navigate through the various educational apps on the iPad: "It's a thing, so they try it and they don't get frustrated. They learn to work through it—'cause my thing is empowerment," she said.

Teacher Katya attributed a child's ability to confidently use language to the iPad implementation. Similarly Teacher Patty felt that this the language growth she observed in her students was stimulated by the iPad use. In either case, the teachers saw language growth happening with their students, but each had a slightly different opinion based on her experiences and observations. Katya believed that her children were getting more comfortable with language because of the songs they were singing from the iPad. In turn, the children felt more confident to ask questions or make simple statements to her. In the case with Teacher Patty, she felt the kids would respond in English when they were more comfortable with the language.

The third experience the teachers observed was the increase of peer-to-peer and student-to-adult communication that took place when the children used the iPads. Teacher Elise said she

would listen to the children's conversations when they were using the iPads. During one of the interviews, she shared an exchange between two children:

Student A said, "Okay, it's my turn now."

Student B responded, "When I'm done, it'll be your turn."

Student A said, "Okay."

Student B responded, "It's your turn now. I want to watch you."

While this could be an exchange that could have happened at any activity center in the room, Teacher Elise felt that this situation was unique because she had stressed the importance of sharing the iPads and not arguing over who gets to use them. This experience led her to believe that the kids were developing both communication and social skills like turn-taking. She felt this short verbal exchange was an example of how children were mixing social, cognitive, and vocabulary growth.

Although Teacher Ellen did not recall any specific exchanges, she did perceive the students to be talking more with one another. She stated, "They're talking to each other, you know. They're asking each other for help and saying things like, 'Can you help me?' or 'Where is that one?' It's communication. There's a lot of language going on." She added, "It's interesting because it helps the quieter kids too." She expressed that she was not sure why this was the case, but she has heard more children helping one another. She has heard students say, "No, you push it here" and "You do it this way." When she heard children speaking to one another like this, she found the children helping one another or playing together on one iPad even though they each had their own.

Teacher Katya was one of the teachers that gave the students a chance to use the iPads outdoors. She found that the conversations that take place outside interesting because students were more talkative than when they were in the room. Teacher Katya said,

Kids will check them out and take them to any area on the yard except for the water places. They just love to video each other doing stuff like singing or jumping. Then they come and play their videos for me. I ask them, “How did you do that?” and “Who are your friends in the movie?” They make up silly stuff and then they leave the iPads and go do something else. They don’t know it, but I am making notes for the DRDP to show that individual children are now having conversations.

Within this particular situation, Teacher Katya used the verbal exchanges as evidence to support a child’s growing language and literacy development. According to the DRDP Language and Literacy Development section, the exchange could be noted as progress in one of the following areas: (a) understanding of language, (b) responsiveness to language, or (c) reciprocal communication and conversation. Table 4 is an array compiled from a cross-case synthesis of the transcribed interviews.

Table 4

Word Arrays on Teachers' Experiences with Children's Communication

Number of Uses	Context
1	She drew a caterpillar and she said, "Oh, look. It's a caterpillar."
2	I mean, they're learning to talk it over.
3	Can you help me work it?"
4	Help me teacher.
5	So some of the kids were helping them saying, "No, you push it here."
6	They're talking to each other.
7	It's a lot of language for them 'cause they're talking to each other more.
8	It's communication, a lot of language going on.
9	And Teacher look, it's going..."
10	Often, I'll see one looking over another child and they'll say, "What do you win? Or what are you playing?"
11	Okay, we're getting the dialogue where they're sharing.
12	I do have one child in here. She's a very smart child but for some reason, she doesn't, she can't speak. She has a very hard time but she's learned how to say "tablet" fairly well.
13	They wouldn't have talked about touching or pressing before, so this is all added to their vocabulary, their comfort levels.
14	Look! I did letter C.
15	Oooh, look teacher. I traced my name.

Note. Words used were *communicate, help, look, share, speak, and talk.*

Teacher Katya was not the only one who referenced language development in the context of the iPad implementation, as there were plenty of examples of how teachers could formally measure language growth as kids interacted around the iPads. The concept of using the iPad to document student progress will be further discussed in Chapter Five.

Theme 2: Teachers' Technological Success and Students' Cognitive Growth

The second theme is directly related to what the teachers experienced as they implemented the iPads into their instructional programs. This theme can be also divided into two parts. The first part is how the teachers perceived the students were learning and developing new skills as they played educational apps on the iPads. The second part of the theme is how teachers anticipated operational challenges as they implemented the devices into their programs, which

led to better planning and subsequent implementation success. Both of these subthemes provide information related to the answering of the first two research questions. The first subtheme in this section emerged as teachers commonly used terms like *help*, *problem solve*, *share*, and *try* during their interviews.

At onset of this study, Teacher Patty's classroom had no working computers, and she had never used an iPad in her classroom. According to Patty, she "would use the desktop but it doesn't work. It is a little bit more dinosaur." Recognizing this deficiency, she used other forms of technology in her classroom like the radio, CD players, and her own personal smartphone. The plan to introduce the iPads into her room gave her the option to introduce the technology to her kids while learning it herself. She said,

I realize that if I'm going to help them, I really need to learn the basics myself so we can explore together. Even if they couldn't figure it out, I'd say, "We'll figure it out, just push the X." So what I do is take the curriculum, and the tablet now, and intertwine them together. If I am working on a specific letter or number, I am able to let them explore it on the tablet.

Many of the teachers also experienced how tablets supported noncognitive skills like those monitored in the DRDP. Teacher Ellen noticed that the kids were developing social skills that were an integral part of readiness for kindergarten. "There's the sharing, helping each other out," she said. At the onset of the study, she shared that she was concerned that the children would fight over the iPads, but she never experienced this. She admitted she did not track any of the social progress on the children's DRDP, but she did observe that the kids were better at sharing the iPads than other objects in the classroom.

Teacher Elise, for example, described the learning that resulted when she implemented the iPads into her instructional program: “I think it’s called Sketch It. I’m not sure if that’s the name, but the kids use their fingers to form letters or their name.” For her, it was a way to track fine motor skills and determine if a child was progressing in their ability to trace or write their name. Another observation she made about how the children were learning was when she saw how the children were able to take the iPads around the room and document their own work. Whether it was using the iPad to write letters or using the camera app to take pictures, she felt that the iPad was helping children learn in new ways.

What they do—they take the iPad around the room. Let’s say they built something with blocks and they’ll take it over and they’ll take a picture of what they built. At the beginning, there was only the games. But now some of them, like I said, are moving from the games and finding creative uses for the iPad.

Elise’s comments describe how the devices supported skill development but also give insight on how a child’s creative development is fostered as they use the devices more. Her experiences of implementation dispelled a misconception that she had, which was that children would just want to play games on them. She encouraged her colleagues by saying, “I had the idea that the kids would only like games, but now as I’ve seen them being used, I know they’re actually learning. They’re learning socialization, cognitive skills, and everything.”

She also experienced social and cognitive reinforcement of skills that need to be established before the kids leave for kindergarten. She shared the following experiences with me:

I saw the kids actually helping each other ’cause some the kids didn’t know how operate it. Some of the kids were helping them saying, “No, you push it here” and “You work it

this way.” They knew how to help each other with it. One of the kids got stuck on this program and the other kid said, “This is what you need to do, connect the dots.”

