

PRESCHOOL TEACHER PRACTICES AND BELIEFS ABOUT DIGITAL
TECHNOLOGY USE IN CLASSROOMS

by

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To my late husband, who always told me that someone with the last name of Claxton needs to have doctor in front of their name. You always reminded everyone you met that learning is a life-long journey. To my children, Joshua and Kayla, thank you for listening to me talk about all the issues in early childhood education and for always being there to love and support me.

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ABSTRACT

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The focus of this dissertation centers around the beliefs that early education teachers hold regarding the role digital technology plays in the learning and development of young children and how those beliefs are implemented in the classroom. Although there is some previous research on this topic not enough is known about digital technology beliefs and practices at the preschool level. Thus, the focus of this dissertation centers around including the “voices of preschool teachers.”

Using a mixed methods approach via survey and selected follow-up interviews, 100 preschool teachers expressed their beliefs and practices about digital technology use. Three groupings emerged; one group that favored using technology with young children, one group that favored technology use but with limitations, and a final group that did not see any benefit in using technology with young children. Preschool teachers also related the role technology may play in the learning and development of young children and levels of technology access. Almost all teachers reported that they had access to at least one electronic device; children’s access, however, was much more limited.

Lived experiences as teachers worked through the COVID-19 pandemic were also reported. Many teachers found that they were able to form better connections with parents and families via an electronic format, often at times that were more convenient for parents to talk. Teachers also reported learning how to use various types of digital technology during the COVID-19 pandemic and they reported continuing to implement what they had learned.

Teachers' beliefs about technology use in classrooms by teacher demographics were tested to detect whether there were differences between the three belief groupings. The results indicated that when teachers received technology support they were more likely to have favorable beliefs about technology use.

TABLE OF CONTENTS

ACKNOWLEDGMENTS	iv
ABSTRACT	v
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ABBREVIATIONS	xiii
CHAPTER ONE	1
INTRODUCTION	
Early Childhood Educators' Beliefs, Knowledge, and Use of Digital Technology	2
My Interest in the use of Digital Technology at the Preschool Level	4
The Impact of COVID-19 on Technology Use	6
Purpose of the Present Study	7
Major Research Questions	8
Significance	8
CHAPTER TWO	9
LITERATURE REVIEW	
Debates Surrounding Technology Use with Young Children	9
Potential Advantages of Technology Use by Young Children	11
Potential Disadvantages of Technology Use by Young Children	13
Teacher Preparedness and Beliefs About Digital Technology and Learning	16
Preschool Teacher Preparedness	16

Preschool Teacher Beliefs	17
Technology Guidelines and Recommendations for Young Children	20
Relevant Major Theories Related to Technology	23
Bronfenbrenner's Bioecological Theory	23
Elder's Life Course Paradigm	26
Vygotsky's Sociocultural Theory	27
Summary	29
CHAPTER THREE	31
METHODS	
Research Design	32
Study Participants	33
Survey Participants	33
Achieved Survey Sample	33
Interview Study Participants	37
Data Collection Instrument Development	38
Preschool Teacher Survey Development	38
Interview Question Development	40
Procedures	40
Oakland University's Internal Review Board	40
Sample Selection and Data Collection	40
Data Analysis	42
Preschool Teacher Survey Variables	42
Semi-Structured Interview Variables	42
Paper Surveys Versus Electronic Surveys	43

Analysis of the Preschool Teacher Survey	43
Analysis of the Semi-Structured Interview	45
CHAPTER FOUR	48
DATA ANALYSIS AND RESULTS	
Digital Technology Use in Preschool Classrooms	49
Preschool Teacher Access to Digital Technology	49
Preschool Teacher Confidence Levels Related to Digital Technology	51
Children's Access to Digital Technology	52
Advantages or Disadvantages of Using Digital Technology with Young Children	55
Formation of Beliefs About Use of Digital Technology with Young Children	57
Preschool Teacher Training Related to Digital Technology	57
State Guidance Related to Technology	57
Support Related to Technology	58
Memories of Learning to Use Digital Devices	60
Changed Views/Practices Related to Digital Technology Since the COVID-19 Pandemic	61
Teachers' Beliefs and Use of Digital Technology Related to Demographic Variables	63
Overview of Chapter 4 Findings	64
CHAPTER FIVE	67
DISCUSSION AND IMPLICATIONS	
Insights About the Study Results	69
Teacher Access to Digital Devices and Technology Training	69

Technology Support	70
Beliefs, Benefits, and Advantages of Using Digital Technology	71
State Technology Standards or Guidelines	72
National Technology Standards or Guidelines	73
Digital Technology and the COVID-19 Pandemic	73
Future Research Possibilities Related to Technology	74
Conclusions	75
Limitations of this Study	76
REFERENCES	78
APPENDICES	
A. Digital Technology Survey for Preschool Teachers - 2022	85
B. How Research Questions are Answered by Survey and Interview Questions	101
C. Semi-Structured Preschool Teacher Digital Technology Interview	105
D. Oakland University Institutional Review Board	109

LIST OF TABLES

Table 1	Preschool Classroom Descriptive Information for Survey Participants	34
Table 2	Preschool Teacher Descriptive Information for Survey Participants	36
Table 3	Selection Criteria and Selected Demographic Information for Semi-Structured Preschool Teacher Interview	38
Table 4	How the Research Questions are Answered by Survey and Interview Questions	40
Table 5	Primary Themes and Subthemes from the Semi-Structured Preschool Teacher Interview	46
Table 6	Teachers' Confidence Levels Using Digital Devices	51
Table 7	Chi-Square Test and Contingency (2 x 2) Tables for Benefits of Using Digital Technology by Technology Support Received	64

LIST OF FIGURES

Figure 1	Bronfenbrenner's Ecological Systems Theory	24
Figure 2	Percentages of Electronic Devices 100 Preschool Teachers Had Access to in Their Classrooms	50
Figure 3	Percentages of Electronic Devices Children Had Access to in Their Classrooms	53

LIST OF ABBREVIATIONS

AAP	American Academy of Pediatrics
COVID-19	Coronavirus 2019
DAP	Developmentally Appropriate Practice
Fred Rogers Center	Fred Rogers Center for Early Learning and Children’s Media at Saint Vincent College
GSRP	Great Start Readiness Program
ICT	Information, Communications and Technology
LARA	Michigan’s Department of Licensing and Regulatory Affairs
MiAEYC	Michigan Association for the Education of Young Children
NAEYC	National Association for the Education of Young Children

CHAPTER ONE

INTRODUCTION

Many young children today interact with a wide range of technology in their everyday lives, having technological resources available to them in their homes and other informal settings. They may become proficient users of computers, mobile phones, video games, and other digital devices, without necessarily any formal instruction (Morgan & Kennewell, 2005; Plowman & McPake, 2013). However, a digital divide does exist most often mediated by the availability of resources in a family or community. Educational settings can serve as one vehicle to help close the digital inequity gap (Steele, 2019). Consideration for digital literacy development, however, may not receive much attention in many preschool classrooms; rather the focus continues to be on traditional forms of literacy development, such as: a storybook read aloud to children, children exploring books by looking at the pictures, scribbling on paper, tracing numbers or using invented spelling. There are some early educators that hold the opinion that young children should not be exposed to digital technology (e.g., computers and tablets) but rather learn literacy concepts using only “real” materials. However, with the increasing integration of digital formats in today’s society, young children’s instruction should include developing a range of developmentally appropriate digital skills and knowledge (Maureen et al., 2018). For example, young children could use a tablet to listen to a story they are interested in, review how to form the letters of their name or work on math concepts.

About half of the children entering kindergarten each year in the United States have attended a center-based care arrangement such as a preschool, childcare center, or Head Start program (National Center for Education Statistics, 2020). Many center-based childcare facilities use tablets because of their easy-to-use and intuitive interface for young children (Rideout, 2013). However, it is unclear how knowledgeable early educators are in supporting children's use of digital technology in classrooms.

Early Childhood Educators' Beliefs, Knowledge, and Use of Digital Technology

The focus of this dissertation centers around the beliefs that early education teachers hold regarding the role digital technology plays in the learning and development of young children and how those beliefs are implemented in the classroom. Digital technology has various definitions, including the use of techniques, skills, methods, and processes to accomplish an objective. It is the transfer of information from person to person or person to machine to help with solving problems, making decisions or learning new information. Digital technology generally implies an input, changing it according to a system, and then producing an outcome (Glencoe, 2010). In other words, an input can be thought of as the objectives that a teacher is expected to learn (e.g., iPads will be used to record children's planning ideas). The system is the process of the delivery of content (e.g., a training course about planning with iPads). The outputs are the end-product of an educational experience (e.g., knowing how the planning app works at the child level and teacher level).

Early childhood educators are continuing to gain knowledge about how to appropriately incorporate the use of digital technology and interactive media with young children in their classrooms (Armstrong, 2015). The practices of educators connecting to

other professionals, classroom families and creating a community of practice around the use of digital technology to support children's holistic growth and development may be more beneficial now than ever before. In light of the COVID-19 pandemic, there has been a dramatic shift to online modes of learning due to social distancing norms and forced school closures. Schools at all levels have had to adjust to new ways of working, shifting classes for example, to video conferencing platforms like Zoom and Google Meet (De' et al., 2020) and many schools have invested in laptops or tablets for student use.

Early childhood educators may also have to work toward applying national, state and early childhood organization guidelines as they support young learners. The National Association for the Education of Young Children and Fred Rogers Center for Early Learning and Children's Media (2012) offer this position statement:

For the adults who work with young children, digital literacy includes both knowledge and competence. Educators need the understanding, skills, and ability to use technology and interactive media to access information, communicate with other professionals, and participate in professional development to improve learning and prepare young children for a lifetime of technology use. (p. 9)

Digital technology offers early educators' new opportunities to build relationships with other early educators, families, and the children they teach. As children are exposed to new technological experiences, often on a daily basis, these experiences are likely to influence their competency and skills in using new technological tools. Educators can use digital technology to build on face-to-face communication, keep parents informed and help young children find their way to becoming responsible digital citizens.

There are early childhood educators, early childhood advocates and policymakers that have expressed concerns that childhood play, the work of young children, may be changing with the introduction of digital technology at this level of schooling. As Frost (2009) looked at children's play, in an historical context, he characterized it as spontaneous, pleasant, child-led, freely chosen, opportunistic and creative. Children's play was focused on the activity and process rather than the product, and was low-risk and highly engaging. Piaget (1962) has connected children's play to terms such as creativity, adaptation, experimentation, learning, communication, and socialization. With these play-based terms in mind, is time spent on computers and devices, at an early age, shifting irrevocably the way children play alone and with each other? If changes are occurring in children's play, are they in a positive and supportive direction (learning new things in a new way), negative direction (delaying children's development in such areas as; literacy, physical and social-emotional) or simply another way for children to acquire experiences and express themselves? If used in developmentally appropriate ways, digital technology and interactive media can serve as a catalyst for young children to tap into their full learning potential (Steele, 2019).

My Interest in the use of Digital Technology at the Preschool Level

During my doctoral coursework, Ecology of Early Learning: Health, Care and Education, I explored how preschool teachers used technology in their classrooms by conducting a focus group and then I had the opportunity to observe two focus group participant's classrooms to see how they used technology in their classrooms (Claxton, 2017). For the most part, the teachers in this Great Start Readiness Program (GSRP; Michigan's state-funded preschool program) did not have much technology in their

classrooms. The district-provided technology that was available consisted of a listening station with a CD player and an assortment of CDs. One of the teachers reported that she used her own phone to document children's work or communicate with parents about a child's progress. This teacher also told me that the district had made the decision to remove all computers and tablets at the preschool level because the district felt it was more important to have computers/tablets in kindergarten classrooms and tech support was not available for preschool classrooms. This preschool teacher was very disappointed in the district's decision because she understood the potential learning opportunities that "her low-income children" would be missing in their preschool year. To me, it seemed counterintuitive to Michigan's technology standards and expectations for students in grades PK - 2 (Michigan State Board of Education, 2009). The state standards included such topics as children learning to use digital tools in developmentally appropriate ways to build relationships with other children and adults, solving problems while using digital devices and introducing children to appropriate internet-based resources to help them become more knowledgeable digital citizens.

As part of my field experiences (Field-Based Project I and II) I developed a survey to explore how preschool teachers thought about digital technology, their beliefs about using digital technology with preschoolers and how they used digital technology in their classrooms (Claxton, 2020). One of the teachers that replied to the survey stated that she and her co-teacher do not use electronic devices with the children they teach, "NEVER with the children. Young children should not have access to technology in the classroom." Another teacher with a differing viewpoint offered this statement for working with young students:

When a child has a question or inquiry that we don't have the answers to we look up the information on the iPads with the children. We ask them questions to provoke their thinking while showing them short (appropriate) related videos or pictures. . . . We also use the iPads and desktop computer to do research.

Clearly, the two preschool teachers in this sample had opposing views about the use of digital technology with young children. It seemed that there is not a consensus amongst preschool teachers regarding the use of digital technology at this level. Preschool classrooms, less than 15 miles apart from one another, were experiencing technology very differently, some not at all and some learning how to do research on the internet.

The information I gathered as a part of my two previous classes piqued my interest in this topic. I was curious to learn more about how preschool teachers plan for digital technology use in their classrooms. What, if any, training or support do teachers receive related to digital technology? And possibly most importantly, how do preschool teachers form their beliefs about using digital technology to enhance young children's learning?

The Impact of COVID-19 on Technology Use

In many ways, the COVID-19 pandemic has changed how technology is viewed with in-person class restrictions. Issues related to digital technology use may be more pressing now than ever before. In many cases digital technology has been the only way preschool teachers can connect with their classroom children and families (this is not only true for preschool teachers but for teachers no matter the level they are teaching). Preschool teachers have had to find inventive ways to engage children for example,

giving children step-by-step directions on how to create an interactive poll on one of the digital platforms (e.g., Google Meets, Zoom). Using digital technology in this way children can predict what the outcome might be and then see real-time results. This is just one small example of how digital technology may be “forcing the hand” or helping the field of early childhood embrace the use of digital technology. Preschool teachers likely are still making adjustments to the changes that come with using digital technology in interactive ways with young children but also, they may be experiencing the benefits of children learning via technological avenues.

Purpose of the Present Study

There are many studies that have been conducted at the elementary, middle school, and high school levels about technology use with students, but far fewer studies are available at the preschool level. Even fewer available studies have looked at digital technology beliefs, access and use from the perspective of a preschool teacher and what types of planning go into digital technology use in a preschool classroom. Most available studies at the preschool level look at use of computers or tablets. This dissertation focuses primarily on computer and tablet technology and what impacts they have on young children and how preschool teachers think about digital technology to support young children’s growth and development. Including the voice of preschool teachers may prove to be extremely important to understand the realities of using digital technology with young children and what needs are unmet both on the child’s side and the teacher’s side. In particular, teachers lived experiences through the COVID-19 pandemic may provide unprecedented information about technological experiences at the preschool level and further understanding related to the digital divide.

Major Research Questions

The overarching research questions that this dissertation explored include:

- What types of digital technology do teachers and children use in their preschool classrooms and how do they use it?
- What advantages or disadvantages, if any, do preschool teachers see in using digital technology with young children?
- How do preschool teachers form their beliefs about the use of digital technology with young children?
- Have preschool teachers changed their views and/or practices related to digital technology since the COVID-19 pandemic began?
- Do preschool teachers vary in the advantages they see in the use of digital technology related to demographic variables such as age, years of experience teaching or by program type?

