November 2022

Saudi Pre-Service Teachers' Beliefs and Practices Regarding Digital Technology in Early Years Education: A Qualitative Case Study

May Mohammed Alyaeesh
University of South Florida

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Education: A Qualitative Case Study

by

May Mohammed Alyaeesh

Major Professor: Ilene Berson, Ph.D.
Jolyn Blank, Ph.D.
Sophia Han, Ph.D.
Sara Flory, Ph.D.

Date of Approval:
November 4, 2022

Dedication

I dedicate this dissertation to the following extraordinary people. To my father, Mohammed Alyaeesh, for believing in me and teaching me to never give up. To my mother, Haila Alraqib, for her endless support and encouragement. To my loving, generous, and outstanding husband and life partner, Ibrahim Alshayban, for sharing the hardships and surrounding me with love and support. I am lucky to have you in my life. To my brilliant children, Aljawhara, Abdulrahman, and Mohammed, who are my greatest love and the source of my strength. To my amazing sisters, Mead, Heba, and Reem, for being my cheerleaders. To my late mother-in-law, Aljawhara Al Mutlaq, who had the most generous and compassionate heart and always prayed for me and wished me luck and success. I wish you could be with me now to celebrate the completion of this work. To my government, for giving me such a great opportunity and fully sponsoring my education outside the country, and to the United States, for being my home away from home for the past 10 years.

Acknowledgements

First and foremost, I thank Allah for giving me the strength to accomplish this work. I would like to express my enormous appreciation to my outstanding committee members, whose insight, expertise, and ideas guided and enriched this study. This work would not have been possible without my major professor, Dr. Ilene Berson. I will never be able to thank you enough for your constant help, advice, understanding, and encouragement to become better and reach my fullest potential. I will always be in your debt and will never forget what you have taught me and the many opportunities, discussions, and insights you gave me.

My deep gratitude to the rest of my committee members, Dr. Jolyn Blank, Dr. Sophia Han, and Dr. Sara Flory. Thank you for all your support, encouragement, and wisdom and for being such an inspiration. Your knowledge and experience improved this research in numerous ways. I appreciate every memory, learning moment, and enriching experience I have had as a PhD student at such an exceptional university.

To my beloved parents, Mohammed Alyaeesh and Haila Alraqib, for your unfailing love and understanding that gave me the strength and faith in myself to accomplish this work. A special thanks to my incredible sisters, Mead, Heba, and Reem, who have been a continuous source of love and strength, especially during challenging times. I love and appreciate you so much.

To my amazing husband, Ibrahim Alshayban, for being my rock and a wonderful partner who always understood and supported me throughout this journey. I can never repay you for all

the things you have done for me throughout my studies and on the countless times you helped me overcome difficult times. This work would not have been possible without you by my side.

To my children, Aljawhara and Abdulrahman, who supported me and made me laugh when I was feeling anxious or stressed. I am so thankful for your understanding, patience, and sacrifice, despite being so young. Just looking into your eyes gave me the strength to do better. I would also like to thank my other son, Mohammed, even though he has yet to come into the world. To all my children, everything I accomplish is for you. I love you from the bottom of my heart and am always grateful to be your mother.

A special thanks to my participants for their generous time, cooperation, enthusiasm, and for sharing their personal thoughts and experiences despite their heavy workloads.

Finally, I would like to express my gratitude to everyone who encouraged, assisted, and advised me throughout my PhD journey and helped me be where I am now. I could never view this achievement as mine alone but as the work of many people who helped me along the way. You deserve all the honor and praise. Without you, I would never have made it this far.

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Abstract

This study investigated Saudi pre-service teachers' beliefs and practices regarding digital technology in early years classrooms. It sought to determine whether participants were prepared to employ such technology to meet the objectives of the Saudi Vision 2030 national development program. This topic was viewed through the lens of the TPACK framework. The study found that the student teachers were not sufficiently prepared to infuse digital technology. They held positive beliefs about digital technology infusion but were concerned about young children's use of this technology. There was an absence of effective practices, participants' technical competence was very basic, and their recognition of the benefits of digital technology was limited. Their digital technology practices were largely based on passive, teacher-centered learning. A lack of practice, feedback, role models, and relevant courses had a strong impact on their conceptualization, beliefs, and implementation of digital technology during their internships.