Teacher Elise had experiences similar to Teacher Ellen’s of children helping one another. She commented, “Right now, I see them—when one needs help with an iPad or one knows more than the other, they help each other. It’s like Buddy Time in the Sanford Harmony curriculum.” Teacher Elise was referencing the Sanford Harmony program, which is a social-emotional curriculum that the teachers use to foster inclusion and relationship skills. The Buddy Time she referenced is designed for two students to work together to accomplish a task while building friendship and inclusivity. She also believed that the experience of using the iPads helped her children learn because it matched some of their learning styles:

The children enjoyed it and they actually learned things quicker. I mean, every child is different. Some learn by visualizing, some learn by sensory, some learn by just talking, and some learn by listening. I think it’s good for some of the children that need the visual. It just seemed to help them.

Similar to Teacher Elise, Teacher Ellen did find areas of cognitive growth too. She explained,

I know it’s good for them to have social communication within their daily experiences. I see them playing and tracking with each other as they use them at the same time. So they get into it and don’t even realize they are counting or matching letters.

Based on their experiences, the study participants advised hesitant colleagues to simply try the devices in their classrooms. Their personal experiences are shared throughout this next section of the study. These experiences were unique to each of the participants and demonstrate how

they used the devices in their classrooms. Along with their experiences, the word arrays in Table 5 revealed underlying concepts that helped them all experience successful implementations.

Table 5

Word Arrays on Teachers' Experiences with Instructional Benefits

Number of uses	Context
1	Then they'll try to eventually help them.
2	I think just trying out the iPad
3	Actually, the kids help me...
4	I think that with technology, it's a different kind of problem solving.
5	Sit down and ask them to show me how to use it and try to figure it.
6	And so far, every time I've needed something, they either help me or I've gone out in the world and they've helped me.
7	I would share with them to start with basics. Basics being able to teach the children the home button.
8	So I'm gonna [sic] have to try something different.

Note. Words used were *help*, *problem-solve*, *share*, and *try*.

Teacher Patty found she needed very little to successfully implement the iPads into her instructional program, and she experienced very few challenges. Her personal system of implementation was similar to the approach that she took with students. "The challenge for some of the kids was they were presented something they have never done before. I was like that too with the computers in the classroom," she said. Since the implementation was new to her, she disclosed she would ask herself two questions: "Why am I afraid to do try?" and "How do I start?" She said when she was able to answer these questions, she got a "little more comfortable" using the tablets. When she reached this level of comfort, she was also ready to help the children. Her experience leads her to offer this advice to other colleagues:

I'd probably take the same technique with them because it is something new. It's something that they're not familiar with, so they have to kind of take a little bit at a time

until they are able to take a full course meal and eat it all. We have teachers that are not that into this technology as well. But as we look around, we all have to get there.

Teacher Ellen also experienced a great deal of apprehension prior to using the devices. To alleviate her initial fears, she made sure to introduce the tablets to the kids in a very systematic way. Recognizing her own apprehension made her cognizant of how her feelings could disrupt the ability to implement the iPads in her classroom. She disclosed, “I noticed the adults were sometimes more apprehensive to try them than the kids, so I would ask the kids to show me things. I would ask them ‘Can you help me work it?’” Feelings of inadequacy were listed as one of the barriers that prevented K–12 teachers from implementing technology in their classrooms (Blackwell, 2013). In her case, her ability to recognize her own apprehension was overcome as she saw how eager the kids were to help their teacher learn how to use the iPad. She explained that, to a great extent, the success she saw the kids having with the iPads was a major reason the devices were now a critical component to her program. She stated,

This study reminded me that not all kids have access to these programs, you know, at their homes or in other places. In early ed, I see so much language growth as they explain things to me or help their friends ’cause the kids start talking to each other more when they use the iPads. They say things like, “How do I get this game?” It’s not just language but communication too.

Ellen’s personal experiences offer qualitative data that help establish a pattern that initial apprehension can be overcome when the teachers recognize and acknowledge their fears but do not allow those feelings to stop them from trying. Teacher Katya outlined a similar pattern of initial fear on a larger level, as she was concerned that her colleagues would be afraid to try the devices. She explained, “The teachers are afraid of using them, but the tablets are very self-

explanatory. Just try them.” She added that many of her colleagues use smartphones, so tablets are not that much different. If given the opportunity to share her experience, she would encourage them,

Sit down and ask someone to show you how to use it and try to figure it out on your own too. Don’t be afraid and if you get stuck, just push the X or the home key. Then, if you can’t figure it out, find one of the kids that can teach you and the other kids. They love playing the teacher.

Unlike Ellen, Elise acknowledged that she relied on her personal experiences and knowledge to help guide her implementation of the devices. Since the iPads came preloaded with a few educational apps, Teacher Elise felt teachers would need very little support to get started.

Although she acknowledged that some of her colleagues may be afraid at the onset of implementation, she believed they could learn it quickly. When asked the question, “What other supports are needed to help other early education professionals integrate tablets?” she responded,

I think it’s helpful to have them instead of computers. I don’t think we need any other support because basically, all of the teachers now—all of us know how to handle an iPad. Since these came with some apps and games, we didn’t have to go searching for some, only if we wanted extra ones.

In their responses to interview questions, the words *afraid*, *challenges*, or *fear* were repeated multiple times, but this time the words were used in reference to the physical management of the devices (Table 6). These words came up during the first round of interviews as they were asked what were some of the challenges they foresaw.

Table 6

Word Arrays on Teachers' Challenges Implementing iPads

Number of uses	Context
1	I think—the only challenge is the children all want to use the iPads at the same time.
2	I think that was a challenge to get them all to use it.
3	I don't think we need to be afraid or need any other support 'cause basically all of our teachers—all of us know how to handle an iPad. And if you don't you can ask another teacher.
4	Some of the kids are more advanced and some of them will need more challenging apps so it's still a challenge for me.
5	I haven't let them use the tablet as much because I'm a little afraid of it getting broken.
6	So teachers need basics, closing them and not to be afraid of it.
7	Show the educators that are afraid of it, you can't ruin the whole economy because you have a tablet.
8	I don't know if they're afraid of technology . . . The whole world is at your hand if you allow it.
9	They're self-explanatory. Just try it. Nothing is going to happen to the tablet.

Note. Words used were *afraid*, *challenge*, and *fear*.

Teacher Tanya asked about the challenges of finding enough plugs to keep the devices charged and ensuring the batteries were not drained completely. Teacher Elena was concerned about the devices getting stolen and finding a space that they could be secured since none of the classroom closets had locks. Two of the teachers also shared that they were concerned about the iPads breaking because their experience has taught them that kids can be pretty rough on classroom items.

Almost two months later, I shared some of their initial concerns with them and asked them to reflect on the challenges they had initially anticipated. I also wanted to know if they had been able to resolve these concerns over the course of the study. Of the five participants, none of them found theft, breakage, or charging to be a challenge. These initial predictions seemed not to materialize, as the teachers seemed intent on addressing the issues as part of their

implementation plans. For example, they strategically planned ahead and taught the children how to care for the devices to address any concerns over breakage. When I questioned them about why their concerns did not seem to materialize, Teacher Katya compared her preparation to a good lesson plan:

When you think about all the problems that could arise, you plan so they won't happen. So what I tried to do was think of all the things that could physically go wrong with the iPads and planned for those too. Since I was concerned about them breaking, I showed the kids how to carry them using the handles and had them practice by passing them around in the group.