Significance

Digital technology use in early childhood education must be a mindful practice that is integrated with the highest principles of teaching and learning. Digital technology tools (i.e., computers and tablets) can be used poorly or enhance learning experiences. Many technology enthusiasts forget that learning is a transformation of the mind and heart. The younger the learner, the more the need for a fluid exchange of ideas, interactions between a teacher and a child, and between a child and the content.

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews and summarizes the various discussions in the literature related to potential advantages and disadvantages of young children's access to digital technology. Preschool teachers' preparedness and beliefs about using digital technology are discussed. Three major early childhood theories are included related to technology use and the impact technology use may have on preschool teachers and young children. Early learning technology standards and guidelines are described in an effort to facilitate early childhood educators in making informed decisions regarding the use of technology and interactive media tools with young children. The final section of this chapter summarizes the research, theories, and policies related to digital technology in the field of early childhood.

Debates Surrounding Technology Use with Young Children

There are various discussions in the literature about whether young children should have access to digital technology in their classrooms, in addition to home use. Most arguments in the literature for or against technology seem to be concentrated around the quality and value of children's experiences with digital technology or communication technology (Donohue, 2015; Kimball, 2019). What advantages are there to using digital technology with young children? More specifically, does digital technology enhance or potentially impair the developmental skills related to early literacy development, physical development and social development? Plowman and McPake (2013) spoke with 50 parents of 3- to 4-year-olds and asked about technology use with

young children. These parents overwhelmingly revealed that the most important thing for them was to find a good balance between technology-based and more traditional games, toys and outdoor play experiences. With careful planning, most of these parents believed that they were able to find that balance for their children.

There are those who argue that technology and devices are replacing children's opportunities to play together, create art, pretend, and explore the outdoor environment. Kimball (2019) points out that an early childhood classroom should represent the culture and world that children live in and thus technology needs to be appropriately integrated. Digital devices used by young children are meant to be enjoyable, the goal is to make sure the time learning is worthwhile.

Many children today have been born into a digital world and will grow up having known nothing but a world full of devices, both in their homes and in their classrooms. However, another issue that bears consideration related to digital technology use by young children is what is commonly called the digital divide. This term is increasingly used to explain the social effects of access to information and communication technology (Cronin, 2002). There are some that explain the digital divide as the line between homes and schools that have computer access and internet connectivity and those that have neither access nor connectivity. Family income, family background, parental education, and location (urban vs. rural) all contribute to the digital divide. Cronin (2002) explains, in the late 1980s and early 1990s, this trend was talked about as the information rich and the information poor. The digital divide is not new but, rather a gap that exists between the "haves" and the "have-nots" and has been exacerbated by such things as; computers that continue to increase in power and efficiency, the introduction of the Internet and

most recently the COVID-19 pandemic has pointed out where gaps in educational preparedness and access exist (Dorn et al., 2020).

There is a general societal opinion that the educational system is the main tool through which a resolution can be achieved to lessen the digital divide (Tarman, 2003; Steele, 2019). The digital divide is a very complex issue that reveals itself in different ways given various backgrounds and cultures. The solutions must include an understanding of local needs and conditions, and integration must happen in sustainable ways. To lessen the gap, it will take multiple parties pushing for reform: children of the community, parents, educators, community organizations and policymakers.

Potential Advantages of Technology Use by Young Children

Clements and Sarama (2003) stated that the computer, in particular, can support and extend children's learning and development, as they use computers to explore, play, solve problems, do puzzles and manipulate objects on the screen. At the same time, learning to use the computer may be characterized by the active involvement of the children as they interact with the software, investigate, experiment, and focus on the discovery process rather than the end product. For example, sign-making can extend to computer screens and keypads, showing that children can transform the content of the meaning of a sign, whether on a screen or on paper, through playful manipulation.

Young children, with increasing accuracy, represent their thinking, by drawing and painting using a variety of traditional tools: such as pencils, crayons, markers, paints, and paintbrushes in a typical preschool classroom. With experience, young children gain increasing control over these tools thereby enhancing their eye-hand coordination, motor and cognitive development, and emergent literacy skills (Copple & Bredekamp, 2009).

These active learning activities lay the groundwork for later academic learning, including writing. Matthews and Jessel (1993) studied the development of graphic representation, alongside the more traditional tools children often use as they progress through the developmental stages of drawing. These researchers used a mouse-driven computer program for electronic painting called paintbox in their observational study that included seven children in preschool ranging in age from 22 to 46 months. As the children used the paintbox and more traditional drawing medium over several sessions, the researchers began to understand that similar techniques were used to draw, regardless of whether they were using electronic or traditional medium. Initially, children were challenged when using paintbox and they required instruction from adults, much like when children are first learning to use a marker or pencil. However, once they understood the movement and manipulation of the mouse in relation to drawing on the screen, “painting on the computer” provided another vehicle for preschool children to represent their thinking. This study demonstrates the possibility of drawing actions, not being tied to a particular medium but rather a change in medium and context that may offer young children a different way to express themselves. Paintbox, with time and opportunity to explore, may offer new types of thought-provoking experiences for young users of this application.

Young children using tablets with a stylus has also been studied by Couse and Chen (2010). These researchers videotaped 41 preschool children (ages 3 to 6) as they used tablets. The premise of this study was to learn about the children’s ease of acclimating to tablet use and how it engaged them in drawing. Study findings suggested that:

The tablet computer appears to be a viable tool to offer young children for representing their ideas in the early-childhood classroom. We found children readily became at ease with using the stylus and the inking features. Although they encountered glitches associated with learning this new technology, children were able to persist without becoming frustrated. (p. 95)

These researchers also learned that children learned to use tablets quickly, even despite glitches. Children worked to solve problems (e.g., when children could not find the correct button for all the colors they wanted) independently and confidently. The authors suggested that tablets hold potential as a learning tool as a means to apply digital technology standards in early education.

Potential Disadvantages of Technology Use by Young Children

Arguments against use of technology in classrooms are reviewed by Cordes and Miller (2000) in *Fool's Gold: A Critical Look at Computers in Childhood*. They ask, “can young children really differentiate between their own human thinking and the powerful operations of a machine? Is it even fair to impose such a task upon them” (p. 20)? These authors state that computers are complex thinking tools designed and developed with adult bodies and adult mental abilities in mind. Even for adults, their concentrated use is potentially related to job stress and injuries. For children, whose growing bodies are generally more vulnerable to stress, use of computers present several challenges to healthy development. For example, researchers (Madigan et al., 2019) found that over time, children who spent more time using screens did indeed show poorer performance on developmental measures. This study included 2,441 mothers and their children between the ages two to five. Data were collected at the start of the study (at age 2) then

again when children were three and five. Mothers reported on how much time their children spent in front of screens (i.e., computers and TV) on a typical day, and also reported on developmental measures by answering questions about their children's communication skills, behavior and social interactions. The study found that on average, the children were spending about 2-3 hours a day in front of a screen. The American Academy of Pediatrics recommends young children spend no more than one hour a day watching quality educational programming (AAP, 2016). (More detailed information about the AAP recommendations can be found in the Technology Guidelines and Recommendations for Young Children section of this chapter.)

These researchers (Madigan et al., 2019) went on to explain the developmental delays remained strong even after the researchers accounted for other factors that could influence developmental milestones, including parental education, how physically active the children were and whether parents regularly read to their children. In a Time interview (Park, 2019) Madigan stated, "The results show that there is a lasting influence of screen time, especially when children are two to five years old, when their brains are undergoing a period of tremendous development."

Plowman and McPake (2013) studied fifty 3- and 4-year-old children and their families using a case study approach. These researchers visited families repeatedly over a period of a year or more, getting to know the families well. In an effort to debunk technology myths about screen time use and young children, they found that interactive technology does not always equal learning. An electronic book that reads to a child or a program that asks a child to point to a picture on the screen and when correct the child hears "well done" does not equal an educational encounter. There are product marketers

that make the claim that technology products can accelerate learning in reading, writing or math concepts. All too often however they are, “mundane educational tasks disguised as entertainment” (p. 30).

DeLoache et al. (2010) studied vocabulary growth in 12- to 18-month-old toddlers in naturalistic settings. The researchers exposed the children to a highly popular video media product promoted for this age group. Even when the treatment group was exposed for a substantial amount of time to the video over a four-week period, these children learned only a few of the words featured on the video. These results suggest that young children may have difficulty understanding the relation between what they see on a screen and the real world. An additional finding from this study may suggest that normal developmental progress was credited to children’s additional video exposure. When in fact, there was no difference in how many words children learned between the two groups (treatment and control). These results suggest that much of the enthusiasm espoused about learning from media marketed for young children may be misplaced.

A preschool teacher in a semi-structured interview conducted by Kara and Cagiltay (2017) in Turkey expressed technological interactivity this way, “technology prevents building communication of children with their friends” (p. 129). Technology may be used in replacement of socializing with peers and preventing social play. Children may be frequently choosing to play with a computer rather than, for example, spending time outside or discussing the rules to an invented game of tag. Technological interactivity pales in comparison to human interaction, for example, sharing a reading experience with a capable partner (e.g., another child, a teacher) cannot be replicated for an early reader (Plowman & McPake, 2013).

Elkind (1996) explains that caution should also be taken when evaluating a young child's intellectual abilities via perceived computer competencies. They can be very misleading, for example, a child's use of grammar and syntax may be far ahead of their level of comprehension. A child may use "of" and "because" correctly without any understanding of or mental connection to prepositional phrases. Similarly, children often can display a level of computer competence that masks a much lower level of cognitive understanding. Young children may know how to operate a computer, but may not have yet attained the concrete operations (e.g., deductive reasoning, following rules) described by Piaget.

Teacher Preparedness and Beliefs About Digital Technology and Learning

Preschool Teacher Preparedness

Questions exist around the quality of digital technology experiences for young children; are preschool teachers prepared and confident to integrate technology into their classrooms? Most early educators do not possess sufficient specialized instruction and operational competencies to feel that they can fully integrate digital technology into their classrooms. Educators need continuous and systematic support in the area of information, communications and technology (ICT), in order for them to fully realize all the advantages of ICT, and perhaps simplify their everyday work in the process (Veličković & Stosić, 2016). Plowman and McPake (2013) explain this phenomenon as teachers being “digital immigrants” having adapted technology into their lives later in life. These “immigrants” have learned a certain level of adaptation and can do what they need to do but don't necessarily have a natural affinity to using technology or feel fully integrated as “tech users.”

The sudden closing of school buildings across the country due to the COVID-19 pandemic forced educators, teaching children of all ages, to face the most jolting change to classroom practices perhaps of any in history. With extremely short notice, educators were asked to leave their classrooms and, in many cases, to create a learning experience for children that was totally virtual or at the very least required more reliance on the use of technology. The EdWeek Research Center surveyed teachers asking, “How has the shift to remote learning changed you as a teacher, for better or worse?” (Heubeck, 2020). An elementary school teacher in Maine replied; “I was not prepared for teaching online the way the younger teachers were ... The learning curve was steep and I'm still learning. Still grieving the loss of the way teaching used to be.” An early educator in Utah stated, “I am stressed in new ways ... I spent endless hours crying and waking at night with nightmares about how I would push out lessons that were quality, with online resources that I wasn't capable ... of using.” In Texas another early educator was able to put a more positive spin on the sudden change required to teach young children during the COVID-19 pandemic; “I honestly think this challenge has changed me for the better. I’ve had to explore and become adept at a wide variety of online platforms. I’ve developed new ways of communicating with students and parents.” The COVID-19 pandemic has thrust technology use into the limelight in new and unprecedented ways – Whether teachers and families were prepared or not, technology has become an educational lifeline in many ways for early education teachers and families with young children.

Preschool Teacher Beliefs

Preschool teachers’ beliefs about computers, information and communications technology (ICT) and play in early childhood education settings merit consideration as

well. Nikolopoulou and Gialamas (2015) state that not enough information is known about preschool teachers' beliefs regarding ICT and play in preschool, as well as their confidence in integrating ICT in the classroom. One hundred and ninety preschool teachers in Greece were asked about their individual characteristics, views about the appropriateness of using computers in preschool, and information about children's computer use in the classroom. Eighty percent of the teachers in this study stated that the curriculum they implemented did not provide specific guidelines about technology use; the choice/nature of the teacher-organized activities was left to the teachers' discretion. Therefore, teachers' beliefs and confidence levels may influence their classroom practices and choices, and as a consequence, young children's learning. Computer self-efficacy was also assessed according to four items on a "confidence with technology" subscale. The findings suggested that teachers view ICT play, as not just free play. Rather ICT must be integrated into the early childhood curriculum. Teachers with fewer years of teaching experience and higher teacher computer self-efficacy were more confident in their beliefs around teaching practices.

Veličković and Stosić (2016) confirmed this notion that "younger" educators, younger in terms of years of service, declared that computers should be used more, believing that a digitalized environment is where younger generations "live and grow." Younger educators are more open to computer use, more likely to use one on a daily basis and are more aware of the usefulness of computers when it comes to educational work.

Another study looked at 17 preschool educators' understanding of their relationship between general educational beliefs about early childhood learning and the

foundations of educators' positive information and communication technology (ICT) pedagogical beliefs (Mertala, 2017). Beliefs are examined from the viewpoint of pedagogical goals and practices. Goals refer to the features of what educators believe preschool education is for, and what should be taught at this age level. Practices, in turn, are the means to achieve these goals. ICT pedagogical beliefs, following the same path, are understood as beliefs about why (goals) and how (practices) ICT should be used in preschool education. Educators in this study valued the general educational belief that learning socio-emotional skills is more important than academic skills. They also emphasized that learning is something that happens interpersonally, and that children must have an active role as meaning-makers in the learning process. Small group instruction and personalized activities were valued. However, when the focus was shifted to ICT pedagogical beliefs, the educators expressed that the main goal behind ICT use is supporting the development of young children's academic skills and use of technology was thought to be inactive.

Using a more sophisticated method - path analysis - Blackwell, Lauricella and Wartela (2014) described the direct and indirect effects of various factors on teachers' use of technology in early childhood education. The model showed that support, having a school-wide technology policy, and more teaching experience had positive direct effects on technology use. Interestingly, having more teaching experience in this study differed from what Nikolopoulou & Gialamas (2015) and Veličković & Stosić's (2016) studies found related to teacher beliefs. This study pointed out that teachers with more years of experience were using technology more, the two previously mentioned studies found that fewer years of teaching experience related to more technology use. Additionally,

Blackwell, Lauricella and Wartella (2014) found that both confidence and attitudes were positively influenced, in that, having a technology policy for your school fostered positive attitudes toward technology. Settings that offered support, that is, helped teachers understand how to use technology to improve student learning had teachers that were described as having a more positive attitude toward technology and in turn more confidence.

Taking preschool teachers' beliefs and educational goals into account and identifying developmentally appropriate activities using computers with young children can support them in adopting new teaching approaches using computers (Hall & Higgins, 2002). Further, these authors (Hall & Higgins, 2002) identified an important factor as a part of their study – collecting information about children's progress. Evidence related to what children are learning (e.g., sorting skills, recognizing patterns, working with a peer to solve a problem on the screen, learning capital letters from the keyboard) establishes the effectiveness of computers in early childhood settings. Teacher beliefs about effective practices generally, and about the effective use of ICT in particular, are then grounded in measurable learning outcomes. These learning outcomes can then provide the foundation to support further development of classroom activities that incorporate technological experiences for young children.