Chapter 1: Introduction

Recent studies have shown digital technology to be a valuable instructional tool to enhance learning, make activities more productive, and improve learning outcomes (Dong & Xu, 2020). Young children's interactions with digital devices are now commonly part of their daily lives (Saracho, 2015; Weng & Li, 2018; Xie et al., 2019), shaping their learning and play (Dong, 2018; Edwards, 2016) and extending into the classroom in some schools (Dong, 2018; Otterborn et al., 2019). Given this development, early years organizations have recommended employing digital technology in teaching (National Association for the Education of Young Children [NAEYC] & Fred Rogers Center, 2012). Technology and interactive media support learning and growth when teachers use those tools intentionally and in accordance with children's developmental level, needs, and interests.

However, digital technology can be challenging to apply in early years education (Edwards & Bird, 2017). Such classrooms are unique, being shaped by play-based learning, and teachers often know little about appropriate ways to use technology through play (Edwards & Bird, 2017). Furthermore, children have limited writing and reading skills and rely mostly on visual representation, which should be taken into consideration in technology integration (Magen-Nagar & Firstater, 2019). In addition, mere access to such technology does not automatically lead to more fruitful infusion of it in schools (Xie et al., 2019). Teachers' beliefs and knowledge influence how they use technology in classrooms, even when tools and technical assistance are available (Cheng & Xie, 2018).

Despite this potential to facilitate intellectual development, many teachers have limited their classroom technology use to low-level activities as a reward or free time (Hsu, 2016). Quality of technology use is associated with how teachers leverage technology to evolve pedagogical practices and promote education (Xie et al., 2019). This quality is linked to such factors as teachers' beliefs. Those who hold more positive beliefs are most likely to implement technology to teach content and foster learner-oriented tasks and higher-order thinking (Xie et al., 2019). According to Bice and Tang (2022), learner-oriented tasks provide children with opportunities to establish knowledge actively, while teacher-centered learning involves children absorbing information passively from their teacher. Digital technology infusion is influenced by the teacher's pedagogical beliefs, and teacher-centered learning with digital technology has been linked to poor learning experiences.

Researchers are increasingly focusing on the infusion of technology in children's learning (Magen-Nagar & Firstater, 2019; Saracho, 2015). Early years teachers are less likely to consider using technology in class, less likely to believe in the value of digital technology, and receive less preparation to use it compared to teachers of higher grades (Xie et al., 2019). In early years, integrating mobile technology is inconsistent and rare. Many early years teachers have a lack of confidence and are uncertain about infusing technology (Marklund, 2019) and need to overcome diverse obstacles once it is presented (Edwards, 2016), while others still question its usefulness, and there are many concerns around developmentally appropriate ways to utilize it with young children (Palaiologou, 2016). The NAEYC and Fred Rogers Center (2012) offer guidance for early years teachers in this regard to optimize experiences for developmental domains.

A growing number of studies indicate that the key to fruitful technology use depends on how effectively teachers incorporate it into lessons and activities (e.g., Alalwan et al., 2020;

Dong & Xu, 2020; Hsu, 2016; Kewalramani & Havu-Nuutinen, 2019; Nikolopoulou & Gialamas, 2015b; Otterborn et al., 2019). Therefore, it is important to understand teachers' beliefs about technology integration and identify factors associated with its use because those beliefs strongly influence their decisions in the classroom (Xie et al., 2019). The NAEYC and Fred Rogers Center (2012) position statement identified a need to adequately prepare teachers to make informed decisions regarding when and how to select and utilize technology.