Figure 5. Planning ahead helped the iPad implementation. Teacher Tanya found an extension cord called an octopus that allowed her to address a challenge of how she would charge all of her iPads at one time given the limited number of outlets in her classroom.

Teacher Tanya created a charging station using an extension cord called an octopus (Figure 5). In addition, she kept the iPads in a padded rolling cooler bag and so she could take the tablets to any place she wanted the kids to use them. Meanwhile, Elise assigned a couple of children as iPad monitors who would make sure the tablets were plugged in and stored in the closed at the end of each day. In each of these cases, the teachers planned ahead so their initial fears and challenges would not come to fruition.

Summary

In this chapter, I presented the findings of the study as individual case studies. From these case studies, a cross-case synthesis was done, key words were identified, and two major themes emerged. These themes were based on the analysis of interview transcripts and were supported by observations in each of the five classrooms during the course of the study. The findings were discussed in two parts that corresponded with the major themes that emerged from the data.

Data in the first section focused on individual case studies as each of the participants introduced the iPads into their classrooms. Data were collected for each participant through the transcriptions of three interviews. In addition, each classroom was observed on three different occasions to see how the iPads were being implemented into the instructional programs. Based upon the teacher interviews and classroom observations, each classroom was analyzed as its own unique case study. Once all of the data had been collected, word arrays were created, and a method known as cross-case synthesis was used to collectively look at all of the individual cases to see if any common themes emerged between all of them.

In the second section, participants described (a) what they observed as students communicated in nonverbal ways as they began to engage with the devices, (b) what they observed and heard as children used one-way forms of communication, and (c) what they observed and heard as children communicated with one another and the teacher. In the area of data analysis, participants described how they experienced technological success while observing cognitive and social growth amongst their students.

The final section focused on the participants' experiences and what they perceived would help their colleagues plan for implementation. At the beginning of the study, words like *afraid*,

challenge, and *fear* were part of every interview. However, thoughtful planning and the iPads' ease of use helped dispel fears and challenges as the teachers implemented the devices into their instructional programs. Although the teachers never met with one another, there was general agreement that the iPads also provided another way for their students to learn while playing educational apps or using the tablets in creative ways.

Among the outcomes are (a) creation of well-thought out implementation plans, (b) use of iPads to support skills, (c) understanding the different forms of preschool communication between students and teachers when the iPads are in use, (d) creative uses of the devices, and (e) improved vocabulary and communication skills. In short, early education teachers discovered that the iPad implementation into their instructional program produced new forms of socialization, communication, and learning in their classrooms. Classroom implementation and use does vary from teacher to teacher, which makes it difficult to evaluate the best approach to their introduction into all subsidized care preschool programs. To that end, Chapter Five discusses the implications that emerged from this study, and recommends future topics for research.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Overview

The purpose of this multiple case study to understand the experiences of preschool teachers as they implement iPads into their instructional program. Based on the results, an in-depth understanding of how professional development can be designed and developed for early education teachers. These findings are even more critical since children in subsidized preschool programs have less access to digital resources outside of school. Research was conducted through semi-structured face-to-face interviews with five early education teachers and through observations in their classrooms. The study was conducted with the approval of the district's Committee on External Research and Review (CERR) and the university's IRB. This chapter reviews, discusses, and makes recommendations in light of the relevant research and literature. This chapter also outlines the implications of the findings and how they could be used to guide professional development and other purposes. However, the implications from this study are designed to guide professional development for early education teachers who serve low-income children in subsidized preschool programs. The chapter concludes with suggestions for future research around the training, implementation, and use of tablet devices in subsidized preschool programs.

Summary of Findings

Three fundamental questions guided the research for this study:

1. How does socio-cultural learning theory (SLT) and developmentally appropriate practice (DAP) apply to a preschooler's use of tablet technology?
2. What do early education teachers need to understand so iPads can be successfully utilized in a preschool classroom?

3. How do early education teachers describe their experience as they implement iPads into the instructional program?

The research questions were answered by themes that emerged from interview data, and were reported in Chapter 4.

Discussion

Theme 1: Children Communicating in Different Ways

The research around quality prekindergarten programs is primarily based on constructivist theory (Mahoney, 2013; Piaget, 1951) and child-initiated exploration as in the sociocultural learning theory (Bulotsky-Shearer et al., 2011; Vygotsky, 1978). Researchers also agree that a critical period for a very young child to develop communication skills is their preschool years (Neuman, Newman, & Dwyer, 2011). In light of this study, communication skills and vocabulary development often lag behind children from economically disadvantaged backgrounds. Neuman et al. (2011) stated, “Children from economically disadvantaged circumstances tend to have less extensive vocabularies before they enter school than their middle-class counterparts” (p. 249). To prevent a similar digital achievement gap, the findings of this study are of critical importance because of access and equity concerns for low-income families.

The preschool teachers in this study had wide range of experience with working with very young children. All of them progress monitor their students using the DRDP, but only one used it during the study period. In particular, there are specific measures within DRDP that could have been helpful if the study had been focused on student progress. Since this was not the focus, but a topic that was discussed by teachers, it is a topic that will be discussed as a recommendation for further research later in this chapter.

Teachers in this study experienced new forms of children's communication when the kids were using the iPads. Their observations are consistent with a child's developmental progress as measured within the DRDP sections called: (a) responsiveness to language, (b) communication and use of language, and (c) reciprocal communication and conversation. Observations and data collected through the semistructured interviews evidenced how children were communicating while they were using the tablet devices.

In general, giving teachers the autonomy to plan how the iPads would be appropriately introduced in their classrooms could be used as a springboard of how lessons could be specifically designed to enhance communication. The teachers' perceptions from this study could be shared with other early education professionals should the iPads be implemented in other subsidized programs. Research by Parette et al. (2013) found there is a need for other programs to embed technology into early education classrooms too. Their study reported, "Although the presence of technology in many early childhood classrooms in the U.S. may not yet be present, or minimal, there is growing use of an array of technologies with young children that could be used in education settings" (p. 171). When early educational professionals are given the opportunity to learn from their colleagues about current research, they can take those ideas and enhance them to fit their particular classrooms and situations

The early education teachers in this study, as reported in Chapter Four, discussed their observations of what they were seeing the kids doing and saying as they interacted around the iPads. The semistructured interviews provided qualitative evidence of what the teachers were experiencing and the value of the iPads as a tool to promote communication. However, study findings demonstrated the need to collect quantitative data around the children's progress as measured by the DRDP. As Teacher Patty stated,

I'm hearing more communication. I'm hearing more collaboration than parallel play.

They'll ask me, "How do I get there?" and I'll turn to them and say, "Well what is it you are looking for?" Then they become more verbal with me without even thinking about it.

Teacher Tanya heard similar types of communication in her classroom. She stated,

They keep finding new things to say. I heard a kid say, "I want to go where you're going." The other child responded, "You have to do a double tap and then you can see the last one." They wouldn't say these things if they were playing in a block area." Tanya's perception was that the children were generating new types of conversations that were different than conversations she had heard in the past.

Theme 2: Teachers' Technological Success and Students' Cognitive Growth

Preschool teachers described what they perceived were going to be challenges for them as they implemented the devices into their instructional program. To help answer the second research question, "What do early education teachers need to understand so iPads can be successfully utilized in a preschool classroom?" teachers were asked about their initial concerns about tablet implementation in their classrooms. During their initial interviews, the five participants made the following predictions. They anticipated (a) children would fight over the devices, (b) children would not want to stop using them, and (c) device management would be a problem.