Technology Guidelines and Recommendations for Young Children

To help contend with the lack of curriculum guidance around technology, the National Association for the Education of Young Children (NAEYC) and the Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College (2012) offer a joint position statement to help guide early childhood educators in making

informed decisions regarding the use of technology and interactive media tools with young children. These organizations consider both the benefits and challenges of implementation. The guidelines define technology as encompassing some of the tools already in classrooms and some that teachers may consider using, including a broad range of digital devices such as computers, tablets and multitouch screens. Older analog devices, still being used in some classrooms are also included, such as tape recorders, VCRs, VHS tapes, record and cassette players. The joint recommendation includes 1) Selecting, using, integrating, and evaluating technology tools that are intentional and developmentally appropriate; 2) Providing a balance of activities, when used appropriately technology can extend and support active, hands-on, creative, and authentic engagement; and 3) Prohibiting the passive use of television, videos, and DVDs in early childhood programs.

The Michigan Department of Education also offers guidance that recognizes that digital technology plays an increasing role in the lives of young children in preschool programs and beyond. In 2009, preschool technology learning expectations, the Michigan Educational Technology Standards for Students, Grades PK-2 (Michigan State Board of Education, 2009) were adopted. These learning expectations were developed with the understanding that young children's age-appropriate use of technology should be used to support and extend learning and development under the guidance of adults who understand how to use it appropriately. The standards are as follows:

1. Creativity and Innovation - Children use a variety of developmentally appropriate digital tools to learn and create.

2. Communication and Collaboration - Children work together when using developmentally appropriate digital tools.
3. Research and Information Literacy - With adult support and supervision, a) children interact with developmentally appropriate internet-based resources; b) children use developmentally appropriate digital resources to locate and use information relating to a topic under study.
4. Critical Thinking, Problem Solving, and Decision Making - Children can explain some ways that technology can be used to solve problems.
5. Digital Citizenship - Children begin to understand how technology can be used appropriately or inappropriately.
6. Technology Operations and Concepts. Children begin to learn to use and talk about technology tools appropriately.

These standards are intended to 1) assist teachers with their own self-reflection regarding their practices in the classroom, 2) help teachers consider the experiences and prior learning of the children in their classrooms, and 3) help teachers to visualize representative experiences and practices that will help to lead them toward reaching the Michigan Early Learning Expectations across the prekindergarten to grade 3 levels.

As digital devices have become more and more prevalent not only in schools but in homes and in society generally, the need for guidance for appropriate use with young children has arisen. The American Academy of Pediatrics (AAP, 2010) offered an early recommendation on technology use for parents, this information however is relevant for early childhood teachers as they should be familiar with parent recommendations as they consider technology use in their classrooms. The AAP initially discouraged any amount

or type of screen time for children under 2 years of age, and no more than one to two hours of total screen time per day for children older than 2. The AAP in 2016 updated the recommendations to include: 1) For children younger than 18 months, avoid the use of screen media other than video-chatting. Parents of children 18 to 24 months of age who want to introduce digital media should choose high-quality programming, and watch it with their children; 2) for children ages 2 to 5 years, limit screen use to 1 hour per day of high-quality programs. Parents should co-view media with their children, and 3) for children ages 6 and older, place consistent limits on the time spent using media, and the types of media, and make sure media does not take the place of adequate sleep, physical activity and other behaviors essential to health. These recommendations demonstrate two important points. First, children need direct interactions with parents and other regular caregivers for healthy brain growth and prevention of childhood obesity. Secondly, from an ecological standpoint, the need for updated AAP recommendations points out the ever-changing influence that technology has on society, early childhood classrooms and children's lives. Technology, in various forms, is ever-present in the daily lives of the children of this generation.

Relevant Major Theories Related to Technology

Bronfenbrenner's Bioecological Theory

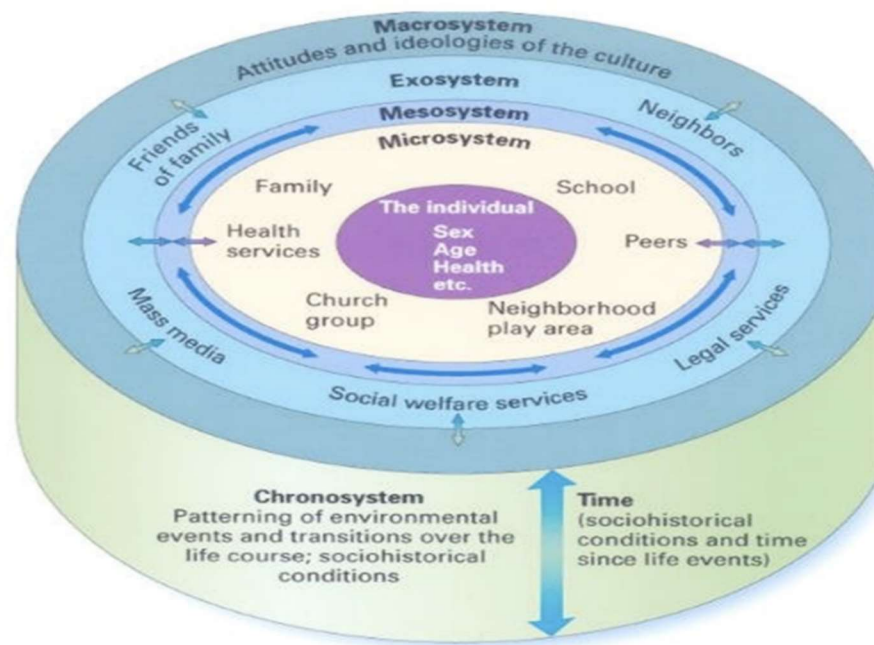
Bronfenbrenner's (2005) ecological model studies human development in relationship to a person's (a child's or a teacher's) environment; this can include society as a whole, the period in which a person lives, and how behaviors and decisions affect development. Using this lens to view behavior and development could be thought of as a synergetic relationship. Science (Shonkoff and Phillips, 2000) tells us that early

experiences are embedded biologically (i.e., built into our bodies) for better or for worse. Bronfenbrenner also recognized a person's biology is a part of the synergetic relationship and hence, his model has also become known as the "bioecological" model.

Bronfenbrenner suggested that in order to understand human development, the entire ecological system, including five socially organized subsystems, needs to be considered. Each system depends on the contextual nature of the person's life and within and between each system are bi-directional influences, both away from the person and towards the person.

Figure 1

Bronfenbrenner's Ecological Systems Theory



The microsystem (see Figure 1) is the layer closest to a child or teacher and contains the structures with which the child and teacher have direct contact. The microsystem encompasses the relationships and interactions a child or teacher have with their immediate surroundings such as family, school, neighborhood, or childcare environments. A preschool teacher, for example, may use the classroom tablet as a part of a small group lesson to show a website that features two types of ladybugs. The teacher and children discuss how the images of the ladybugs on the tablet look the same and different from one another. The next layer, the mesosystem, consists of the interactions between the different parts of a person's microsystem. The mesosystem is where a person's individual microsystems do not function independently, but rather are interconnected. These interactions have an indirect impact on the individual (e.g., the relationship between a child's parents and his or her teacher). The connections that the teacher builds with a parent as they use a phone app to share classroom experiences or during a virtual parent-teacher conference where developmental milestones are discussed demonstrate this scheme. A parent may also share with a teacher how a child has written his or her name using a device at home.

The exosystem, the third level of Bronfenbrenner's ecological model, refers to a setting that does not involve the person (the child, the teacher) as an active participant, but still affects them. This includes decisions that have bearing on the person, but in which they have no participation in the decision-making process. An example would be an Intermediate School District (ISD) making the decision to remove all computers in Great Start Readiness Program (GSRP) classrooms or providing a tablet to each child (family) or teacher that attends the school. These types of decisions have an impact on the

teacher and children in GSRP, either limiting the exposure they have to computers or greatly enhancing access to computers.

The fourth level of the ecological system is the macrosystem. The macrosystem encompasses the cultural environment in which the person lives and all other systems that affect them. Examples could include the economy, cultural values, and political systems. The almost inescapable presence of technology in our society in almost all environments, educational or otherwise, that we are exposed to is one example of this, at least in many parts of the United States and around the world.

The final layer, the chronosystem, refers to the events and transitions over a person's life course. As GSRP children transition to kindergarten or a teacher seeks out further educational experiences, their level of technological exposure and growing competence with technological products, for example, demonstrates this element of the ecological system.

Elder's Life Course Paradigm

Elder (1998) discusses historical forces that shape social trajectories of family, education, and work. These historical forces, in his work looking at individuals during the time of the Great Depression and World War II, in turn, influence a person's behavior and particular lines of development. Some individuals are able to select the paths they follow, a phenomenon he calls human agency, but these choices are not made in a social vacuum. The time period that an individual is born into and grows up in sometimes establishes an "experiment in nature." Elder explains that, "the life course of individuals is embedded in and shaped by the historical times and places they experience over their lifetime ... lives are lived interdependently, and social and historical influences are

expressed through this network of shared relationships” (p. 3-4). If we were to think of this time in history as the “Great Technological Revolution” and study the lives of children born over the course of the next 10 to 15 years looking at how technology has shaped and impacted their lives the results likely may look very different in terms of some of the same variables that Elder looked at (e.g., income, high school graduation, a person’s life work) as compared to individuals born at a prior point in time or even 15 to 20 years into the future. The introduction of the tablet computer, in particular, for use by young children may provide an interesting test of effects for example on, child’s language development, social development, or health outcomes.

The COVID-19 pandemic may provide a natural experiment in time, like no other to date, for looking at topics related to digital technology use in relationship to such things as preschool teacher training (preservice and in-service) around the use of digital technology both to offer quality lessons and to support children in becoming tech users. Additionally, beliefs about digital technology use may have changed as a necessity to cope with online learning and what young children are truly capable of learning via technology. The COVID-19 pandemic may have changed how digital technology will be utilized by both teachers and young children well into the foreseeable future.

Vygotsky's Sociocultural Theory

In McLeod’s article (2018) he explains Vygotsky's sociocultural theory on human development as a socially facilitated process in which children acquire their cultural values, beliefs, and problem-solving strategies through collaborative dialogues with more knowledgeable others (i.e., MKO; someone who has a better understanding or higher ability level than the learner). Vygotsky's theory is comprised of concepts such as

cultural-specific tools, private speech, and the Zone of Proximal Development (i.e., ZPD; the difference between achievement independently and achievement with guidance and encouragement from a skilled partner).

Vygotsky's theories stress the fundamental role of social interaction in the development of cognition (Vygotsky, 1978); he had the strong belief that community plays an essential role in the process of "making meaning." Vygotsky believed that children are born with basic abilities for intellectual development called Elementary Mental Functions (i.e., attention, sensation, perception, memory). As interactions take place within a sociocultural environment, the interactions become more developed and more sophisticated. A given culture provides its children tools of intellectual adaptation that allow them to use their basic mental functions more and more effectively. Vygotsky referred to these more effective mental processes as Higher Mental Functions. Tools of intellectual adaptation is Vygotsky's term for methods of thinking and problem-solving strategies that children internalize through social interactions with the more knowledgeable others. For example, adults provided a few simple instructions for children learning how to use a new drawing program to help them overcome problems they encountered as they were learning.

Vygotsky sees cognitive functions, even those carried out alone, as affected by the beliefs, values, and tools of intellectual adaptation of the culture in which a person develops and therefore socio-culturally determined. The tools of intellectual adaptation, therefore, vary from culture to culture.

Summary

Digital technology use in early childhood education must be a mindful practice that is integrated with the highest principles of teaching and learning. Digital technology tools (i.e., computers and tablets) can be used poorly or enhance learning experiences. There are educational technologies on the market that offer relatively meaningless experiences for young children and may contain inappropriate content or perhaps may be detrimental to normal growth and development for a young learner.

Preschool teachers have some deep-rooted ideas about using technology, based likely on their own background and as Plowman and McPake (2013) explain many may be described as “digital immigrants” having learned just what they need to know to do their jobs. Every powerful tool makes demands on us, and its use in many ways alters the way we live and engage with the world around us. These tools that create change are rarely all good or all bad. Careful consideration of guidelines and standards created by experts are imperative when introducing digital technology into an early childhood classroom. We must find ways to teach young children mindfulness and responsibility in their use of digital technology. It is also essential to be mindful and responsible when selecting the technologies that are most appropriate for educating young children.

Keating (1999) states that as compared to other historical time periods, digital technology changes may be more rapid in, “its capacity for almost infinite acceleration, because the technology innovation is precisely about knowledge. It builds on the notion that information in an ideal sense becomes totally accessible and very inexpensive or free” (p. 244). Digital technology therefore may become a universal phenomenon and in

Bronfenbrenner's (2005) ecological system a layer in the microsystem as influential as parents and teachers are to a child.

CHAPTER THREE

METHODS

This study examined the beliefs and practices of preschool teachers regarding their use of digital technology with young children through survey questions and follow-up interviews. Many studies that examine digital technology use are carried out with school-aged children; few ask preschool teachers to share their views. Thus, this study will add to the available literature about digital technology use at the preschool level by including the voice of preschool teachers. This study included questions related to the lived experiences of preschool teachers as they have worked through the COVID-19 pandemic and how these experiences may have changed their thinking related to digital technology. This study provided unprecedented information about how preschool teachers think about digital technology to support young children's growth and development.

Providing answers to these major research questions will contribute to the limited knowledge about digital technology use at the preschool level:

- What types of digital technology do teachers and children use in their preschool classrooms and how do they use it?
- What advantages or disadvantages, if any, do preschool teachers see in using digital technology with young children?
- How do preschool teachers form their beliefs about the use of digital technology with young children?

- Have preschool teachers changed their views and/or practices related to digital technology since the COVID-19 pandemic began?
- Do preschool teachers vary in the advantages they see in the use of digital technology related to demographic variables such as age, years of experience teaching or by program type?

This study will also provide information for further development of digital technology recommendations and guidelines for preschool classrooms and policy initiatives at various levels (e.g., school districts, state-level governance).

Research Design

This study employed a mixed methods research approach, a procedure for collecting, analyzing, and “mixing” both quantitative and qualitative research methods in a single study. More specifically a complementary mixed-methods approach was used (Greene et al., 1989) that employed different methods, qualitative and quantitative methods, to assess the same conceptual issue. The logic of complementary mixed methods is to measure convergence of related issues. I selected interview participants to further refine and potentially add details to previously gathered survey information. Using a complementary mixed-methods approach may confirm a participant’s view about an issue or idea; it may also provide a fresh perspective related to the issue or idea.

For this study a survey was collected from preschool teachers first that included quantitative data (e.g., demographic information, ratings, count data) and qualitative data (e.g., open-ended short answer responses). The survey was followed-up with a semi-structured interview from a subset of survey participants producing further qualitative information. A mixed methods research design enables a researcher to gather, examine,

and integrate quantitative data and qualitative data through numerical data and text data (Creswell, 2003). Employing this approach allowed for the collection of data of different types in succession and offered one of the best ways to facilitate a comprehensive understanding of the research questions posed by this study looking at them in different ways (Creswell, 2003).

Study Participants

Survey Participants

Survey study participants included preschool teachers working with children 2 to 5 years old or before kindergarten entry in several states across the United States. The preschool teachers worked for various types of programs (e.g., Head Start, state-funded preschool programs, for-profit centers, not-for-profit centers) and implemented various types of early childhood curriculum models. This study provided an opportunity to gather descriptive information about preschool teachers, as well as examine the variance in beliefs and practices in digital technology use at the preschool level.

Achieved Survey Sample

The achieved survey sample included information from 100 participants, 87 electronic submissions and 13 paper submissions. A case was included if at least 3 demographic variables and at least 2 content questions were answered. There were several "false starts" in the Qualtrics data set, it appeared that some respondents started a survey but did not finish it. The N has been included in reported information and tables in this chapter and Chapter 4 to indicate the number of responses received for each question.