Saudi Arabia is witnessing a transformation toward technology infusion in education, led by the Tatweer Company and Ministry of Education (Mohammed, 2021). This is in line with Saudi Vision 2030, a project seeking to reduce the country's dependence on fossil fuel by developing the economy along with the national education system (Ministry of Education, n.d.). To achieve this goal, there is a need to ensure that teachers are prepared and have the skills and knowledge for technology use in early years classrooms (Aljouf, 2019). Vision 2030 considers technology a crucial driver and enabler of social and economic transformation. Therefore, there has been a great emphasis on the technological abilities of the teacher and a rising demand to infuse technology in Saudi schools. For these reasons, technology infusion has become an essential component of the education system in Saudi Arabia (Al-Abdullatif, 2019).

Two of the main goals for the education sector in Vision 2030 are improving performance and integrating digital resources (Mohammed, 2021). One related initiative is Future Gate, a website with digital resources for teachers and students that equips public schools with digital tools (Ministry of Education, n.d.). The present study assessed whether future teachers were equipped to integrate digital technology in the classroom. It did this by soliciting pre-service teachers' beliefs about technology use and their knowledge and practices during their experience in the field.

Education is rapidly evolving, requiring new and emerging competencies among teachers (Batane & Ngwako, 2017). Training teachers on technology use with young children is now a key component to ensure teachers are ready for today's classroom. Internships are the main stage when pre-service teachers start to apply the skills and knowledge gained during coursework and build their practices and philosophies. Thus, studying this stage helps understand how much a program has prepared them in this regard.

Personal Background

Despite gradual advancements, Saudi education has long been based on rote learning with basic tools, such as chalkboards (Aljabreen, 2016). Students have been expected to passively receive and memorize information to answer questions and take tests, while the teacher's role has been seen as imparting knowledge. Generation after generation, this pattern has slowed or prevented innovation as many continue teaching as they were taught.

In contrast, technology use is more effective when it is incorporated intentionally to foster student-centered learning, and digital technology can increase active learning and promote authentic experiences (NAEYC & Fred Rogers Center, 2012). However, digital technology was not part of my formal education until high school, when I had a computer class about basic digital literacy skills. In my bachelor's program, I had one course about technology use during my preparation program that focused on hyperlinks in PowerPoint, and my professors limited their use of digital technology to PowerPoint slides.

Since that time, technology has reshaped education and society. My interest in this area came from working as an early years teacher and teacher educator. In a private school where I worked, I observed that Saudi teachers resisted incorporating digital tools into formal learning, and there was a lack of awareness of the advantages of those tools beyond showing a video or

puzzle game. When required to use digital technology, teachers often called it useless and preferred spending time on something else or failed to use it to support child-centered learning. I struggled with my classroom partner as she disagreed with me about using technology in children' play and activities in our lessons based on concerns regarding screen time, an unwillingness to spend much time to let children learn how to use and learn through digital technology, and the need to focus on academics and readiness for future grades. The use of tablets in the classroom was associated with rewarding students, playing songs, and tracing letters and words. Although I believed in the usefulness of digital technology at the time, I recognized that we as teachers were not sufficiently prepared to integrate it into the classroom, and the one technology course I took did not equip me with the knowledge and skills needed to appropriately integrate technology with young children.

In addition to my work as a regular teacher, my experience as a teaching assistant increased my interest in this topic as well. During supervision, I noticed my fellow pre-service teachers' students struggled with digital technology, and their technology integration was mostly passive, i.e., showing pictures, watching a video, reading words, or filling out digital worksheets. I noticed they paid less attention to the technology section in their lesson plan as it was the most challenging part for them.

Later, an Information and Communication Technology class in my doctoral program introduced me to the benefits of the intentional use of technology, passive and active use, and theories related to technology integration, such as Technological Pedagogical Content Knowledge (TPACK) developed by Mishra and Koehler in 2006; the Technology Integration Matrix (TIM) developed by the Florida Center for Instructional Technology (FCIT) in 2006; and Substitution, Augmentation, Modification, and Redefinition (SAMR) developed by Puentedura

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in 2006. According to them, technology integration goes beyond offering access to technology and replacing traditional tools; it requires actively engaging children and finding appropriate digital tools, activities, and practices. These concepts led me to reflect more critically on Saudi teachers' use of technology and reach a more scientific understanding.