From the beginning, all of the participants were concerned about how the children would share or not share the iPads. However, by the end of the study, no teacher reported that the children fought or struggled with sharing the devices. Anticipating that this could be an issue, all of the teachers in the study described how they thoughtfully planned ahead to ensure that the iPads were introduced successfully in classrooms. During the interviews, teachers described

how they introduced the iPads in small groups, at an activity center, through rotations, or in time-measured intervals to ensure that every child had access to them during the course of a day. These forms of intentional planning by the teachers eliminated the threat of children fighting over a device.

Second, four of the five participating preschool teachers discussed how the children would not overuse the devices or become upset when they were asked to join another activity. These particular teachers also planned so children would not spend too much time on the devices and established procedures for their use. They also had systematic ways to monitor what the kids were using the devices for. For example, in the initial introduction of the tablets, Teacher Ellen, Patty, and Tanya used timers. “The kids would have a timer. Okay, 15 minutes. Then another group could come on. I used the timer in the beginning because I was a little afraid of letting them use the devices as a free choice activity,” she stated. Similarly, Teacher Ellen made the tablets part of her instructional rotations. She worked directly with small groups of children and made them all use the same app(s) to ensure they knew how to use them. She quickly realized that she did not need to do this as the children became bored only using one education app at a time. She shared, “I realized that the app needs to fit their need. When they had only one choice they would say things like ‘I have that app at home,’ or ‘I’m bored, can I do something else?’” As these two teachers reported, the fear of children overusing the device could be alleviated or eliminated by using a combination of timed rotations and student choice.

The final non-instructional concern that the teachers had was about their ability to physically manage the devices. There was initial concern by a couple of the teachers about storage, charging, and keeping the tablets from being damaged. Just as the first two challenges were overcome through intentional planning, the fear of damage was also abated in a similar

fashion. One of the teachers created student monitors who helped make sure that the iPads were stored in the closet and plugged in at the end of the day. Another teacher created her own charging station by using an extension cord called an octopus (Figure 5). Still another teacher used a padded cooler on wheels to store the devices and ensure that they could be rolled outdoors if they were going to use them for an activity outside.

These teacher practices align well with the research that successful technology implementation begins with strong pedagogy and teachers who plan with a purpose as outlined in the ISTE Standards for Educators, which states,

Educators continually improve their practice by learning from and with others and exploring proven and promising practices that leverage technology to improve student learning. Educators set professional learning goals to explore and apply pedagogical approaches made possible by technology and reflect on their effectiveness (ISTE, 2018).

A retrospective study (Delgado, Wardlow, McKnight, & O'Malley, 2015) examined patterns behind why K–12 teachers still do not use technology within their classrooms and found that operational issues were still a major reason cited by teachers. Some of the operational issues that Delgado et al. (2015) noted were “access to available technology, time, and technical support. Lack of technology includes insufficient computers, peripherals, and software” (p. 399). This statement is similar to those made by early education teachers who stated that their desktop computers did not work, became unserviceable, or were just “dinosaurs.”

The intentional planning by all five of the participants improved the implementation and provided a better initial experience for the teachers. My observations of the students and the reviews of the transcriptions have potential to influence the creation of professional development for other early education teachers too. Leaders in the early education community would be wise

to ensure that implementation practices align with current research from the K–12 system to find ways to increase successful implementation outcomes for preschool teachers. This is also imperative because many teachers in subsidized preschool programs have little or no experience with using tablets or other mobile devices as part of their instructional programs. For example, Blackwell et al. (2014) identified other barriers that often prevent the integration of technology in K–12 settings. They stated,

First-order extrinsic barriers prevent teachers from using technology due to a lack of access, time to learn and use technology, training and support, and professional development. Second-order intrinsic barriers are teaching beliefs, comfort with technology, and perceived values of technology for student learning. (Blackwell et al., 2014, p. 83)

Although these findings are different than what was shared by the early education teachers in this study, it is a good reminder that pedagogical concerns do exist and should not be ignored. Study participants were more concerned with management issues but overcame these by utilizing a variety of planning and management strategies to reinforce the positive introduction of the tablets in their classrooms. It should also be noted that each of the preschool teachers shared different stories of how they planned for implementation as well as introduced the devices into their classrooms.

Study participants did share common experiences in their observations about the types of developmental growth they were seeing in their students. They identified the social and academic areas as being some of the most successful for their preschoolers. A recommendation to explore and align practices with the progress monitoring tool, the DRDP, would be instrumental in obtaining specific and quantifiable data in relation to student achievement.

However, reviewing the transcriptions and observations revealed evidence-based practices that dealt with specific areas of growth as children utilized the iPads. Teachers regularly commented on the problem-solving skills the children were learning. In addition, they commented on the vocabulary, communication, and academic skills the children were acquiring as they used the iPads. Finally, they noticed how the children enjoyed the immediate feedback that an app provided.

Each of these observations by the teachers took place as children were using the iPads but how the children were to use the devices during the observation was not intentionally planned. In a sense, the teachers felt the digital skills that the kids were acquiring was because they were learning through digital play rather than direct instruction by a teacher. Dewey's (2004) initial concept of child-centered learning can be applied to this form of learning. As he designed learning opportunities for children, the researcher found:

His curriculum was designed around the interests of children with an intentional focus on the environment. Dewey believed in pragmatic ideas that would create environments intentionally designed by the teacher that would lead to unconscious learning by the child. We never educate directly, but indirectly by means of the environment. (Dewey, 2004)

In this case, the teachers created environments that were conducive for learning by using the tablets in activity centers, outside the classroom, or wherever the child saw fit to take them. By doing this, the child-centered model that Dewey espoused led to learning for the child. In accordance with Dewey's philosophy on how children learn, Teacher Tanya stated,

Jose [pseudonym] was playing a game called Math Journey and I was watching him.

Well, he pressed four after looking at the picture; then he pressed seven, and he saw he

was counting. He doesn't know the word "math" or "addition," but he's learning that he has to count the pieces to get the right answer.

In addition to the usefulness that the iPad provided as the teachers focused on student growth, it is important to understand the ways that interactive play corresponds to student learning.

Children at this age rely heavily on interactions with adults to help them build the social and cognitive skills they will need to be successful in school and life (Piaget, 1951; Vygotsky, 1978). For this reason, preschool teachers spend a great deal of time interacting with their students and carefully observe the interactions children have with their peers. While the academic gains are important, if they are not accompanied with proper social skills development, then the whole child is not being addressed.

In addition to stressing the importance of interactions as method of learning, Plowman et al. (2012) noted the role of adult-child interaction remains a key component to the successful integration of technology. They reported, "Children usually needed adults or older siblings to help them acquire specific operational skills, after which they could move on to become independent users" (p. 31). Although there were no tablets during the 1970s, Vygotsky's (1978) concept, zone of proximal development, postured that the correct amount of challenge and adult assistance is what helps a child learn.