Sixty-one participants replied to the gender question, most in this sample were female (96.7%). All 100 teachers reported their zip code. Fifty-five different zip codes in

8 different states (California, Connecticut, Georgia, Maryland, Michigan, Minnesota, Mississippi, and Virginia) were reported across the country. Ninety of the teachers however, reported being from Michigan. Table 1 presents the demographic information for classroom related data for this sample of preschool teachers. Table 2 presents descriptive information related to preschool teacher characteristics.

Table 1

Preschool Classroom Descriptive Information for Survey Participants

	Number	%
Age of children being cared for		
24 to 35 months	5	5%
24 to 47 months	4	4%
24 to 59 months	5	5%
24 to 71 months	7	7%
36 to 47 months	5	5%
36 to 59 months	13	13%
36 to 71 months	19	19%
48 to 59 months	31	31%
48 to 71 months	8	8%
60 to 71 months	2	2%
Type of classroom		
Federally funded in a private or not-for-profit classroom	9	10%
Federally funded in a public school classroom	8	8%
State-funded classroom in a private or not-for-profit classroom	7	7%
State-funded in a public school	35	37%
State-funded classroom in a for-profit classroom	3	3%
Federally and state funded in a public school classroom	6	6%
Not-for-profit classroom	13	14%
For-profit classroom	14	15%
Type of early childhood curriculum or approach used		
Creative Curriculum	4	4%
Creative Curriculum plus 1 other curriculum	8	8%
HighScope Curriculum	70	70%
HighScope Curriculum plus 1 other curriculum	6	6%
Reggio Emilia	5	5%
Project Approach	1	1%
Program developed curriculum	6	6%

Teachers were asked to fill in all the age groups of children they cared for. Ninety-nine teachers replied to this question. Approximately one-third (31%) of the children in care were between 48 and 59 months old. Another one-third were between 36 and 59 months or 71 months old. The remaining age groupings were reported less than 10% of the time. Many teachers cared for a mixed-age range of children (57%), meaning that the age range of children in care spanned more than 1 year. Ninety-five teachers replied to the question about the type of program they worked in. Forty-seven percent of respondents worked in a state-funded program, most often in a public school building. Eighteen percent worked in a federally funded program, 6% worked in a program with blended state and federal funding and the remaining 29% worked in a not-for-profit or for-profit program, presumably a tuition-based classroom. All 100 teachers replied to the question about curriculum type, 76% used the HighScope Curriculum or the HighScope curriculum and one other additional curriculum. Twelve percent of the sample used Creative Curriculum or Creative Curriculum and one other additional curriculum. Smaller percentages used Reggio Emilia (5%), the Project Approach (1%) or a program developed curriculum (6%).

Table 2*Preschool Teacher Descriptive Information for Survey Participants*

	Number	%
Years working in early care and education		
Less than 1 year to 2 years	13	13%
3 to 5 years	17	17%
6 to 9 years	15	15%
10 to 15 years	23	23%
16 to 20 years	13	13%
More than 20 years	19	19%
Ethnicity of participant		
Hispanic/Latinx	2	3%
Middle Eastern	2	3%
Race of participant		
American Indian/Alaska Native/African American	1	2%
American Indian/Alaska Native/White	1	2%
Asian	3	5%
Black/African American	3	5%
White/Caucasian	51	86%
Highest level of education completed so far		
High school diploma/GED/ Some college	4	6%
Associate degree	7	12%
CDA certification	5	8%
Bachelor's degree	21	34%
Some graduate course work	6	10%
Master's degree	18	30%

All 100 preschool teachers in this sample replied to the question about early childhood work experience; approximately one-third had worked 5 years or less, another third between 6 and 15 years and approximately another third 16 or more years. Fifty-nine participants replied to the question about race, most were White/Caucasian (86%). Sixty-one teachers replied to the questions about ethnicity, 3% reported having an Hispanic or Latinx background and 3% reported having a Middle Eastern background. Sixty-one teachers reported their education level; 20% had earned an associate degree or

CDA certification, 34% had earned a bachelor's degree, 10% had some work toward a master's degree and an additional 30% had earned a master's degree.

Interview Study Participants

Twelve preschool teachers were selected from the 27 that expressed interest in completing an interview via Zoom at the time of survey completion. Each of the 12 teachers were contacted via email, phone call or text at least 5 times to set up an interview time at their convenience. To help ensure a variety of interview responses teachers were selected for interview completion based on the following criteria from survey responses; type of early childhood curriculum used, state of residence and reply to question 17 on the survey which asked about the benefits of using digital technology with young children (teachers fell into 1 of 3 categories based on their responses; favorable, favorable with limitation, and against digital technology use with young children). A total of 4 teachers completed a follow-up interview the other 8 either never responded to invitations to be interviewed, their email bounced back or their phone number was no longer in service. Table 3 shows a breakdown of the interview selection criteria and selected demographic information for each interviewee.

Table 3

Selection Criteria and Selected Demographic Information for Semi-Structured Preschool Teacher Interview

	Type of EC Curriculum	State	Benefits of Technology	Program Type	Level of Education	Race
Interviewee #1	Creative Curriculum	GA	Favorable	State-funded	Master's Degree	African American
Interviewee #2	Reggio Emilia	VA	Favorable	Not-for-profit	Associate Degree	White
Interviewee #3	Creative Curriculum	MI	Favorable	State-funded	Bachelor's Degree	White
Interviewee #4	Creative Curriculum	MI	Favorable with limits	State-funded	CDA	White/Middle Eastern

Data Collection Instrument Development

Preschool Teacher Survey Development

The preschool teacher survey technology questions were developed in Qualtrics (Qualtrics XM, 2022) from a pilot survey I used previously in my Oakland University Field-Based I and II projects. The pilot survey was reviewed by my Field-Based Faculty Advisor and the Chair of the Human Development and Child Studies department. They were asked to review the survey for relevant content and usability. An expert familiar with survey development outside of Oakland University was also asked to review the pilot survey for understandability and usability. After the pilot survey results were analyzed, further refinement of the survey took place by making slight formatting updates and additional questions were added. The additional questions were developed, ones not asked of the pilot teachers, to ensure that more refined questions and relevant topics

related to digital technology use by preschool teachers were captured and to capture replies related to all research questions posed by this study (see Appendix A for Digital Technology Survey for Preschool Teachers). The survey was reviewed again by my Dissertation Advisor and five doctoral-level dissertation classmates for relevant content and usability. All suggestions and changes were updated in Qualtrics after this round of reviews and all questions were examined to ensure the format and response options were appropriate.

Table 4 offers a shorten version of how each research question posed by this study was answered by survey or interview questions (see Appendix B for How the Research Questions are Answered by Survey and Interview Questions).

Table 4

How the Research Questions are Answered by Survey and Interview Questions

Research Questions	Survey Number	Interview Number
• What types of digital technology do teachers and children use in their preschool classrooms and how do they use it?	10, 13, 14, 15, 16	1, 2, 6, 7
• What advantages or disadvantages, if any, do preschool teachers see in using digital technology with young children?	17	8, 9, 10
• How do preschool teachers form their beliefs about the use of digital technology with young children?	9, 11, 12	4, 5, 11
• Have preschool teachers changed their views and/or practices related to digital technology since the COVID-19 pandemic began?	20, 21	12, 13
• Do preschool teachers vary in the advantages they see in the use of digital technology related to demographic variables such as age, years of experience teaching or by program type?	1, 3, 5, 7, 9, 11, 12, 17, 27, 28	

Interview Question Development

A semi-structured interview was developed from a technology use guiding questions document I had developed for focus group interviews from my prior Oakland University ecology class. Questions included in the interview related to the COVID-19 pandemic were developed as part of another previous class assignment asking parents about their views and experiences with school closures and teaching children at home. The semi-structured interview was reviewed by my Dissertation Advisor and five doctoral-level dissertation classmates for relevant content and usability. Suggestions and changes to questions were updated as appropriate (see Appendix C for Semi-Structured Preschool Teacher Digital Technology Interview).

Procedures

Oakland University's Internal Review Board

This dissertation survey and interview project was submitted to Oakland University's Internal Review Board (IRB) for modifications based on the pilot study IRB approval. The modified project was vetted by the IRB, all requests for updates, additional information, or further clarification about the survey or interview were addressed. The final IRB approval for this survey and interview project was granted on April 18th, 2022 (see Appendix D IRB Approval Letter).

Sample Selection and Data Collection

The preschool teacher Qualtrics survey link was posted on the National Association for the Education of Young Children's (NAEYC) open discussion forum called "Hello." The open discussion forum is a place for online discussion and conversations with early childhood professionals. I am a member of NAEYC and all

NAEYC members are granted access to this forum. A short message was included with the post asking preschool teachers to first, agree to participate in the study and then to complete the survey information. Survey responses were collected from April 26th, 2022 to June 18th, 2022 using this method.

Additionally, lists of preschool centers from three counties; Washtenaw, Oakland and Macomb in the Southeastern Michigan area were downloaded from Michigan's Department of Licensing and Regulatory Affairs (LARA). The lists combined included a total of 1,056 centers. Centers were selected in the three-county area that indicated they were open and operational and cared for preschool-aged children (centers that only cared for school-aged children or only provided infant and toddler care were excluded). Centers that indicated they were closed due to the COVID-19 pandemic or for any other reason also were excluded. A total of 183 teacher and director email addresses were collected via center websites or in some cases through Michigan's Great Start to Quality website of those centers that indicated they were open, operational and cared for preschool-aged children. The survey was distributed using an electronic survey link through Qualtrics. The survey link was sent via my Oakland University email address asking preschool teachers to first, agree to participate in the study and then to complete the survey information. Survey responses were collected from May 4th, 2022 through June 18th, 2022 using this method.

Paper surveys were also collected at two early childhood conferences in Michigan in May of 2022, the Michigan Association for the Education of Young Children (MiAEYC) conference on May 6th, 2022 and HighScope's International Conference on May 12th, 2022. Purposive sampling techniques (Kish, 1965) were also employed as

many conference participants (e.g., center directors, early childhood specialists, college professors) that I engaged with did not work in a preschool classroom but rather worked with, coached or taught preschool teachers. Seventeen conference participants were sent the electronic Qualtrics survey link to subsequently forward to their preschool teacher contacts.

Data Analysis

Preschool Teacher Survey Variables

Two instruments, a survey and follow-up interview, were used to collect data with respect to developing a better understanding of preschool teachers' perspectives on the use of digital technology in their classroom. The survey was administered first and included 30 questions. Twenty-one questions were multiple choice or check all responses that apply (fixed answer). For some fixed-answer questions "other (please explain)" was included as an option to provide further clarification. Nine questions were fill in the blank or required a short answer reply (open-ended answer). The survey collected both qualitative and quantitative information.

Semi-Structured Interview Variables

Interviews were semi-structured, in that, interview participants were generally asked the same set of questions; however, depending on their responses, additional questions and topics were explored. In a few cases, a question was excluded based on a previous reply, for example, if a teacher answered that children do not have access to digital technology in the classroom the question related to how children used digital technology was not asked. The semi-structured interview included 14 questions--three short-answer questions, and 11 open-ended questions. In some cases, additional variables

were introduced by the preschool teachers as the interviews took place, these additional variables were included in the analysis. All interviews were recorded with the participant's permission.

Paper Surveys Versus Electronic Surveys

In order to test potential survey bias in the administration of an electronic survey asking preschool teachers about electronic technology use in their classrooms, some surveys were collected in paper format. Paper surveys were collected at two early childhood conferences in Michigan in May of 2022, MiAEYC and HighScope's International Conference. A total of 13 paper surveys were collected over the two days. A sample of 13 randomly selected respondents from Michigan that completed the survey electronically were drawn to test for survey biases. Chi-square statistics were performed on 6 demographic variables (years of work experience grouped by 9 years or less or 10 or more years, education level grouped by less than a bachelor's degree or bachelor's degree or higher, curriculum type, race, gender) to assess if those that completed the survey on paper were significantly different than the randomly selected group of respondents that completed the survey electronically. In all chi-square tests that were performed the two groups were not significantly different from one another.

Analysis of the Preschool Teacher Survey

Open-ended survey questions were reviewed, and similar responses and quotes were grouped together to form emergent themes. Each open-ended grouping per survey question was recoded into a separate variable using numerical categories based on the identified themes in the replies. For example, teachers were grouped into two categories based on their response to survey question 17 that asked about the benefits of using

digital technology with young children. The two groupings were: teachers that replied, Yes, they see benefits in using technology with young children; the other group included teachers that replied, Yes, but technology should be used with limitations and No, benefits seen. Some fixed-answer questions with predefined categories were also recoded into separate variables to form a smaller number of groupings. For example, the number of years working in the field of early childhood initially had seven categories that were recoded into two categories. Descriptive statistics were run for both recoded open-ended and fixed answer survey questions, including frequencies, mean, mode, and standard deviation. Missing information was also noted for each variable, any given variable may have missing information, some variables had missing responses from 55% of the participants.

Crosstab analyses with chi-square test statistics and tested with the standardized adjusted residual of counts was used to describe and analyze the recoded replies to survey question 17 that asked about the benefits of using technology with young children in relationship to demographic variables. For example, a crosstab analysis was performed using two groupings for survey question 17 in relationship to the two recoded groups for number of years working in the field of early childhood. The following list describes how the 9 demographic variables, grouped by classroom and preschool teacher descriptive information, were recoded into two grouping categorical variables:

Classroom Descriptive Information

- Type of classroom funding – Federal or state, Not-for-profit or for-profit
- Type of curriculum used – HighScope Curriculum or Other early childhood curriculum

- Income level of families in care – Extremely low or low income, Middle or high income
- State technology guidelines – Yes, the state has guidelines, No or not sure the state has guidelines

Preschool Teacher Descriptive Information

- Teacher training related to digital technology – Yes or No
- Teacher support related to digital technology – Yes or No
- Teacher age – 39 years old or younger, 40 years old or older
- Years of work experience – 5 years or less, More than 5 years
- Teacher level of education – Less than a bachelor's degree, Bachelor's degree or higher

IBM SPSS Statistics 23 (IBM Corp., 2021) was used to calculate the descriptive statistics and crosstab analysis.

Analysis of the Semi-Structured Interview

The recorded semi-structured interviews were transcribed, the responses were reviewed, and initial themes were identified by examining the responses. Large categories (themes) and some sub-categories (themes) were developed per question as the interviews progressed. The interview categories that emerged were coded for each interview question per participant. Analysis took place by examining the frequency of codes for each identified primary theme and subtheme. Table 5 shows the primary themes and subthemes that emerged from the analysis and an example quote that defines each primary theme or subtheme.

Table 5*Primary Themes and Subthemes from the Semi-Structured Preschool Teacher Interview*

Primary Themes and Subthemes	Example Quotes
● Feeling of excitement learning to use a computer ◦ Building family connection	“Using a computer made me want to learn, it was so exciting and new at the time.” “I remember working with my dad. We learned how to use it [a 1980s computer] together.”
● No support for technology use	“No school-related tech support what-so-ever.”
● Children play with technology ◦ Use non-digital technology ◦ Use digital devices	“The children are really curious about how the technology works. They ask how to use it as they play.” “We show them how the older CD player and the corded phones work.” “We use the iPads to teach them about looking things up on Google.”
● Benefits of electronic devices ◦ Improved my teaching ◦ Better connections with parents	“Computers are not going away. I have children in my classroom that don’t have them at home, so we need to teach them at school.” “I can get instant answers and make it easier to follow directions for myself.” “I send videos to parents. We did a gingerbread comparison and I shared what we did to parents. How we did it in the classroom.”
● No state guidelines or standards	“We don’t have state guidelines, just limits on screen time. They are really missing the point.”
● Changes in response to COVID-19	“I am using it more now for things I never thought about before. I use Apps now.”
● Technology use in the future	“The pandemic opened up the discussion of preschool teachers using technology in their classrooms.”