The teachers I observed were in the substitution level of the SAMR model, where digital tools are used as a direct replacement for traditional resources and methods of instruction. I recognize that technology use should be transformative rather than an enhancement to normal instruction. Rather than merely replacing the chalkboard, digital tools are better used in creating novel experiences and activities that would not be feasible without those tools. The quality of technology infusion relates to teachers' TPACK and ability to use diverse resources and tools to teach content and facilitate knowledge construction. This reflection on my experiences encouraged me to explore the beliefs and knowledge of the teachers affecting Saudi pre-service teachers' decisions about technology integration as well as their technology use in practice.

Problem Statement

Pedagogical behavior is guided by intrinsic factors, including values, beliefs, and epistemology. From my experience as a teacher and teacher educator, Saudi in- and pre-service teachers marginalized technology when planning and delivering a lesson, which typically involved low-level activities. This observation aligns with previous studies that have found pre-service teachers often feel insufficiently prepared to integrate technology (Alelaimat et al., 2020), including in early years education (Marklund, 2019).

The Saudi Vision 2030 national development program calls for integrating digital technology into early years education (Ministry of Education, n.d.). This goal requires training in-service teachers and ensuring the adequacy of the education of pre-service teachers. Such

training is hampered, however, by the paucity of research on early years education and teacher preparation in Saudi Arabia or the Middle East in general (Aljabreen, 2016; Alqarni, 2015). Technology infusion has been challenging in the context of early years education (Edwards & Bird, 2017) due to major factors, including teachers' beliefs and knowledge (Hus, 2016; Magen-Nagar & Firstater, 2019; Mertala, 2019; Xie, 2019). The present study has sought to address the abovementioned gap in the literature and increase the understanding of pre-service teachers' readiness for technology integration in Saudi early years education by investigating their beliefs and practices.

Study Purpose and Research Questions

The purpose of this study was to analyze and explain pre-service teachers' beliefs and practices regarding digital technology in early years education. Using TPACK as the framework, I sought to understand how well the early childhood education program at a university in the Eastern Region of Saudi Arabia was preparing pre-service teachers to intentionally use digital technology in conjunction with subject matter and teaching methods. According to Newman et al.'s (2003) typology, this study adds to the current understanding of a complex phenomenon related to pre-service teachers' beliefs and practices in a specific context. As in many qualitative case studies, the primary goals were to (a) gain "greater understanding of the case" (Stake, 1995, p. 16); (b) describe pre-service teachers' beliefs about the use and role of technology in early years; and (c) generate an in-depth understanding of how the pre-service teachers used technology in their internship and the factors influencing their beliefs and sense of adequacy. The study also explored to what extent pre-service teachers were prepared to integrate technology in response to Vision 2030 objectives, guided by the following research questions:

1. How do Saudi pre-service teachers perceive the role of digital technology in early years education?

2. How do Saudi pre-service teachers infuse digital technology in their teaching practice?

Significance of the Study

Use of digital technology in early years education is growing, as this technology is increasingly viewed as a central aspect of children's learning. Preparing teachers with the knowledge and skills to use digital technology has thus become a fundamental component of any teacher education program (Batane & Ngwako, 2017). Beliefs, digital capabilities, and ability to conceptualize how digital tools can be infused contribute to teachers' receptiveness to using those tools (Palaiologou, 2016). Teaching philosophy and practices are also connected to teachers' beliefs about technology integration, making it important to understand those beliefs (Hatzigianni & Kalaitzidis, 2018). Thus, it is critical to understand if and how pre-service teachers employ their knowledge and skills to infuse digital technology during their internship and understand what factors influence their technology use.

Few studies have examined TPACK within early years education (Park & Hargis, 2018). What research has been done on early years teachers' beliefs and practices about digital technology infusion has mostly been conducted in a Western context, concentrating on in-service teachers (Dong & Mertala, 2020) and largely based on self-reported findings, such as surveys (Hsu, 2016; Wang et al., 2018). For this reason, the existing research might not exemplify teachers' beliefs and practices in different cultures (Dong & Xu, 2020). Social context shapes how one perceives and interacts with the world. Hence, technology use in early years classrooms will differ from one society to another. In addition, the upgraded TPACK framework added

contextual knowledge, highlighting its importance. According to Chai et al. (2014) and Roussinos and Jimoyiannis (2019), contextual factors affecting teachers' formation of TPACK call for additional exploration. Any exploration of pre-service teachers' intentions, practices, and beliefs about infusing digital technology with young children should consider their social and cultural context. To address this gap, the present study took contextual influences into consideration. This research contributes to the literature by describing Saudi pre-service teachers' beliefs and practices in an early years setting through a qualitative descriptive case study approach employing the recently upgraded TPACK framework.