In response to the third research question, "How do early education teachers describe their experience as they implement iPads into the instructional program?" the teachers expressed belief that other early education professionals need to learn how to use the iPads as part of their instructional program. Instead of waiting for the children to learn to use tablets in kindergarten or later, they encouraged their colleagues to be proactive in finding ways to use the devices. Teacher Katya stated,

Don't be afraid to use them; they're self-explanatory. Let the kids experiment, and you should experiment too. Take one and play with it awhile so you understand it to some degree and if you get stuck, one of the kids could probably help you.

Other responses that described the participants' experiences often included the terms, *basic*, *easy*, *learning*, and *try*.

When asked at the end of the study to discuss how their experiences might provide insight to their colleagues, the participants shared that there is not a great deal of technology experience needed to help the children use it. Teacher Tanya stated, "I would show them the wonders that the devices offer: unlimited music, videos, learning apps, and ways to document student progress." Her comment does serve as a reminder that there are many purposes for using the tablets with an aim to improve a child's opportunity for long-term success. At the end of the study, Teacher Elise provided an insight that she wanted to share with other early education professionals. She shared,

At the beginning, I had the idea that the iPad would be only playing games, but now as I've seen, the kids are actually learning. They're learning everything. It's socialization, cognitive, and non-cognitive stuff. For example, they learn how to take turns.

Teacher Patty offered this perspective as a teacher who had never used technology in her classroom:

I wasn't too familiar with them, but you should still go for it. I am still learning how to do little things like sort games and create folders for the kids, and sometimes I can't figure it out, so I ask a friend or watch a YouTube video.

Her background also provided a context for designing professional development for those that have not used technology.

Like the participants in this study, Blackwell (2013) did find anecdotal evidence showing that the use of technology has promising influences on learning outcomes for students and teachers. She reported, “Mobile technologies (like the iPads) are highly motivating and more engaging than traditional classroom tools such that teacher can use the devices as tools for scaffolding student learning” (p. 249). She also believed that mobile implementation was well-suited for young children. She found, “Touch screens allow for direct manipulation and are intuitive to learn because there is no mouse, making them cognitively simpler than computers. Thus, teachers may choose to use tablets more often than they previously chose to use desktop or laptop computers” (p. 233). A recommendation from the data collected during this dissertation research may suggest the need for devices that can be used by both teachers and students.

Implications

In a summary by the a county office of child care (2017), it was reported, “Subsidized early care and education programs help low-income working parents become financially stable, yet only 41 percent of eligible preschoolers are being served in licensed care facilities” (p. 7). According to their data, there are approximately 18,872 eligible four-year-olds that could attend a subsidized care preschool program that do not (p. 7). In total, this means that approximately 41,000 low-income preschoolers are attending a subsidized care but may have little access to mobile technology. Given the large number of preschool children that are enrolled in subsidized preschool programs, the following implications for mobile technology implementation can be made based on the findings of this study.

First, resistance to the implementation of mobile devices or other similar forms of technology needs to be addressed. Blackwell (2013) reported that resistance can often come from the school site itself and teachers (p. 234). She found, “In addition to institutional

constraints, teachers encounter personal barriers, including teaching philosophies, attitudes and beliefs, perceived value of technology, comfort with technology, and personal use” (p. 234–235).

The participants of this study described the implementation process in a way that could be described as two phases. First, they anticipated what challenges they might face and planned how to address them. Teacher Elise said, “What I did is use them in small groups. We have our rotations, and then every time we rotate it is about six children in a group, and so they all get to use the iPad for about 10 minutes.” Other participants also planned how they were going to introduce the devices to the children. Teacher Katya said,

My solution was that we rotated groups by days: these five children had it on Monday, five different kids had it on Tuesday. This would allow all of the children to have it a couple times a week since there are only 24 children.

While Teacher Elise and Katya planned for how the devices would be introduced to the children, other teachers planned for the maintenance of the devices themselves. “The funniest things come to mind: ‘How do I keep them charged?’ ‘Do I need a charging station?’ ‘Will not closing the windows lead to battery draining?’” remarked Teacher Tanya. For each of these teachers, these types of questions guided their thinking as they planned how they were going to implement the devices in their classroom.

A second implication is that teachers need to understand that personal learning is part of the implementation process if they are going to help their students become digitally literate. Hutchison & Reinking (2011) found that a lack of professional development was another reason that many technology efforts in the K–12 system failed. They reported, “Studies have suggested that a lack of appropriate professional development is one of the prominent reasons that teachers do not integrate technology into their curriculum” (Hutchison & Reinking, 2011, p. 316).

Understanding some of the struggles that K–12 education has experienced provides historical research about how to strengthen the implementation of the devices into preschool settings.

With this previous research, early education professionals now possess some requisite knowledge so initial trainings can address pedagogical beliefs, comfort levels, and answer practical operations questions.

In a similar way, personal learning could be seen as a necessary component for professional growth in a changing culture for children. Shuler (2012) found “72% of the education apps in the iTunes store were created for preschool and elementary age students” (as cited in Blackwell, 2013). The idea that so many apps are being created for educational purposes lends itself to the possibility that a mobile device may be able to support learning and teaching in ways that have not been previously explored. In order to do use the devices in this way, early education professionals need to find ways to leverage technology to help their students develop the digital skills they will need. Teachers Patty and Ellen took on the challenge of introducing the technology into their classrooms even though they had never used it before. Teacher Patty shared, “I was not a computer person. My husband would always tell me, ‘Honey you live in the 21st century.’” Her comments reflect the need for technology professional development so early education teachers can help their students make connections between education and the current digital culture that students are growing up in.

A third implication involves student interactions around technology. As this study has shown, many different types of interactions take place around iPads. All five of the teachers experienced increases in conversation and communication as the children used the iPads. In addition, children used the iPads as interactive tools as they shared apps, sang songs together,

and took pictures or videos of one another. These new forms of play require teachers to also develop new ways to facilitate interactions with the children.

In a Deweyian setting, children play with objects in an intentionally created environment. As the kids played with these objects, they also interacted with adults who helped them develop early learning skills such as sorting, counting, or classifying (Dodd-Nufrio, 2011). In this type of environment, the adults help children develop foundational academic and social skills that would be used throughout their lives. In the same manner, the introduction of mobile technology offers children the opportunity to interact with adults and learn how to use digital technology to create things or support new learning. In this study for example, most participants found educational apps that the children could use independently, but Deweyian philosophy would have encouraged the teachers to interact more with the children as they used the devices. Teachers Patty and Elise described some of the ways they interacted with the children as they used the iPads. Teacher Patty shared that she would interact with her students as they learned to write the letter *A* on the tablet. Once they could form the letter *A*, she let them play a game on the iPad that helped them trace the letter *A* or make the letter *A* using puzzle pieces. She said,

I have been using it [the tablet]; the children who really couldn't get the *A* form down, they now remember it. We would take turns making the letter, and then they were doing it on their own. They'd say, "Hey, I did an *A*." So it gave them the dependency as well as the independency.

Her description is an example of how a teacher could interact with a child while using the iPad as an object to guide learning. Early education professionals, then, need to assess the different ways that adults could interact with children as they used technology.

The fourth implication is the importance of the interactions that take place when a child's socioeconomic status (SES) is taken into account. For example, Chien, Howes, Burchinal, & Pianta (2010) found that a child's classroom engagement may be linked to their poverty status. For example, they reported,

Teachers of low SES children reported explicitly focusing on developing children's literacy and mathematics skills through direct instruction to prepare children for kindergarten. Teachers of higher SES children, on the other hand, reported developing skills more indirectly by allowing children to engage in the literacy or mathematics activities of their choice. (p. 1546)

Given that this study focused on subsidized care preschool programs in which all the children are low income, one approach an early education teacher might take to improve interaction would be to work alongside a student as he or she used a tablet device.