Each primary theme code was crossed with survey responses for the same or similar questions to validate the survey results with the themes and subthemes that emerged from the interview data analysis. The interview data supplied many meaningful and pertinent quotes to reinforce the results from the survey data. In many cases,

interviewees added important details to supplement what they had expressed on the survey.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

This study used a blend of methodologies to allow for both quantitative and qualitative data to be collected. Phase one of the study included collecting and analyzing survey data which was quantitative (e.g., fixed answer, demographics) and qualitative (e.g., short answer). Phase two included collecting and analyzing follow-up interviews from a sub-sample of survey participants. The follow-up interviews were semi-structured to allow participants to expand upon the replies they had provided in the survey. Using both quantitative and qualitative methods can provide a richer picture and deeper understanding of the data collected (Creswell, 2003).

The results of each overarching research question posed by this study are explored and reported on in this chapter. In each section of this chapter, divided by titles that correspond to research questions, survey data is reported first followed by relevant interview information. The initial survey data set contained several “false starts.” A survey case was retained if at least 3 demographic variables and at least 2 content questions were answered, 100 survey participants make up the achieved sample for this study. The N is reported for each survey question as there was missing data throughout the survey, for some questions up to 55% of responses were missing. The overarching research questions included in this study are:

- What types of digital technology do teachers and children use in their preschool classrooms and how do they use it?

- What advantages or disadvantages, if any, do preschool teachers see in using digital technology with young children?
- How do preschool teachers form their beliefs about the use of digital technology with young children?
- Have preschool teachers changed their views and/or practices related to digital technology since the COVID-19 pandemic began?
- Do preschool teachers vary in the advantages they see in the use of digital technology related to demographic variables such as age, years of experience teaching or by program type?

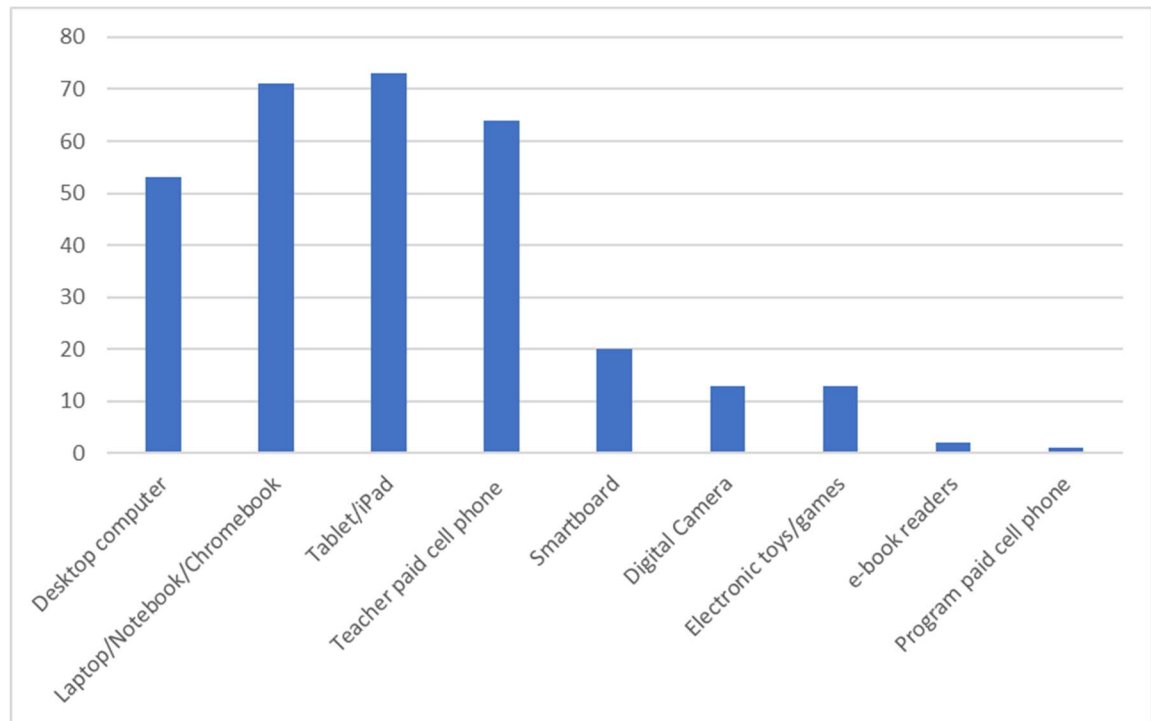
Digital Technology Use in Preschool Classrooms

Preschool Teacher Access to Digital Technology

Preschool teachers were asked, “What kinds of electronic devices do you have access to in your classroom?” Teachers were presented with 9 short answer replies to choose from plus an “other” option to fill in if they had access to other types of electronic devices. All 100 teachers provided a response to this question. Four teachers completed the other option, naming devices that would be considered older technology (e.g., cassette player), not digital technology. Therefore, these replies were not included in the results. Figure 2 presents the percentages of electronic devices teachers reported having access to in their classrooms. Teachers could choose one digital device they had access to up to all 9 listed devices (plus the other option).

Figure 2

Percentages of Electronic Devices 100 Preschool Teachers Had Access to in Their Classrooms



Seventy-three percent of teachers replied that they had access to a tablet or iPad, 71% replied that they had access to a laptop/notebook or Chromebook and 53% replied they had a desktop computer they could access. Most teachers (74%) had access to at least 1 type of word processing device (e.g., desktop, laptop, tablet), and an additional 22% had access to 2- or 3-word processing devices. Sixty-four percent of teachers reported having access to a cell phone that they paid for and 1% reported having access to a cell phone paid for by the program for use in the classroom. The remaining electronic devices were named 20% or less of the time.

The interview participant from Virginia mentioned that having access to a computer has helped her to improve her teaching, “I can get instance answers and make easier to follow directions for myself.” This teacher had several years of experience in the classroom and was able to self-reflect about how “lucky” she was to now have a computer to assist her with all her teaching responsibilities.

Preschool Teacher Confidence Levels Related to Digital Technology

Teachers were presented with the same 9 short answer replies included in the question asking about access to digital technology. They were asked to rate how confident they felt using the devices they had access to. A sliding scale from 1 to 5 was used with 5 being very confident and 1 being not confident at all. Table 4 presents information related to teachers’ confidence levels when using digital devices.

Table 6

Teachers’ Confidence Levels Using Digital Devices

Type of digital device	% Reporting with access to various devices	Mean	S.D.
Desktop computer	81%	4.39	.932
Laptop/notebook or Chromebook	80%	4.39	.899
Tablet/iPad	88%	4.42	.658
Teacher paid cell phone	92%	4.74	.512
Smartboard	70%	3.37	1.27
Digital camera	85%	4.64	.673
Electronic games	92%	4.13	1.10

Note. A cell phone paid for by the program and e-book readers are not included in this table as only one teacher replied with their confidence level related to these two items.

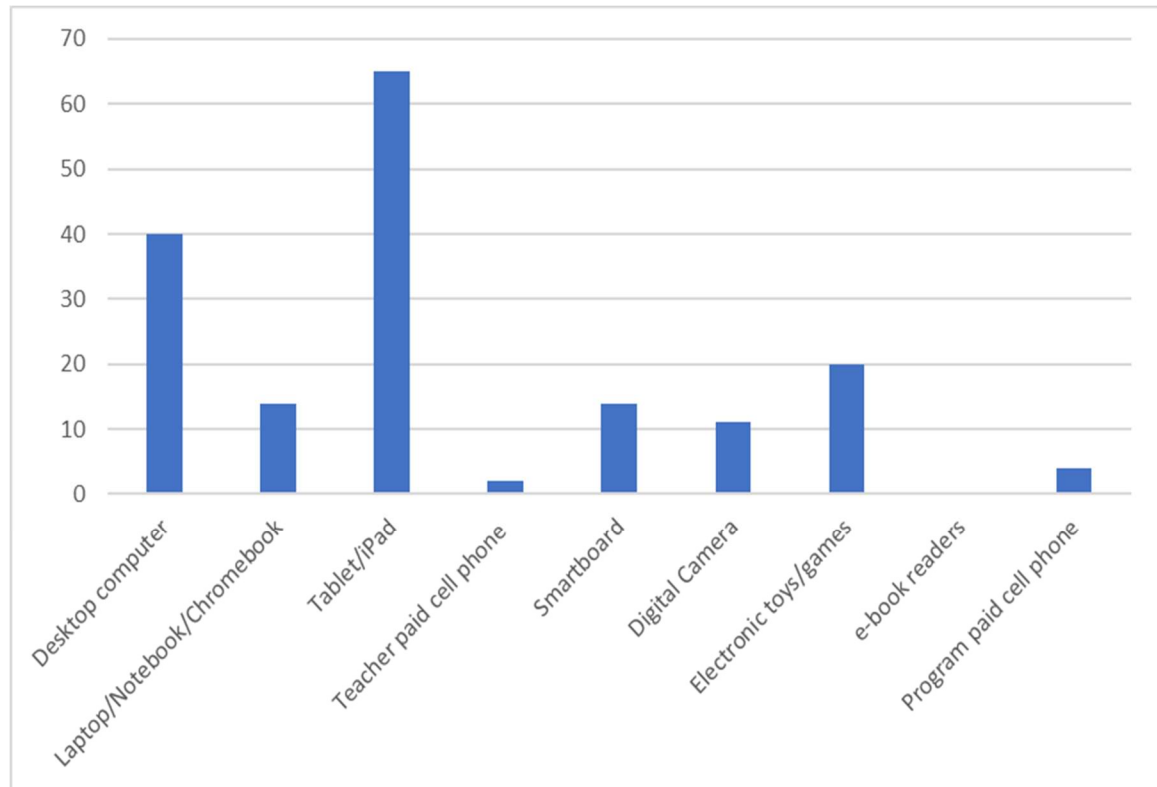
It should be noted that not all teachers rated their confidence levels with the devices they had access to, for example, 43 of the 53 teachers (81%) that had access to a desktop computer replied with their confidence level using it. The means presented in Table 4, most over 4.00, indicate that most teachers felt fairly confident using the devices they had access to. However, the Smartboard mean of 3.37 suggested teachers that have access to a Smartboard are not all confident about using one. Also of note, at least one teacher that had access to a desktop computer (2 teachers), laptop (2 teachers), Smartboard (4 teachers), and electronic games (1 teacher) rated their confidence level as low, minimum levels reported as a level 2 or lower.

Children's Access to Digital Technology

Approximately half of the sample of teachers (N=55) reported children's access to technology in their classrooms. Forty-three teachers (78%) reported that children had access to at least one piece of digital technology in the classroom while 12 teachers (22%) stated that children do not have access to digital devices in the classroom. Four of the teachers who reported children do not have access stated that their program restricted access, the other 8 teachers reported that devices are not accessible to children because, as one teacher put it, "I do not believe 4-year-olds should use screens in my class." Figure 3 presents the percentages of electronic devices children had access to in their classrooms of the teachers that answered affirmatively.

Figure 3

Percentages of Electronic Devices Children Had Access to in Their Classrooms



Of the 43 teachers that answered that children had access to devices over half (N=28, 65%) reported that children had access to a tablet or iPad, 40% (N=17) replied that children had access to a desktop computer and 14% (N=6) replied that children could access a laptop/notebook or Chromebook. The remaining electronic devices accessible to children were named 20% or less of the time. Sixty-seven percent of the 43 teachers that reported children's access to devices stated that children had access to 1 type of word processing device (e.g., desktop, laptop, tablet), and an additional 16% had access to 2- or 3-word processing devices.

Teachers who reported having accessible electronic devices for children were asked to provide examples of how children used the devices. A total of 69 examples were provided and most often (39%) children used iPads or computers to play educational learning games (e.g., ABC mouse). Children used electronic devices to listen to/watch music, stories or videos 17% of the time. Children took pictures in the classroom or around the school grounds (15%, some teachers mentioned that children used a digital camera to do this rather than an iPad or computer) and 13% reported using the computer to research a topic of interest. Smaller percentages of teachers reported that children used electronic devices to write or draw on a Smartboard or computer (6%) and learned keyboarding or typing (10%). Additional 26.8% of teachers reported that children had access to the internet in their classroom.

Two interview participants talked about how children played with technology. The first interviewee contrasted using digital devices with non-digital devices. “We use the iPads to teach them about looking things up on Google and we show them how the older CD player and the corded phones work.” This teacher went on to explain that once children knew how to use Google they looked things up that interested them during their choice time. The second interviewee spoke about teaching the children how to use the computer and then how they incorporated it into their play, “my kids love when we do big books with the computer. The program we use teaches them vocabulary and about things like the point of the story.” This teacher went on to say, “my children then have the big book and computer as a choice during freeplay. They remember and sometimes will act out the book.” These two interviewees provided good examples of how

technology can be appropriately integrated into children's play and ultimately their learning.

Advantages or Disadvantages of Using Digital Technology with Young Children

When preschool teachers were asked to respond on the survey with a short answer to the question, "Do you see benefits, such as areas of development (e.g., language skills) or domains (e.g., mathematics) that are enhanced by digital technology use with young children?" responses varied quite a bit. Of the 68 teachers that responded to this question, about half (N=37, 54%) were in favor of using technology in a preschool classroom and noted many learning opportunities and areas of potential growth. Academic areas that were mentioned included reinforcing mathematical concepts and literacy skills. One teacher stated, "educational apps and games can be a fun and interactive way to learn math and literacy skills, tracing letters, hearing sounds and counting games. They are learning that information comes from many sources." Another teacher responded favorably that children seem to gain confidence in their learning, social skills and knowledge growth, "and they take ownership of the researching that we are doing. They are more willing to articulate their questions and have the independence to seek out those answers on their own or ask a peer for help." One other important point expressed by a preschool teacher related to social skills development was that devices can assist non-verbal children, allowing them to communicate with others in the classroom.

Approximately another quarter of the 68 teachers that replied (N=16, 24%) were in favor of using technology with preschool children but had some reservations or qualified their reply with limitations. One teacher summed it up this way, "when used correctly and on a time limit, I believe that there are benefits in certain areas. However,

technology in no way should be teaching our students.” Another teacher expressed the benefits of technology with limits in place this way, “if it is done in small spurts where children are able to learn through play as well.”

Approximately another quarter of the 68 teachers that replied (N=15, 22%) were not in favor of using technology with preschool children. One teacher stated, “at school, I believe our time is best spent supporting the children in building relationships with each other and other adults and being an involved part of the learning rather than a passive role.” Several teachers in this last group mentioned that if technology were to be used it should be at home, not in the classroom – technology use at this level is inappropriate. One teacher related not using technology at this time with the COVID-19 pandemic, “I feel that children, with the pandemic and all, have been overloaded with electronic use. I see no benefit at this time, of using it in the classroom.”

Preschool teachers are not in agreement related to advantages (benefits) or disadvantages of technology use in preschool classrooms. Three groups emerged when survey data was reviewed: those in favor, those in favor with limitations and those opposed to technology use with young children in preschool classrooms. A final quote worth consideration related to technology use, “as adults, we Google things all the time and it serves as instant knowledge.” If the point of schooling is student knowledge and growth this quote seemed particularly relevant.

Interview participants were also asked to discuss how children benefited from being exposed to electronic devices. The Georgia interviewee said, “Computers are not going away, we need to introduce children to computers. It can open a whole world to them. Many of the children I teach don’t have a computer at home so we need to teach

them how to use it.” A Michigan interviewee offered this example, “We just finished learning about gardening stuff. I taught my children how to use Google to look up stuff about flowers and what flowers need to grow.”