Research in early years education in Saudi Arabia is in its early stages, with few studies on early childhood pre-service teachers and technology use. Although Alajaji and Alshwiah (2021) studied Saudi pre-service teachers, their focus was on the impact of using gamification on their achievement and views of the new strategy as a way to teach and quiz them in a teacher training course through the lens of self-determination theory. However, the pre-service teachers' practices in the field and beliefs about using gamification or any other digital resources with young children were not explored. Another recent study by Al-Abdullatif (2019) examined Saudi pre-service teachers' TPACK confidence in a college of education using a quantitative survey, but she did not specify if early childhood pre-service teachers were included. Therefore, the present study extends the Saudi literature, which lacks data on early years pre-service teachers' beliefs and practices regarding technology use with young children.

The Saudi education system is experiencing rapid changes as part of the Vision 2030 national development program, which has highlighted integrating digital technology into early years education (Ministry of Education, n.d.). With these ongoing reforms, more effective use of technology is needed (Ministry of Education, n.d.), but Saudi teachers' efforts in this regard are

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often inadequate (Bingimlas, 2018). Therefore, more studies are needed to assess pre-service teachers' beliefs, knowledge, and practices regarding technology use in early years classrooms. Such research would show the adequacy of teacher preparation programs and ensure pre-service teachers are ready to use digital technology to achieve the educational goals of Vision 2030.

The present study drew data from a Saudi teacher education program, and the results could inform the Saudi education system and the development of early childhood preparation programs. Based on the data, policymakers could make necessary changes to policies, curricula, and preparation programs. As a faculty member in the university where the study took place, I could play a significant role in improving the preparation program. The findings could serve as a valuable guide when I work with the department in creating a development plan to infuse digital technology in teaching practices. As I plan to share my findings with the Saudi Ministry of Education, the findings could also inform new plans and criteria for other universities. Finally, the study could offer a foundation for further research in the field, particularly in the Saudi context.

Theoretical Framework

The TPACK framework was proposed to explain the knowledge domains essential for effective technology infusion in teaching (Mishra & Koehler, 2006). It has had a critical impact on inquiry and practice in teacher education and training (Mishra, 2019) and has been employed to explore the knowledge of pre-service and in-service teachers (Swallow & Olofson, 2017). TPACK was developed from pedagogical content knowledge theory (PCK) introduced by Shulman (1986) and emphasizes the teacher's ability to infuse technology within the structure of pedagogical and content domains. TPACK refers to teachers' knowledge about teaching particular content using suitable pedagogical approaches and technology. The TPACK

framework comprises three main domains: technological knowledge (TK), content knowledge (CK), and pedagogical knowledge (PK), interrelating domains (TCK, TPK, PCK) with an external domain recently named contextual knowledge (Mishra, 2019). Context in TPACK is conceptualized as the larger socio-cultural context, which encompass intrapersonal, interpersonal, cultural/institutional, and physical/technological dimensions (Chai et al., 2013; Chai et al., 2014; Koh et al., 2014). A TPACK lens was thus employed to analyze teachers' knowledge, capabilities, and perceptions regarding digital technology in early education. More details about TPACK are provided in Chapter 2.

Teaching is a multifaceted intellectual process that involves employing various kinds of knowledge (Koehler & Mishra, 2009). TPACK can be adapted for analyzing the knowledge teachers need to infuse technology in their classrooms and for finding ways to foster integrated knowledge. As this ability is a crucial concern in teacher education institutions, this study employed the TPACK framework to investigate Saudi pre-service teachers' practices and beliefs regarding technology infusion, their adequacy in infusing technology in the classroom, and how much their preparation program had equipped them for this purpose.