Designing instruction that allows the children to creatively use the devices to support learning is part of embedding technology into a lesson. Results from the Chien et al. (2010) study also examined classroom engagement and school readiness. Their research results "suggest that free play, when accompanied by high-quality scaffolding interactions with teachers, remains a model of classroom engagement that may be conducive to children's learning" (p. 1545). Just as Piaget (1978) and Dewey (1949) suggested, designing instruction and creating intentional learning environments that foster adult-child interactions is important. Likewise, these theories provide guidelines for how learning will only improve if adults are interacting with children as they utilize the iPads.

The fifth implication of this study is that just using the devices independently will not help children develop cognitively or socially. Cheung & Slavin (2013) reported, "In general,

results are inconclusive over whether technology advances educational attainments” (p. 212). With conflicting data like these, it is apparent that devices may not be as effective in K–12 settings either without adult student interactions. Blackwell (2013) also reported that a survey conducted by Project Tomorrow of 35,525 K–12 teachers found that “the most frequent use of technology is homework and practice” (p. 232). Findings like these have direct implications for how the devices should not be used in early education settings. In fact, teachers should not design time where the devices are used in isolation with no peer-to-peer or adult-to-child interactions because K–12 research has already shown that just using devices may not increase achievement.

Whether intentional or not, the participants in the study contributed to the children’s learning as they interacted with the students. For example, Teacher Tanya showed one of her students how to switch from the camera mode on the iPad to the video mode. Teacher Patty took turns and provided feedback to a student as she was developing her letter skill knowledge. In both of these cases, the teachers were able to see how their interactions led to student achievement. In the case of Teacher Tanya, the little girl created videos that included herself and her friends. When the videos were completed, the children were able to laugh and create role-play scenarios outside. In the case of Teacher Patty, the little girl was able to learn, write, and identify the letter A. The development of the children’s knowledge was directly related to an adult that interacted with them as they were using the iPad. In both of these cases, the learning might not have taken place if the child was using the iPad without the adult interaction.

The sixth implication is that early education teachers need to recognize the importance of giving children in subsidized care programs opportunities to use technology that may not be afforded them because of their low-income status. Blackwell (2013) stated NAEYC “supports

the developmentally appropriate and intentional use of technology in early education” (p. 83). Furthermore, their own position statement (NAEYC & FRCEL, 2012) cautions that there are unresolved issues of equity and access based on a child’s SES:

Today, educators face similar challenges with regard to technology tools, media, and broadband access to the Internet. Children growing up in affluent families more often have access to technology tools and broadband connections to the internet in their homes, begin using the internet at an early age, and have highly developed technology skills and beginning digital literacy when they enter school. Children in families with fewer resources may have little or no access to the latest technologies in their homes, early childhood settings, schools, or communities (p. 4).

The findings reported by these studies and groups suggest that low-income students are in desperate need of technology at their school sites because without them, they will enter kindergarten at a disadvantage. Essentially, preschool children all need opportunities to develop their technology skills, which can now be likened to basic early literacy skills.

The seventh implication is that there needs to additional local, state, and federal dollars invested into subsidized early education programs so technology devices can be purchased for low-income students. The findings from the participants in this study put forward the idea that more early education teachers would like to have the devices in their classrooms but do not because the devices themselves are expensive (O’Donnell, 2016). During the study, Teacher Patty shared a story about a parent from another class who, in reference to using the iPads, asked, “Miss Patty, are all the kids doing it?” Teacher Patty replied that she was a pilot teacher for a study. The parent then asked about her child, “Can you see if he is able to do it too?” Teacher Katya also shared, “It would be awesome if we could all have tablets. Maybe we could have some people write to the district so we could get more.”

By having the opportunity to use the tablets, the teachers in this study discovered an additional way to support their students' cognitive and social development. The implication for legislators, appropriation committees, and early education leaders is clear that additional funding for technology in subsidized care programs is needed. Therefore, increases in funding that are specifically tied to technology investments in early education may help eliminate digital achievement gaps, and these investments allow low-SES students to enter kindergarten on par with their more affluent peers and eliminate current equity issues.

Limitations

There are limitations to this study that should be discussed. Although the teachers had various years of experience, the small number of participants was a limitation. In addition, the study was also conducted in a large urban city in which the majority of the students were English learners and all were from low-income families. To mitigate this limitation, classrooms were chosen from specific parts of the city to ensure that there was diversity amongst the participants and the students in the study. Due to the small number of classrooms and teachers that participated in the study, the results cannot be generalized to all subsidized care preschool programs.

Another limiting factor to the study is that it relies on self-reported data. While the participants reported data from their own personal experiences, their personal narratives cannot be independently verified. In addition, self-reported data obtained through interviews can be biased, as the participants may only recall experiences that were significant to them. Essentially, there is the possibility that some of the experiences and data were not captured because there was too much data to collect as the children utilized the iPads.

Finally, the researcher's personal bias could threaten the legitimacy of the research. However, this threat was controlled through the use of member checks for the individual interviews and through inter-rater reliability screenings.

This multiple-case study engaged rigorous methodology in various ways. The study used multiple data sources to lessen the threat of biased self-reported data, and participants were interviewed a minimum of three times. In addition, multiple observations were conducted in each of classroom during periods of time when the iPads were being employed so data shared during interviews could also be observed by the researcher. Furthermore, each of the semistructured interviews was recorded, transcribed, and shared with the participants to ensure accuracy of the interviews. Furthermore, video and memoing was done during the classroom observations so any observations of the teacher and classroom could be verified. These sources of information provided trustworthy data for analysis. By utilizing these different methods of data collections, I could identify emergent themes with greater confidence of depth in terms of understanding some of the systemic factors impacting these teachers. For example, by doing observations, a deeper understanding of how the teachers were implementing the iPads in their classrooms could be identified. Given the importance of context in qualitative research, this was a strength of the present study.

Recommendations for Future Research

This research study attempted to build understanding about the ways iPads can be successfully integrated into subsidized preschool programs. Successful integration into subsidized preschool programs would increase positive outcomes for low-income students while ensuring they did not enter kindergarten with a digital achievement gap when compared to their more affluent peers. While there was a plethora of research on how technology integration

happens at the K–12 level, there was a general lack of research-based literature on technology integration in early education settings. There is even more of a void about technology research in early education regarding technology's use in publicly subsidized preschool programs for low-income families. The qualitative case study methodology utilized in this study provided detailed information about the experiences of five preschool teachers as they implemented iPads with their preschool students.

While this technology study offers a beginning to technology investigations into preschool programs, there is much more that needs to be done. First, a future research study can be done to examine the relationship between professional development and technology implementation in subsidized preschool programs. There is also more to learn about how early education teachers' pedagogical perspectives on technology may affect implementation efforts in their instructional programs. A survey similar to the Scale of Attitudes Toward Computer Based Education used by Yilmaz and Alici (2011) could be designed for early education professionals. Data collected from a survey may provide critical information so specific pedagogical beliefs can be addressed prior to any tablet implementation.