Formation of Beliefs About Use of Digital Technology with Young Children Preschool Teacher Training Related to Digital Technology

Teachers were asked if they had received any specific training related to digital technology use in a preschool classroom (teachers were asked to refer to the list of devices in the question related to access) and to name the two most recent trainings/classes they had attended. Of the 95 teachers that replied to this question approximately 20% (N=19) of the teachers reported attending a training related to technology, and only a few named specific trainings/classes. Four teachers said they had been trained on a child assessment tool (e.g., COR Advantage) and four teachers mentioned a training related to creating activities or learning content for children to use in the classroom (e.g., Boom Activity Cards, Reggie’s Rainbow, Technology in Early Childhood Classrooms). Two additional teachers mentioned trainings they had received via a local or national technology liaison. Teacher training related to digital technology at the Pre-K level, as expressed by this sample of teachers, would seem to be a non-standard practice. The few trainings that were mentioned also were likely in-service trainings as opposed to preservice trainings.

State Guidance Related to Technology

Teachers were asked if their state provided any preschool technology guidelines or standards. All 100 teachers replied to this question, twenty-five percent of the teachers replied that; “Yes, my state has technology guidelines or standards”, 10% reported “No,

my state does not have technology guidelines or standards”, and 65% responded with “I’m not sure.” Of the 25 teachers that replied “Yes”, 24 were from Michigan. This means that 66 teachers from Michigan did not know, with certainty, about the Michigan Educational Technology Standards for Students, Grades PK-2 (Michigan State Board of Education, 2009). In turn, it therefore seems likely that if they are not familiar with the state standards, they are not working toward implementation of the state standards.

All four interview participants spoke about the lack of state-level technology standards or minimal standards in place. The interview participant from Georgia supported the survey findings related to her state's level of guidelines or standards at the Department of Education. She stated, “Unfortunately, what my state does is just provide limits on how much time children can spend on screens, no real guidelines available. It seems like they are missing the point of what things children *could be* doing with technology.” The interview participant from Virginia offered, “There is no talk or information about how much of a help computers can be. They can be learning tools. When it comes to computers you are out there on your own.” Both of the Michigan interviewees were not familiar with state guidelines or standards. The findings related to state guidelines and standards, from this sample of teachers, would indicate that there is a great opportunity for further development of guidelines and standards for technology use with young children or better promotion of the guidelines and standards that are available.

Support Related to Technology

Teachers were asked in the survey if they had received any type of support (e.g., program administrator, district tech support) related to what types of digital technology to

include in their preschool classroom. Of the 89 teachers that replied to this question, 65 teachers (73%) reported no sources of support are available related to what types of technology to include in the classroom. Of the 24 teachers (27%) that replied that they did have support, 14 supplied a response to what type of support. Ten teachers mentioned a director, administrator or district IT person offered support, the other four teachers mentioned that the support they received came from other staff (teachers) in their building.

Interview participants mirrored the findings related to the availability of technology support for their classroom. One interview participant in Michigan put it this way, “I think children can learn from using computers, children are curious about them, but what I have in my room is what I figured out. Nothing in the way of support.” The interview participant from Virginia offered this, “There is no school related tech support of any kind. My setting is a hospital setting so I’m on my own to figure out any kind of technology.” The second Michigan interviewee stated:

I’m in a Pre-K and kindergarten building. We now have no support for our computers, just the kindergarten rooms. The tech guy can’t come into my room or the other Pre-K rooms. All of these same children are coming from my room and will be in the kindergarten rooms next year but we have no help with anything. It is sort of stupid, the district supports just K to 12, not us.

The last interviewee expressed her frustration with the lack of support available for technology, perhaps more vividly than others. The district she works in presumably understands the need for tech support, but Pre-K was excluded. This Michigan interviewee also said that she and her co-workers were not given any explanation about

why the tech support was removed from their classrooms. This left her to question the district's decision and the potential for "missed learning" her Pre-K children will likely have if devices are not serviced, maintained or she can never ask a question for help with an issue.

Memories of Learning to Use Digital Devices

Interviewee participants were asked to discuss their first memories of using digital electronics and how that made them feel. This was an attempt to better understand how teachers' own experiences may have influenced their beliefs about technology. The interviewee from Georgia shared, "using a computer made me want to learn, it was so exciting and new at the time." She went on to say that the computer was a Christmas gift that her family shared and used together. The interviewee from Virginia reminisced about building family connections. "I remember working with my dad. We learned how to use it [a 1980s computer] together." One of the Michigan participants talked about using a tablet for the first time:

My parents got us a tablet to use in the car. I always looked forward to getting to use it. I would play little games with my sister about counting the animals or listen to a book. I loved it. It was so fun. At the time, I didn't realize that I was learning something. I see it now.

In addition to these teachers expressing joy as they learned about computers or a tablet, they all talked about using a device with at least one other person. The electronic device was used within a social context. These interview participants shared examples in line with Vygotsky's theories stressing social interaction in the development of cognition (Vygotsky, 1978). He believed that community plays an essential role in the process of

“making meaning.” As the interviewee from Michigan pointed out she was “making meaning” and did not even realize it.

Changed Views/Practices Related to Digital Technology Since the COVID-19 Pandemic

Teachers were asked on the survey to provide a short answer to the following question, “Since the COVID-19 pandemic began have you changed the ways in which you use digital technology?” Of the 60 teachers that replied, approximately half (N=32, 53%) of the teachers indicated that they had not changed the way they use digital technology since the start of the pandemic. Twenty-eight teachers (47%) had changed their views or practices related to digital technology since the start of the pandemic and offered 35 replies about how they had changed. Fourteen teachers mentioned that they had been able to better connect with parents and families via Zoom calls, often at times that were more convenient for parents to talk. One teacher said this, “we connect with families and friends near and far. Digital technology has helped us in so many ways to stay connected.” Ten teachers mentioned that children had learned how to learn virtually, for example, doing activities with the teacher as they watched the screen or doing research on a topic of interest.

Teachers also mentioned that they had to learn how to teach virtually during the pandemic, a new experience for many, but they had continued to do things virtually now that they knew how, for example doing teacher meetings online and using more apps that they found during the pandemic. One teacher offered this, “the pandemic opened up the discussion of preschool teachers using technology in their classrooms.”

Teachers were also asked on the survey to provide a short answer about any positives that had come out of the COVID-19 pandemic related to the use of digital technology. Of the 32 teachers that replied to this question almost half (N=13, 41%) replied with a comment related to more frequent family interactions and more positive family connections. A teacher commented on how much easier it is now to have a face-to-face meeting with a parent and, “parents also seem more comfortable and open on Zoom because [they are] not worried about what we think of their house or sitting in little chairs at school. They just seem less stressed.” Another positive that teachers expressed was that the pandemic forced technology upgrades, for example, providing tablets for all children so they can be ready if class moved to a virtual format. Another teacher was able to add a projector, “I was tired of trying to show my phone to kids to look at a picture. Now with the projector, I can pull up the image on the whiteboard for the entire class to see.”

Two interviewees, one from Georgia and the other from Virginia, spoke about positive changes that they have incorporated into their teaching as a result of the COVID-19 pandemic. “I am using it [a computer] more now for things I never thought about before. I use Apps now.” The other interviewee said, “I remember during the pandemic it was a comforting way to stay in touch with children we missed. Having changed the way we communicate and check in/out children with the classroom app has improved our abilities to record keep.” One of the Michigan interviewees also shared positive changes she has continued to implement:

Since COVID we have just kept doing teacher meetings on Zoom. The other thing I just kept doing is having parents and children do a zoom call before the first day

of school. I show them my door and classroom number and some of the materials in the room they will get to play with. I also let them ask me questions. As the whole world has experienced COVID-19 and its sometimes-devastating effects it is refreshing to hear teachers express positive changes that they have been able to incorporate into their classrooms.

Teachers' Beliefs and Use of Digital Technology Related to Demographic Variables

In order to test associations among preschool teachers that reported seeing benefits in the use of digital technology with young children and those that did not see benefits, two groupings were formed. Teachers were grouped based on their replies. Group 1 reported benefits in using technology with young children, and Group 2 included teachers that replied, technology should be used with limitations and those that saw no benefits. Nine demographic variables, each grouped into two categorical variables and further divided into classroom and preschool teacher descriptive information were also included in the analysis. Chi-Square test results revealed no statistically significant associations related to beliefs about using digital technology by classroom descriptive information; the type of classroom funding, the type of curriculum used, the income level of families in care and state technology guidelines or standards. In looking across the 5 variables that were tested related to preschool teacher descriptive information; teacher training related to digital technology, teacher support related to digital technology, age of the teacher, years of work experience and level of education only one significant association was found. Table 7 shows the results for benefits of using digital technology by technology support received.

Table 7

Chi-Square Test and Contingency (2 x 2) Tables for Benefits of Using Digital Technology by Technology Support Received

Variables		
Independent Technology support (n=67, df=1)*	Overall %	% Favorable to Using Digital Technology
Received support	21%	78.5%
Have not received support	79%	49%

Note. Comparisons in 2x2 contingency tables for the categories are for dichotomous measures. Frequencies will vary slightly due to rounding. * Significant at the $p < .05$ level.

Preschool teachers that received technology support were significantly different from teachers that did not receive support in their beliefs about the use of digital technology with young children.

Overview of Chapter 4 Findings

Almost all teachers in this sample (96%) had access to at least 1 type of word processing device (e.g., desktop computer, laptop, tablet). Sixty-four percent of teachers also reported access to a cell phone that they paid for and used in their classroom. Most teachers also reported feeling confident in the use of the digital technology they had access to, the exception being Smartboards. The mean for the confidence level using Smartboards was in the mid-range on a scale of 1 to 5, suggesting that some teachers that had access to a Smartboard are not always confident using one. Also of note, at least one teacher that had access to a desktop computer, laptop, Smartboard and electronic games rated their confidence level as low on a scale of 1 to 5, minimum levels reported as less than a level 2. Some teachers reported that children in their classrooms had access to devices such as tablets or iPad, and a smaller percentage reported that children had access to a desktop computer.

Preschool teachers in this sample are not in agreement related to advantages (benefits) or disadvantages of digital technology use in preschool classrooms. Three groups emerged when survey data was reviewed; those in favor, those in favor with limitations, and those opposed to technology use with young children in preschool classrooms. One interview participant in favor of using digital technology with young children put it this way, “Computers are not going away, we need to introduce children to computers. It can open a whole world to them.” Chi-Square test statistics were conducted using two digital technology benefit groupings (those in favor and those with limitations and opposed) to examine associations with classroom descriptive variables and preschool teacher descriptive variables. The only significant association found was between teachers that received technology support and those that did not receive support in their beliefs about the use of technology with young children. All other chi-square test statistics were found to be not significant.

Approximately half of the sixty teachers that responded to ways in which they had changed their use of digital technology since the start of the COVID-19 pandemic indicated they had been able to better connect with parents and families via Zoom calls, often at times that were more convenient for parents to talk. One teacher said this, “we connect with families and friends near and far. Digital technology has helped us in so many ways to stay connected.” Another teacher commented, “parents also seem more comfortable and open on Zoom because [they are] not worried about what we think of their house or sitting in little chairs at school. They just seem less stressed.” Another positive that teachers expressed was that the pandemic forced technology upgrades for

example, providing tablets for all children. One teacher also offered this, “the pandemic opened up the discussion of preschool teachers using technology in their classrooms.”

In Chapter Five a discussion of the study results and their potential implications for various governing bodies are provided. Ideas for future research, limitations and conclusions are also discussed.

CHAPTER FIVE

DISCUSSION AND IMPLICATIONS

The focus of this dissertation centers around including the “voices of preschool teachers,” often not heard in published information. Preschool teachers were asked to express their beliefs about digital technology use, their own use and that of the children in their classroom, and the role technology may play in the learning and development of young children. The discussion of appropriate use of digital technology at the preschool level is not necessarily a new issue, however, the focus is shifting to one of *how to use digital technology* to make a difference in young children’s developmental experiences rather than using technology or not (Anderson et al., 2008). Understanding the realities of using digital technology with young children and continuing to expand developmentally appropriate ways to use technology may help to shape the future landscape of digital technology use in preschool classrooms. Many children in today’s world do not necessarily view technology as a feature that stands out as something special or remarkable; rather, it is commonplace much the same way that generations before have come to rely on the television as just another part of daily life (Loveless & Dore, 2002).

This is not to say, however, that all young children experience digital technology in the same way. A commonly used term to describe this phenomenon is called the digital divide. This term is increasingly used to explain the social effects of access to information and communication technology (Cronin, 2002). In the late 1980s and early 1990s, this trend was talked about as the information rich and the information poor. The digital divide is not new but, rather a gap that exists between the "haves" and the "have-

notes." More recently this divide has been exacerbated by such things as; computers that continue to increase in power and efficiency and the introduction of the Internet (Cronin, 2002). Most recently the COVID-19 pandemic has pointed out where gaps in educational preparedness and access exist (Dorn et al., 2020).

Early childhood educators are continuing to gain knowledge about how to appropriately incorporate the use of digital technology and interactive media with young children in their classrooms (Armstrong, 2015). This statement may be more relevant now than ever before as teachers expressed their lived experiences as they worked through the COVID-19 pandemic. Teachers in this study provided unprecedented information about their technological experiences and insights related to how they had changed the ways in which they continued to teach young children and stay connected to parents.

This study used a blend of methodologies to allow for both quantitative and qualitative data to answer the following research questions related to digital technology use by both teachers and young children:

- What types of digital technology do teachers and children use in their preschool classrooms and how do they use it?
- What advantages or disadvantages, if any, do preschool teachers see in using digital technology with young children?
- How do preschool teachers form their beliefs about the use of digital technology with young children?
- Have preschool teachers changed their views and/or practices related to digital technology since the COVID-19 pandemic began?

- Do preschool teachers vary in the advantages they see in the use of digital technology related to demographic variables such as age, years of experience teaching, or program type?

Insights About the Study Results

Teacher Access to Digital Devices and Technology Training

Almost all teachers (96%) in this study reported that they had access to some type of word processing device (e.g., desktop computer, laptop) and 64% reported that they had access to a cell phone that they paid for and used in the classroom. In some cases, however, some devices that teachers had access to they did not feel confident using. In particular computers, laptops, Smartboards and electronic games were rated at lower confidence levels by some teachers. The low level of technology training reported by teachers (only 20% of 95 teachers reported any type of technology training) may answer why some teachers did not feel confident in the use of some digital devices they had access to. The technology trainings teachers did mention were specific to use of a particular program or assessment tool, only one teacher reported a training related to technology use at the early childhood level. Teachers that did report that they felt confident in the use of the devices they had access to must have received information and training at places other than from the programs they worked for or are self-taught.

This sample of teachers pointed out a large gap in the amount of digital technology preparation currently being offered. This lack of training creates a huge opportunity for professional development, both at the pre-service and in-service levels. Colleges, universities, and early childhood training organizations could develop or better promote, courses related to using technology in appropriate ways to help young children

learn (e.g., a course about using child-centered apps and websites). Teachers would also likely benefit from courses or trainings to strengthen their technology skills, ultimately making their jobs more efficient. Teachers expressed that continuing to work through COVID-19 has forced them to learn various technology skills, but once they learned how to do something they have continued to use the skill, technique, or app. Perhaps some of the resistance or negative views articulated by some study participants are simply because of a general lack of knowledge about the potential of digital technology?

Technology Support

Approximately three-fourths of the teachers that replied to the technology support question indicated they had no sources of technology support for their classroom. As interview participants mentioned, when it comes to technology support, you are out there on your own to figure it out yourself. Generally speaking, coupling the preschool teacher training results with the technology support results from this study preschool teachers had very little help outside the classroom in terms of how to use digital technology, ways to learn about new types of tech experiences for children and keeping equipment functioning properly.

Veličković and Stosić (2016) reported similar training and support findings from their study done in Greece. Most early educators do not possess sufficient training and operational competences to feel that they can fully integrate digital technology into their classroom. Educators need continuous and systematic training and support in the area of information, communications and technology (ICT), in order for them to fully realize all the advantages of ICT.

Beliefs, Benefits, and Advantages of Using Digital Technology

The results expressed by this group of preschool teachers indicated a real divide in the beliefs, benefits, and advantages of using digital technology at the preschool level. Teachers are using computers and tablets for their own work but some do not see the benefit of young children doing their “work” with a computer or tablet. A little over half (54%) of the teachers in this sample advocated for the appropriate use and integration of technology for young children. These teachers noted many learning opportunities and areas of potential growth when children used digital devices. A second group of teachers (23%) replied that they were in favor of using technology with preschool children but had some reservations or qualified their reply with limitations. Another quarter of the participants, (22%), replied that they were not in favor of using technology with preschool children. This group wanted to keep technology out of the preschool classroom and many in this group stated that if technology were to be used it should be at home, not in the classroom – technology use at this level is inappropriate and just offers children a passive learning experience. This latter group expressed, in various ways, that the young children that they teach have way too much access to screen time at home and other places. If this sample of teachers is any indication of the early childhood field at large there clearly is not a consensus about the use of digital technology at the preschool level. The technology debate at the preschool level has not been resolved!

The one significant finding that came from looking at teachers’ beliefs and several demographic variables was when teachers have technology support their beliefs are more positive about the use of technology with young children. This finding does make sense,

just as teachers need to support children's technology experiences, teachers need support to grow, learn and change their technology experiences.

Research done by Blackwell et al. (2014) mirrored the results from the present study in that, having support and a school-wide technology policy (another form of support) had positive direct effects on technology use. Additionally, the Blackwell study found settings that offered support, that is, helped teachers understand how to use technology to improve student learning had teachers that were described as having a more positive attitude toward technology and in turn more confidence.

State Technology Standards or Guidelines

In only two states that data was collected from are there state technology standards or guidelines at the preschool level, Maryland (Maryland Technology Literacy Consortium, 2009) and Michigan (Michigan State Board of Education, 2009). When teachers were asked if their state had preschool technology standards or guidelines 65% responded with "I'm not sure", another 10% replied that their state did not have technology standards or guidelines and 25% replied that their state did have state standards or guidelines. Ninety teachers in this sample were from Michigan; only 24 reported knowing that Michigan had technology standards for Pre-K children. The communication of state technology standards and guidelines to preschool teachers, when they exist, would appear to be problematic. This lack of knowledge around state standards and guidelines may account for some of the technology divide amongst preschool teachers' beliefs about using technology in their classrooms. In Michigan, if preschool teachers are to implement state technology standards and guidelines more

needs to be done to promote them for example, at local and state conferences or via the state registry website.

National Technology Standards or Guidelines

The National Association for the Education of Young Children (NAEYC) and the Fred Rogers Center for Early Learning and Children's Media at Saint Vincent College (2012) offer a joint position statement to help guide early childhood educators in making informed decisions about technology. The American Academy of Pediatrics (AAP, 2010) also has parent recommendations for technology use with young children (preschool teachers could extrapolate useful information from these recommendations for classroom use). Again, however, it would seem that preschool teachers may not be aware of these national guidelines and recommendations. If more training opportunities were made available for preschool teachers these national-level guidelines and recommendations could be promoted. Another possibility for preschool teachers to better understand national recommendations would be to invite pediatricians with specialized training around technology use and screen time with young children to early childhood conferences. Embrace the cross-professional opportunities this type of experience would provide.

Digital Technology and the COVID-19 Pandemic

Approximately half of the teachers (N=60) in this sample did recognize that digital technology and the COVID-19 pandemic had a relationship. Teachers indicated that their views or practices related to digital technology since the start of the pandemic had changed. Many teachers mentioned that they had been able to better connect with parents and families via Zoom calls, often at times that were more convenient for parents

to talk. Teachers also expressed positives that came out of the COVID-19 pandemic as it relates to technology. They were able to have more frequent family interactions and more positive, less stressed family connections.

Elder (1998) studied historical forces that shaped social trajectories of a family, education and work. If 21st century early childhood classrooms, and the COVID-19 pandemic, are thought of as a time in history, children in preschool right now are having technology experiences that will shape and impact their lives. The results of children being exposed to appropriate technology at the preschool level may look very different in terms of some of the same variables that Elder looked at over a lifespan (e.g., income, high school graduation, a person's life work) than children that are not given access to appropriate technology early in life. Although the COVID-19 pandemic has disrupted almost all aspects of early education, and education at all levels in general, it also has forced technology upgrades in many preschool classrooms and forced discussions about appropriate technology use at the preschool level.

Future Research Possibilities Related to Technology

This study did not look at classrooms in terms of the numbers of electronic devices in relationship to the number of children and adults per classroom. A study that compared well-resourced classrooms (e.g., every child has their own iPad), under-resourced classrooms (e.g., one or two electronic devices available to share amongst children), and classrooms that have no technology available would be interesting. How would teachers instruct young children differently if all children were holding a tablet? How might child and program outcomes differ amongst the various classroom types?

This type of study might provide the early childhood field with the fuel to move the “technology bar” forward.

Classroom observations were not possible as a part of this study due to COVID-19 restrictions. However, including preschool classroom observations as a part of a study would provide first-hand information related to digital technology access, use, and interactions around various devices. The observation measures could include viewing technology use from the standpoint of the teacher and/or the children in a classroom. Doing preschool classroom observations would provide another point of reference related to how digital technology is *actually* used in the classroom and what types of interactions happen around digital technology use in a preschool setting.

Conclusions

Think about how young children learn to read and write and then think about how children learn technology skills. “Students LEARN to read until 3rd grade; then they READ to learn. The same is true with technology skills: Students LEARN to access technology until 3rd grade; then they USE TECHNOLOGY to access learning” (Brauner, 2022). These statements seem particularly relevant in light of the findings from this study. If students are to learn to use technology to access learning, then the early childhood field needs to become more tech savvy and develop ways to appropriately integrate technology into early childhood classrooms. Teachers need more information about the benefits that using technology can offer, trainings around how to use technology, and classroom tech support. The findings from this study offer relevant information for policymakers at all levels; local, state, and national. These policymakers need to find ways to make investments in preschool teacher preparation related to

technology, make digital devices available in preschool classrooms, provide tech support and commit to technology sustainability for young children. The findings from this study also seem relevant to early childhood curriculum developers, in that preschool teachers could enhance their knowledge of technology use via relevant curriculum materials.

Preschool teacher training and preparation, in-service and preservice, in technology skills are becoming ever more critical to prepare young children for the complexities of life in the twenty-first century. Preschool teachers need to embrace digital technology, become competent in using technology routinely and embed technology across all aspects of the early childhood curriculum. If they were to do this, they may find that indeed, their work life may be easier.

Digital technology use in early childhood education must be a mindful practice that is integrated with the highest principles of teaching and learning. Digital technology tools (i.e., computers and tablets) can be used poorly or enhance learning experiences. Many technology enthusiasts forget that learning is a transformation of the mind and heart. The younger the learner, the more the need for a fluid exchange of ideas, interactions between a teacher and a child, and between a child and the content.

Limitations of this Study

Although data was collected from 100 preschool teachers in 8 states and across 55 zip codes, likely helping to provide some variation in responses, the data is not nationally representative of the United States. Ninety survey participants were from Michigan, which may have influenced some of the replies based on statewide policies and practices. Various organizations across the state or the statewide Great Start Readiness Program

(GSRP) may have technology or training efforts in place that swayed the responses of Michigan teachers one way or the other.

Many teachers in this sample chose not to complete all the survey questions. There was a fair amount of missing data for some survey questions, up to 55% in some cases. The only survey item that was required was zip code, all other replies were voluntary. More complete data for some variables, and if more respondents would have taken part, may have allowed for more types of analysis and more detailed answers to survey questions.

This sample of teachers included 76 teachers that used the HighScope Preschool Curriculum model or used the HighScope Preschool Curriculum model plus one other curriculum type. The HighScope Preschool Curriculum model includes a volume related to science and technology. Teachers using this curriculum model do have access to information and guidance around using technology in a preschool classroom. Epstein (2012) for example noted, “Young children benefit from becoming familiar with the mechanics of hardware (turning a machine on or using the arrow keys to navigate the screen) and learning to use a few appropriate software programs” (p 92). Access to this type of curriculum guidance may have influenced the responses of teachers implementing the HighScope Preschool Curriculum model.

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APPENDIX A

Digital Technology Survey for Preschool Teachers - 2022

Digital Technology Survey for Preschool Teachers - 2022

Survey Instructions

You are being asked to be in a research study that is being done by Jill Claxton, a student at Oakland University, and under the direction of Dr. Tomoko Wakabayashi, Associate Professor and Coordinator of the PhD Program in Early Childhood Education, Human Development & Child Studies Department.

The purpose of this research study is to gather some information about you, your feelings about digital technology use at the preschool level and your experiences using digital technology in your preschool classroom. Your decision to participate in this study is voluntary. You can choose to stop your participation at any time or skip any part of the study if you are not comfortable. Your decision will not affect your present or future relationship with Oakland University, the researcher, the Human Development & Child Studies Department, or your current employer. For more information about the study and the terms of your participation, please refer to the final two pages of this document for the Information Sheet for Exempt Survey Research.

You can complete the survey anonymously if you choose or you can provide your first name and email address at the end of the survey if you choose to be entered into a lottery for the chance to win one of ten \$25.00 Amazon gift cards. At the completion of the survey, you will be asked if you are interested in participating in a follow-up interview. Each person that is interviewed will receive a \$25.00 Amazon gift card.

By continuing to respond to this survey, you have agreed to participate in the study. Thank you very much your help!

For questions, please email Jill Claxton, jclaxton@oakland.edu

1. How long have you been working in the field of early care and education (children birth to age 5)?

- ☐ Less than 1 year
- ☐ 1 to 2 years
- ☐ 3 to 5 years
- ☐ 6 to 9 years
- ☐ 10 to 15 years
- ☐ 16 to 20 years
- ☐ More than 20 years

2. What are the age ranges of the children you teach? (Please select all that apply)

- ☐ 24 months to 35 months
- ☐ 36 months to 47 months
- ☐ 48 months to 59 months
- ☐ 60 months to 71 months

3. What early childhood curriculum model or approach or a combination of approaches and models do you follow? (Please select all that apply)

- ☐ Banks Street
- ☐ Connect4Learning
- ☐ Creative Curriculum
- ☐ HighScope Curriculum
- ☐ Montessori Educational Approach
- ☐ Project Approach
- ☐ Reggio Emilia Approach
- ☐ Tools of the Mind
- ☐ Waldorf Educational Approach
- ☐ Other (please specify) _____

4. What is your job title?

- ☐ Lead Teacher/Co-Teacher
- ☐ Associate/Assistant Teacher
- ☐ Other _____

5. What type of classroom do you work in? (Please select all that apply)

- ☐ Federally funded (e.g., Head Start) classroom in a public school
- ☐ Federally funded (e.g., Head Start) classroom in a private setting
- ☐ State funded (e.g., Michigan's GSRP, California State Preschool Program (CSPP), Georgia Pre-K Program) classroom in a public school
- ☐ State funded (e.g., Michigan's GSRP, California State Preschool Program (CSPP), Georgia Pre-K Program) classroom in a private setting
- ☐ Not-for-profit classroom
- ☐ For-profit classroom

6. What is the zip code of the building you work in?

7. How would you describe the income level(s) of the families in your classroom? (Please select all that apply)

- ☐ Very low income (extreme poverty; income for 4-person family that is \$27,750 or below)
- ☐ Low income (income for 4-person family that is \$27,750 to \$55,500)
- ☐ Middle income (income for 4-person family that is \$55,500 to \$100,000)
- ☐ High income (income for 4-person family that is \$100,000 or above)

8. In what format are you teaching this school year (2021-2022)?

- ☐ We meet in-person, I am in my classroom and children come to the school building.
- ☐ We meet virtually, I am teaching from my classroom and the children are attending via an electronic format (e.g., ZOOM, Google Meets).
- ☐ We meet virtually, I am teaching from home and the children are attending via an electronic format (e.g., ZOOM, Google Meets).
- ☐ We meet in a hybrid fashion, I am teaching from my classroom and children attend some days of the week and then other days they attend via an electronic format (e.g., ZOOM, Google Meets).
- ☐ Other meeting format (please explain)

9. Does your state have preschool technology guidelines or standards, for example from your state level Department of Education?

- ☐ Yes
- ☐ No
- ☐ I'm not sure

10. What kinds of electronic devices do you (the teacher/assistant teacher) have access to in your classroom? (Please select all that apply)

- ☐ Desktop computer(s)
- ☐ Laptop computer(s)/Notebook(s)/Chromebook(s)
- ☐ Tablet(s)/iPad(s)
- ☐ Smartboard(s)
- ☐ Digital Camera(s)
- ☐ Electronic toys/games
- ☐ e-book reader(s)
- ☐ Cell phone paid for by the program
- ☐ Cell phone that I pay for
- ☐ Other _____

11. Have you ever received specific training or classes on how to use digital technology in your classroom? (Please refer to the list of electronic devices in the question above)

- ☐ Yes (please fill in the names of the two most recent trainings/classes you have completed)

1. _____

2. _____

- ☐ No, I have not received training/classes in digital technology use

12. Do you receive any support (e.g., program administrator, district tech support person) about what types of digital technology to include in your classroom?

☐ Yes (please list from whom you receive support)

☐ No, I don't receive support about what types of digital technology to include in my classroom

13. Again, referring to the electronic devices (digital technology) you have access to in your classroom, on a scale of 1 to 5 with 5 being very confident and 1 being not confident at all, how would you rate your confidence level related to digital technology use for the follow devices? (Please circle your reply. N/A = Not Applicable)

Desktop computer(s)	1	2	3 N/A	4	5
Laptop computer(s)/ Notebook(s)/Chromebook(s)	1	2	3 N/A	4	5
Tablet(s)/iPad(s)	1	2	3 N/A	4	5
Smartboard(s)	1	2	3 N/A	4	5
Electronic toys/games	1	2	3 N/A	4	5
Digital Camera(s)	1	2	3 N/A	4	5
e-book reader(s)	1	2	3 N/A	4	5
Cell phone paid for by the program	1	2	3 N/A	4	5
Cell phone that I pay for	1	2	3 N/A	4	5
Other _____	1	2	3 N/A	4	5

14. Do children have access (e.g., a computer is set up for child use, tablets are stored on a low shelf) to any of the following electronic devices in your classroom? (Please select all that apply)

- ☐ Desktop computer(s)
- ☐ Laptop computer(s)/Notebook(s)/Chromebook(s)
- ☐ Tablet(s)/iPad(s)
- ☐ Smartboard(s)
- ☐ Digital camera(s)
- ☐ Electronic toys/games
- ☐ e-book reader(s)
- ☐ Cell phone that a teacher/assistant teacher pays for
- ☐ Cell phone paid for by the program
- ☐ Other _____

15. How do children use the electronic devices that are available to them? (Please give two examples)

☐

Example 1 _____

☐

Example 2 _____

16. Do children have access (e.g., looking up information on age-appropriate websites) to the internet in your classroom?