Second, a study should be conducted about why all five teachers reported that students seemed more communicative when they were utilizing the tablet devices. If there is any validity to their observations, this topic is worthy of future research since communication and language development are key goals for preschool students. If language and communication is increasing as children use the iPads, there could be value to school districts that seek to reduce the number of long-term English learners and children referred to special education for communication disorders with regard to expressive and receptive language.

Third, a study could compare DRDP scores between preschool programs that employ tablets as part of their instructional programs and those programs that do not use any form of mobile technology. Such a comparison could reveal the benefits of tablet integration or identify practices that lead to academic and social gains by very young children. As the DRDP data is collected and analyzed, preschool stakeholders could determine how best to utilize the tablets to maximize student achievement.

Similarly, only one participant mentioned using the devices for assessment purposes. However, all of the participants perceived that the devices were contributing to a child's development. Only Teacher Elise discussed how she was using the device to capture student evidence that was aligned to the DRDP. During one interview, she asked her students to document the construction of their block buildings with the iPad. Her request was so she could add the pictures to a child's portfolio and show the parents the progress that the child was making.

Since the DRDP progress is built on student work that documents the developmental growth of a child, the iPad offers an easy way to connect assessment to actual student work. In the case of Teacher Elise, she discussed how the students took pictures of the buildings they had created as evidence of their unit of study on buildings. However, these photos could have provided evidence of how the child has moved from building one-dimensional (flat) structures to three-dimensional buildings.

Furthermore, the study was not specific to how the iPad could be used to document student progress, it does warrant further investigation as there are many opportunities for authentic student assessment in a natural setting. Within the DRDP, there are both social and academic indicators that are used to measure student progress. Although never explicitly stated,

the child-centered concepts that could have been assessed by the teachers include; (a) recognition of skills and accomplishments, (b) taking turns, (c) cooperative play with peers, and (d) language in conversation. In addition to the child-centered concepts, there were specific skills that could have also been measured through the use of educational apps that the children played. These skills included: (a) concepts about print, (b) letter and word knowledge, (c) memory (d) number sense of quantity and counting, (e) classification, and (f) shapes.

As a final thought about assessment, the opportunity to use the device could also potentially save the teachers time as they progress monitor their students for a couple of other reasons. The first reason is that the children were very comfortable using the devices and interacting with their peers and adults so it provides a very natural setting to do both social and skill observations that can be used to highlight student progress. The second reason that the devices lend themselves well to assessment is because the children can self-assess their own learning by taking photos of their own work or creating small videos that showcase their own learning. In these formative ways, mobile technology can help make bridge technology and student assessment beginning with the youngest learners.

Fourth, research should be conducted regarding preschool teachers' perceptions about how technology should, or should not be, embedded into a preschooler's instructional program. Utilizing a Likert scale, a data questionnaire could be given to see if successful technology implementation of devices (like the iPad) is dependent on a teacher's preconceived positive or negative perceptions about using technology with young children. According to Couse and Chen (2010), very little research exists at the time of this study to determine if this is true.

Finally, the purpose of this study was also to find ways to design technology-laden professional development that results in finding ways to help early education professionals

embed technology into their daily instruction. The five participants in this study provided case study examples of how this can be done, but there will still be preschool teachers who are reluctant to change their current practices. For this reason, providers of subsidized care preschool programs must employ digital technology so low-income students will not enter kindergarten with a digital achievement gap. A study needs to be conducted that examines if utilizing iPads or other forms of technology actually decreases the achievement gap. A study conducted from this perspective could determine how preschool teachers in subsidized care programs can leverage technology to help students develop their cognitive and social skills through tablet utilization.

Summary

Professional development needs to be intentionally designed for early education professionals who will implement mobile devices into their classrooms. While preschool teachers may have pedagogical differences about the use of technology in their classrooms, it is becoming increasingly important that low-income students in subsidized care preschool programs begin developing their technology skills at a very young age. Additionally, not all children in these situations have the benefit of utilizing mobile devices at school or at home. Advocates for early education and leaders need to establish the means for low-SES children to access the devices while providing preschool teachers the opportunity to attend meaningful professional development. The goal for technology programs should be to utilize research-based strategies, many of which have already been identified in K–12 studies that have examined pedagogical and programmatic ways to successfully implement technology into instruction.

The data collected from the interviews in this multiple-case study have produced topics for discussion, including communication growth and adult-child interactions around the use of

tablet technology. These include examples of successful planning practices by the participants and strategies that lead to positive student outcomes. The results of this study also suggest that key indicators of successful implementation of mobile devices are related to teachers' willingness to explore how the devices can be used in their classrooms and their flexibility to use the devices as the children explore their uses. Remembering that adult-child interaction is still the key to a child's growth reminds teachers that a tablet is only another tool that can help student achievement.

This dissertation opened with a hypothetical story about a four-year-old boy named Joaquin, and it will close with him too. Joaquin has no idea that he is a student from a low-income family, but he does know that he loves coming to school every day to join his friends in different activities. He loves using the iPad to express his ideas, draw pictures, or video his friends doing funny things. He is really looking forward to open house tonight because he is going to show his parents all of the things in his digital portfolio. With the help of his teacher, Joaquin has made a couple of videos of experiments he has done, and he plans to show them pictures of what he has learned in school this year. While Joaquin is a fictional character, his story could be a reality. Just imagine.

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APPENDIX A: Teacher Consent Form

iPads in preschools: A collective case study about tablet technology in subsidized preschool programs with young children

Dean Tagawa, Principal Investigator
Liberty University, School of Education

Dear Participant,

The following information is provided for you to decide whether you wish to participate in the present study. The purpose of this study is to understand the process of implementing iPads into preschool programs that serve at-risk populations. The procedure will be a case-study design using multiple participants. At this stage in the research, the educational use of tablet technology will be generally described as a mobile touch screen device that is used to support cognitive and social emotional growth in a preschool classroom.

Procedures

There will be short professional development offered to teachers about using the iPad during the research study. Data will be collected over three months, beginning in January 2017 and ending in March 2017. Data collection will involve informal 3 observations of the tablets being used during a 30–45 minute instructional period. I will also collect information through 3 interviews that will last approximately 45 minutes. Each of the interviews and classroom observations will be recorded using an audio visual digital recording device to ensure accuracy during transcription. Transcripts of interviews and any field notes that are taken by the researcher will be available for viewing.

Do not hesitate to ask any questions about the study either before participating or during the time that you are participating. I would be happy to share the findings with you after the research is completed. In addition, your name will not be associated with the research findings in any way, and only the researcher will know your identity as a participant.

Risks and Benefits of the Study

There are no known risks and/or discomforts associated with this study. Participation in this qualitative study will help inform future preschool educators about professional development challenges and successful strategies when implementing iPads into classroom instruction.

Compensation:

There is no compensation for the study and the iPads will remain at the school only for the duration of the study and then be returned to the district's instructional technology division. In addition, the participating rooms will receive a pizza party for their class.

Confidentiality:

The records of this study will be kept private. In any sort of report that is published, the researcher will not include any information that will make it possible to identify a participant. Research records will be stored securely and only the researcher will have access to the records. No actual names will be used in the study. At the conclusion of the study, the principal will be given copies of the study to share with parents and staff.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University, the [REDACTED], or the [REDACTED]. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

How to withdraw from the study:

At any time during the study, you have the right to withdraw your consent to participate in this study. To withdraw from the study, we ask you to submit in writing your request to withdraw from the study. The date the letter is submitted is the date your withdrawal from the study is effective. If you do not want your data to be used for the study, you must indicate this in your withdrawal letter. If you choose to no longer participate in the study and do not submit a letter, any data collected may be used by the researcher. Please submit your written statement to [REDACTED].

Contacts and Questions

The researcher conducting this study is Dean Tagawa. You may ask any questions you have now. If you have questions later, you are encouraged to contact him at [REDACTED] or by email at [REDACTED]. You may also contact the researcher's advisor Dr. Alan Wimberley at [REDACTED]. If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd, Green Hall Suite 1887, Lynchburg, VA 24515 or email at [REDACTED]. You may also speak to the principal at [REDACTED] or email at [REDACTED].

Please notify the researcher if you would like a copy of this information to keep for your records.

Statement of Consent:

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

The researcher has my permission to audio-record, video-record, and/or photograph me/my classroom as part of my participation in this study. **Any recordings will only be** reproduced to provide documentation of the study or the incorporation into educational videos, DVDs, and/or printed materials to be used to benefit educators and students about the future use of tablet technology in early education.

Signature of participant: _____ Date: _____

Signature of Investigator: _____ Date: _____

APPENDIX B: Interview Questions I

Introduction by Facilitator

Hello, my name is Dean Tagawa with Liberty College and I am a doctoral student. Thank you for taking the time to be interviewed about iPad implementation in an early education setting. This interview is part of a larger research study that I am conducting to learn about how best to implement touchscreen technology with preschool students.

Please note that I will be recording and taking notes during our time together to ensure your responses are captured during the conversation. As stated in the consent form, your name will not be attached to any responses you make. Do you have any questions before we begin?

1. Tell me about yourself.
2. Tell me how you came to teach our youngest learners.
3. What kinds of technology do you use at home?
4. What do you use the internet for?
5. Do you own a smart phone or tablet? (If so) How do you use it in your personal life?
6. What do you find to be some of the benefits of using a smartphone?
7. What types of technology have you used in the past with your students?
8. What has been your past experiences working with technology in your classroom?
9. What are your feelings about using tablets with preschool students?
10. How would you implement tablets into your instructional program?
11. What are some of the “challenges” that might arise?
12. If you were able to use iPads with your children, what would you hope to hear and see as they were being used?
13. What are some of the benefits that may come from their use?
14. Is there anything else you would like to ask me or tell me?

Again, thank you for your time and participation!

APPENDIX C: Interview Questions II

Introduction by Facilitator

Hello, my name is Dean Tagawa, a doctoral student at Liberty University. Thank you for taking the time to be interviewed again about iPad implementation in an early education setting. As a reminder, this interview is part of a larger research study that I am conducting to learn about how best to implement touchscreen technology with preschool students.

Please note that I will be recording and taking notes during our time together to ensure your responses are captured during the conversation. As stated in the consent form, your name will not be attached to any responses you make nor will your name be used in the publishing of this paper or any related articles. Do you have any questions before we begin?

1. How have you been since our last interview?
2. Tell me about any changes in your classroom (new students, schedules, curricular themes etc.) since the last time we met.
3. Since our last interview, what kinds of things have you tried with your students using the tablets?
4. Are there any specific applications that you have found to be helpful? (If so) Why?
5. How have you incorporated the iPads into your instruction?
6. Tell me about how you schedule their use or build them into your daily instruction?
7. As the tablets have been used, tell me about your observations with the children?
8. During our first interview we talked about the challenges that might arise, and you said, “(Input what the teacher said).” Tell me about this or any new challenges that you faced in their implementation?
9. As an early education teacher, how have addressed these challenges during the implementation?
10. As the iPads have been used with your children, what are you hearing and seeing as they are being used?
11. What effects, if any, are you seeing with your children? Cognitive? Social? Other?
12. Are there any ideas or comments that you would like to ask me or tell me?

Thank you again for your time and participation!

APPENDIX D: Interview Questions III

Introduction by Facilitator

As a reminder, my name is Dean Tagawa, a doctoral student at Liberty University. As a reminder, this is the final interview of a larger research study that I am conducting to learn about how best to implement touchscreen technology with preschool students. Thank you again for meeting with me.

Please note that I will be recording and taking notes during our time together to ensure your responses are captured during the conversation. As stated in the consent form, your name will not be attached to any responses you make nor will your name be used in the publishing of the paper or any related articles. Do you have any questions before we begin?

1. How have you been since our last interview?
2. Tell me about any changes in your classroom (new students, schedules, curricular themes etc.) since the last time we met.
3. Since our last interview, what kinds of things have you tried with your students using the tablets?
4. Are there any specific applications that you have found to be helpful? (If so) Why?
5. Since the beginning of the study what adjustments have you made in incorporating the iPads into your instruction?
6. As the tablets have been used, tell me about your observations with the children over the last couple of months?
7. Tell me any new challenges that you faced in their implementation?
8. As an early education teacher, how have addressed these challenges during the implementation?
9. As the iPads have been used with your children, what are you hearing and seeing as they are being used?
10. What effects, if any, are you seeing with your children? Cognitive? Social? Other?
11. In your opinion, in what ways did the iPad use contribute, or not contribute, to the cognitive, social or other growth in your students?
12. Drawing from you experiences over the last couple of months, what aspects of iPad implementation are the most important?

13. What advice would you give to a colleague that wants to implement tablet technology into their instructional program?
14. Based on your recent experiences and observations, what supports are needed to help other early education professionals integrate tablet technology?
15. As this is the final time we will be meeting as part of this research study, are there any ideas or comments that you would like to ask me or tell me?

Thank you again for your time and participation over the last couple of months!

APPENDIX E: Recruitment Letter

Early Education Center Teachers
[REDACTED]

Dear Early Education Teacher:

As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for a doctoral degree in education. The title of my research project is iPads in Preschools: A Collective Case Study about Tablet Technology in Subsidized Preschool Programs with Young Children.. The purpose of the research is to develop an in-depth understanding of how to design professional development that will help teachers utilize tablet technology that enhances instructional programs for children in subsidized preschool programs.

Participants will be asked to come to a 30-minute informational meeting with me to learn about the study and ask any questions they may have. Participants will also be presented with informed consent information prior to participating. There will be a 45-minute professional development offered to the participants about using the iPads and keeping them safe during the research study. Data will be collected over three months, beginning in February 2017 and ending in April 2017. Data collection will involve 3 informal observations of the tablets being used by the teachers during classroom activities and 3 interviews. Each of the interviews and observations will last about 45 minutes. The observations will be audio-visually recorded to ensure that all information is thoroughly captured. Transcripts of interviews, observations, and any field notes that are taken by the researcher will be available for viewing.

Thank you for considering my request. To participate in this study, please respond by email to [REDACTED].

Sincerely,

Dean Tagawa
Executive Director

APPENDIX F: Observation Collection Form

Participants will be observed 3 times in their classes over a three-month period during the iPad implementation. The field notes will be recorded with an emphasis on details that will provide a thick description for the researcher to analyze. Following reflection about each observation, the researcher will complete the memoing portion of the data collecting form. The form below (Yocum, 2015) will be used to memorialize data collected during each observation.

FIELD NOTES		
TITLE OF STUDY _____		
RESEARCHER NAME _____		
OBSERVATION DATE _____	START TIME _____	STOP TIME _____
INTERPRETIVE LENS _____		
SITE DIAGRAM		