☐ Yes

☐ No

17. Do you see benefits, such as areas of development (e.g., language skills) or domains (e.g., mathematics) that are enhanced by digital technology use with young children? (Please explain)

18. Do you have concerns or feel that using electronic devices (digital technology) with young children is hindering their development in any areas or domains? (Please explain)

19. Please read the following scenario and write your reactions to it in the space below:

Shay, a pre-K teacher, begins her day recording student anecdotes into an online assessment system. As children arrive they see pictures projected from an LCD player onto a screen. Shay creates student response cards as children name the pictures they are seeing (e.g., pan, pen, house, hat). She then distributes, to each child, a picture response card with the word next to the picture (see example below). Shay begins a 7-min lesson to reinforce beginning sounds. She uses a writing grid program and presents the same pictures again with the word next to it. Children are encouraged to listen to the teacher read each word (and picture) as it appears on the screen. The teacher begins with "P - P - an" and encourages the children to read along with her. The class continues this pattern for the remainder of the pictures and words. Shay then projects each picture again asking the children to hold up their response card if they have "P - P - P - an", for example. Doing this type of lesson helps children develop an understanding of concepts about print. Shay then reads to students using an animated book. The book includes embedded animation and an audio recording. There are opportunities for children to predict what happens next and sound cues children can response to.



P - an

20. Since the COVID-19 pandemic began have you changed the ways in which you use digital technology?

☐ Yes (please explain how you have changed your digital technology use since the COVID-19 pandemic started)

☐ No, I have not changed my digital technology use since the start of the COVID-19 pandemic.

21. Some individuals feel that there are positives that have come out of the COVID-19 pandemic related to the use of digital technology. If you have anything that you feel was positive for your classroom children, you, your program and/or your family, please describe them below.

22. What is one thing that you would improve, if you could, related to the use of digital technology in early childhood classrooms?

23. What is your gender?

- ☐ Female
 - ☐ Male
 - ☐ Non-binary
 - ☐ Other (please specify)
-

☐ Prefer not to answer

24. Do you have an Hispanic or Latinx background?

- ☐ Yes
- ☐ No

25. Do you have a Middle Eastern background?

- ☐ Yes
- ☐ No

26. What is your race? (Please select all that apply)

- ☐ American Indian/Alaska Native
- ☐ Asian
- ☐ Black/African American
- ☐ Hawaiian/Pacific Islander
- ☐ White

27. In what year were you born?

28. What is the highest educational level you have completed so far?

- ☐ Some High School
- ☐ High School Diploma/GED
- ☐ Some College (no degree)
- ☐ CDA Certification
- ☐ Associate (AA/AS) Degree
- ☐ Bachelor (BA/BS) Degree
- ☐ Some Graduate Coursework
- ☐ Master (MA/MS) Degree
- ☐ Doctorate (M.D., Ed.D, Ph.D. etc.) Degree

29. Thank you for completing this survey. If you would like to be entered into a lottery for the chance to win one of ten \$25.00 Amazon gift cards please provide your first name and email address. This is completely voluntary you do not have to provide this information. Amazon gift cards will be sent to the winners no later than July 31st, 2022.

☐ First Name _____

☐ Email Address _____

30. If you would be interested in completing a follow-up interview related to digital technology use in your classroom please provide your first name, phone number and email address. Upon completion of the interview a \$25.00 Amazon gift card will be sent

to you. This is completely voluntary you do not have to take part in an interview or provide this information. Gift cards will be sent no later than July 31st, 2022.

☐ First Name _____

☐ Phone Number _____

☐ Email Address _____

Information Sheet for Exempt Survey Research

Digital Technology Survey for Preschool Teachers

Introduction

You are being asked to be in a research study that is being done by Jill Claxton, a student at Oakland University, and under the direction of Dr. Tomoko Wakabayashi, Associate Professor and Coordinator of the PhD Program in Early Childhood Education, Human Development & Child Studies Department the faculty advisor for this project. Your decision to participate in this study is voluntary. You can choose to stop your participation at any time or skip any part of the study if you are not comfortable. Your decision will not affect your present or future relationship with Oakland University, the researcher, the Human Development & Child Studies Department, or your current employer.

What is the purpose of this study?

The purpose of this research study is to gather some information about you, your feelings about digital technology use at the preschool level and your experiences using digital technology in your preschool classroom.

Who can participate in this study?

You are being asked to participate in the study because you are a preschool teacher.

What do I have to do?

You will be asked to complete an online survey that will take you approximately 20 to 25 minutes to complete. The survey will ask you about your digital technology use, your feelings about digital technology use at the preschool level and digital technology that is used to support your classroom.

Are there any risks to me?

For this study, the potential risks are minimal, you may however experience fatigue as you are completing the survey. There may also be a risk that someone who is not part of this research may accidentally see your personal information. We will try to make sure that this does not happen by keeping your research records as confidential as possible. When the results of this research are published or presented at conferences, no information will be included that personally identifies you.

Are there any benefits to me?

Although there may be no direct benefits to you, the results of this study may benefit others in the future.

Will I receive anything for participating?

You can complete the survey anonymously if you choose or you can provide your first name and email address at the end of the survey if you choose to be entered into a lottery for the chance to win one of ten \$25.00 Amazon gift cards. The gift cards will be sent out no later than July 31st, 2022 to the ten winners. At the completion of the survey, you will

be asked if you are interested in participating in a follow-up interview. Each person that is interviewed will receive a \$25.00 Amazon gift card.

What if I want to stop participating in this study?

If you want to stop participating, close your browser before clicking ‘submit.’ If you click ‘submit,’ it will not be possible to stop participating.

Who can I contact if I have questions about this study?

Jill Claxton, PhD student in Early Childhood Education

Human Development & Child Studies Department

Oakland University

Cell phone – (734) 276-7820

jclaxton@oakland.edu

Tomoko Wakabayashi, EdD, Faculty Advisor for Jill Claxton

Associate Professor and Coordinator PhD Program in Early Childhood Education

Human Development & Child Studies Department

Oakland University

Pawley Hall, Room 420C

248-370-3078

twakabayashi@oakland.edu

For questions regarding your rights as a participant in human subject research, you may contact the Oakland University Institutional Review Board, 248-370-48

APPENDIX B

How Research Questions are Answered by Survey and Interview Questions

How Research Questions are Answered by Survey and Interview Questions

Research Questions	Survey Questions	Interview Questions
What types of digital technology do teachers and children use in their preschool classrooms and how do they use it?	10. What kinds of electronic devices do you (the teacher/assistant teacher) have access to in your classroom? · Desktop computer(s) · Laptop computer(s)/Notebook(s)/Chromebook(s) · Tablet(s)/iPad(s) · Smartboard(s) · Digital camera(s) · Electronic toys/games · e-book reader(s) · Cell phone paid for by the program · Cell phone that I pay for 13. Again, referring to the electronic devices (digital technology) you have access to in your classroom, on a scale of 1 to 5 with 5 being very confident and 1 being not confident at all, how would you rate your confidence level related to digital technology use for the follow devices? 14. Do children have access (e.g., a computer is set up for child use, tablets are stored on a low shelf) to any of the following electronic devices in your classroom? · Desktop computer(s) · Laptop computer(s)/Notebook(s)/Chromebook(s) · Tablet(s)/iPad(s) · Smartboard(s)	1. Do you have any of these technology items in your classroom on a regular basis? · Desktop computer(s) · Laptop computers(s)/Notebook(s)/Chromebooks(s) · Tablet(s)\iPad(s) · Smartboard(s) · Digital camera(s) · Electronic toys/games · e-book reader(s) 2. How about older devices? · DVD/music player(s) · tape recorder(s) · VCR(s)/VHS tape(s) · record player(s) · light table · LCD projector · microscope(s) 6. From the standpoint of a child, is the electronic equipment/digital technology accessible (e.g., a computer is set up for child use, tablets are stored on a low shelf) to them? Do children use/play with the digital technology? 7. Do you use/play with the children using digital technology?

Research Questions	Survey Questions	Interview Questions
	· Digital camera(s) · Electronic toys/games · e-book reader(s) · Cell phone that a teacher/assistant teacher pays for · Cell phone paid for by the program 15. How do children use the electronic devices that are available to them? 16. Do children have access (e.g., looking up information on age-appropriate websites) to the internet in your classroom?	
What advantages or disadvantages, if any, do preschool teachers see in using digital technology with young children?	17. Do you see benefits, such as areas of development (e.g., language skills) or domains (e.g., mathematics) that are enhanced by digital technology use with young children?	8. Do you think the children in your classroom benefited from being exposed to electronic devices and digital technology? In what ways? 9. Has digital technology enhanced your teaching? In what ways? 10. Do you assess children's learning by having them use an electronic device?
How do preschool teachers form their beliefs about the use of digital technology with young children?	9. Does your state have preschool technology guidelines or standards, for example from your state level Department of Education? 11. Have you ever received specific training or classes on how to use digital technology in your classroom?	4. Thinking back to your earliest memories of using electronic devices (digital technology), what comes to mind and how did it make you feel? How did you learn to use a computer or tablet? 5. Do you receive any support for example, from a district tech person or program

Research Questions	Survey Questions	Interview Questions
	12. Do you receive any support (e.g., program administrator, district tech support person) about what types of digital technology to include in your classroom?	administrator about what types of technology to include in your classroom? 11. Does your state have preschool technology guidelines or standards, for example from your state level Department of Education?
Have preschool teachers changed their views and/or practices related to digital technology since the COVID-19 pandemic began?	20. Since the COVID-19 pandemic began have you changed the ways in which you use digital technology? 21. Some individuals feel that there are positives that have come out of the COVID-19 pandemic related to the use of digital technology. If you have anything that you feel was positive for your classroom children, you, your program and/or your family, please describe them below.	12. Can you tell me in what ways have you used digital technology throughout the COVID-19 pandemic? 13. Have your views or opinions about digital technology changed over the years? Or in response to the COVID-19 pandemic?
Do preschool teachers vary in the advantages they see in the use of digital technology related to demographic variables such as age, years of experience teaching or by program type?	1. How long have you been working in the field of early care and education? 3. What early childhood curriculum model or approach or a combination of approaches and models do you follow? 5. What type of classroom do you work in? 7. How would you describe the income level(s) of the families in your classroom? 9. Does your state have preschool technology guidelines or standards, for example from your state level Department of Education? 11. Have you ever received specific training or classes on how to use digital technology in your classroom?	

Research Questions	Survey Questions	Interview Questions
	12. Do you receive any support (e.g., program administrator, district tech support person) about what types of digital technology to include in your classroom? 17. Do you see benefits, such as areas of development (e.g., language skills) or domains (e.g., mathematics) that are enhanced by digital technology use with young children? 27. In what year were you born? 28. What is the highest educational level you have completed so far?	

APPENDIX C

Semi-Structured Preschool Teacher Digital Technology Interview

Interview with (First name) _____

Phone Number _____

E-mail Address _____

Date _____

Start Time _____

Thank you for agreeing to talk with me about technology use in your preschool classroom. If you don't know the answer to one of the questions or are not comfortable answering a question you can say; "I don't know." I anticipate the interview taking about 20 to 25 minutes. If you need to stop at any time, please let me know. This interview is voluntary.

1.	Do you have any of these technology items in your classroom on a regular basis? (Check all that apply) (Just to clarify, I'm not talking about play equipment that might be in the dress up area for pretend play)	_____ Desktop computer(s) _____ Laptop computer(s)/ Notebook(s)/Chromebook(s) _____ Tablet(s)/iPad(s) _____ Smartboards(s) _____ Digital camera(s) _____ Electronic toys/games _____ e-book reader(s)	Notes
2.	How about older devices?	_____ DVD/music player(s) _____ tape recorder(s) _____ VCR(s)/VHS tape(s) _____ record player(s) _____ light table _____ LCD projector _____ microscope(s)	

3.	Any other technology related items?		
4.	Thinking back to your earliest memories of using electronic devices (digital technology), what comes to mind and how did it make you feel? How did you learn to use a computer or tablet?		
5.	Do you receive any support for example, from a district tech person or program administrator about what types of technology to include in your classroom?	☐ No ☐ Yes (please explain what guidance you receive)	(If no technology items in the classroom ask: Did you receive guidance about not including technology in your classroom ?)
6.	From the standpoint of a child, is the electronic equipment/digital technology accessible (e.g., a computer is set up for child use, tablets are stored on a low shelf) to them? Do children use/play with the digital technology?		(Skip if no technology items in the classroom)
7.	Do you use/play with the children using digital technology?		(Skip if no technology items in the classroom)

8.	Do you think the children in your classroom benefited from being exposed to electronic devices and digital technology? In what ways?		(Skip if no technology items in the classroom)
9.	Has digital technology enhanced your teaching? In what ways?		
10.	Do you assess children's learning by having them use an electronic device?		
11.	Does your state have preschool technology guidelines or standards, for example from your state level Department of Education?	☐ No ☐ Yes (How do you follow these guidelines or standards?)	

12.	Can you tell me in what ways have you used digital technology throughout the COVID-19 pandemic?		
13.	Have your views or opinions about digital technology changed over the years? Or in response to the COVID-19 pandemic?		
14.	Is there anything else you would like to tell me about digital technology use at the preschool level or technology as it relates to your classroom?		

Again, thank you, it has been a pleasure talking with you. I appreciate your time. A gift card will be sent to your email address. Can I verify your email address?

End Time _____

APPENDIX D



Date: April 18, 2022

Study #: IRB-FY2021-113

Study Title: Technology Survey for Preschool Teachers - Oct 2020

Submission Type: Modification

IRB Decision: Exempt

Research Team:

Jill Claxton

Tomoko Wakabayashi

The IRB has reviewed the Modification submission related to the above referenced study and determined that the changes listed below do not affect the exemption status of the study. The study remains Exempt per federal regulations.

The approved modifications are the following:

1. In addition to distributing the preschool teacher survey online via electronic format, paper versions of the survey will be distributed and collected at in-person early childhood conferences. Preschools teachers will be offered the opportunity to fill out a paper survey and return it the day of the events. Preschool teachers will be invited to fill out a survey and place it in an envelope upon completion.
2. Addition of a follow-up preschool teacher interview about their use of and beliefs about digital technology. The interview will be conducted via Zoom and recorded for transcription purposes. The interview will take about 20-25 minutes to complete.
3. Revise research incentive for participating in the preschool teacher survey to increase the chance of winning from one of five \$10.00 gift cards to one of ten \$25.00 Amazon gift cards.
4. Add additional \$25.00 Amazon gift card as incentive to those who complete the follow-up interview.
5. Update preschool teacher survey with some revised questions and some additional questions.
6. Decrease the number of participants and records to be used in this study from 250 to 200 each

7. Expand the inclusion criteria to include preschool teachers from different programs across the USA.
8. Revise recruitment document to include the revised incentive for completing the survey, the changed time needed to complete the study and information about the optional follow-up interview procedure and its additional incentive.
9. Revise the Information Sheet to include the revised incentive for completing the survey, the changed time needed to complete the study and information about the follow-up interview procedure and its additional incentive.
10. Revise research location to include administering paper survey in-person in addition to online survey and Zoom interviews.
11. Distribute the preschool teacher survey in electronic format via a national online platform for the early childhood community.

The submission includes the following documents:

- Recruitment Document for the Survey and Follow-Up Interview
- Revised Information Sheet for the Survey and Follow-Up Interview V 4-18-22
- Revised Survey
- New Follow-up Interview Questionnaire

The IRB approved (date-stamped) consent document(s) has been published under Attachments in the Submission Details page. Please download the IRB date stamped consent and use it in consenting participants.

You are approved to implement the aforementioned modifications. Please retain a copy of this notification for your records.

This letter can also be found in Cayuse under the Letters tab in the Submission Details page.

If you have any questions, please contact the IRB office.

Thank you.

The Oakland University IRB