Definition of Terms

Teacher Beliefs

Belief is a multidimensional concept and refers to "psychologically-held understandings, premises or propositions about the world that are felt to be true" (Mertala, 2019, p. 335). Educational beliefs are interior constructs that help teachers understand experiences and drive certain pedagogical practices (Hsu, 2016). A teacher's beliefs in this context encompass their attitude toward teaching, learning, and learners and can therefore drive their decisions in the classroom.

Digital Technology

Digital technology includes such devices as cameras, interactive whiteboards, programmable toys, desktop computers, laptops, tablets, smartphones, e-books, game consoles, digital toys, and media players (Dong & Xu, 2020; Palaiologou, 2016). In this study, I use the term "digital technology" instead of the broader term "technology" because, as Koehler and Mishra (2009) and Schmidt et al. (2009) noted, technology can include traditional, non-digital technology, such as pencils and paper. Additionally, Fleer (2017) divided technology into high technology (such as tablets and electronic toys) and low technology (such as dolls, books, and screwdrivers).

TPACK

TPACK is a framework for technology integration. It involves knowing the complex roles of and connections between the three core components of instruction (pedagogy, content, and technology) required for high-quality technology infusion. Its focus is applying suitable and effective strategies and tools to teach certain content (Chai et al., 2013).

Organization of the Study

This chapter introduced the topic and personal background of the researcher. It included the problem statement, purpose of the study, research questions, study significance, theoretical framework, definitions, and limitations and delimitations. The second chapter offers a comprehensive literature review. The third outlines the research design, including the paradigm, case study approach, quality criteria, case selection, trustworthiness, data collection and analysis, and limitations. Chapters 4–6 discuss the data for each of the three participants, and Chapter 7 concludes the study with a cross-case analysis.

Chapter 2: Literature Review

This chapter reviews the literature on digital technology in early years education, digital technology use as contemporary play, its impact on children's development and learning, digital technology and early years teachers, a general background on Saudi Arabia, Vision 2030, early years education, teacher preparation programs, and the theoretical framework.

Digital Technology in Early Years Education

The world around young children is changing rapidly (NAEYC & Fred Rogers Center, 2012), with the ubiquity of digital technology changing play and learning (Edwards, 2016; Magen-Nagar & Firstater, 2019). This technology can include cameras, interactive whiteboards, programmable toys, desktop computers, laptops, tablets, smartphones, e-books, game consoles, digital toys, and media players (Dong & Xu, 2020; Palaiologou, 2016). These devices have increasingly been used as a pedagogical tool to engage young children and facilitate learning, and teachers are increasingly expected to use them (Dong et al., 2020).

Research has found positive connections between technology-based activities and engagement. Through educational technology, children can actively construct and reformulate their learning and develop their thinking (Jiménez, 2015). Contrary to popular opinion, digital technology does not displace other types of active learning, and when incorporated intentionally, is another valuable learning tool (NAEYC & Fred Rogers Center, 2012). Young children can employ this technology to make believe, investigate new domains, and actively engage in challenging and enjoyable activities. The U.S. Department of Education indicated that developmentally appropriate technology can support children's learning and growth as they can

utilize it for playing, solving problems, and roleplaying while learning about different technologies and acquiring digital literacy (Lee, 2016).

Digital Technology Use as Contemporary Play

The nature of play is shifting in terms of the tools accessible for play and the manner in which these tools are used in diverse sorts of play (Edwards & Bird, 2017). The term "digital play" has been used in research to address digitalization of early years education (Marklund, 2019). Many educators and researchers have categorized play based on the tool associated with it, such as rough-and-tumble play, socio-dramatic play, and fantasy play. Nevertheless, there is little research on the relationship between digital technology and play in early years education, as it is not often considered an aspect of young children's play (Marsh et al., 2016). With rapid advances in digital technology, however, there has been a call for reconsidering prior definitions, leading to the notion of digital play (Marsh et al., 2016).

Children now use various digital tools more often and in more ways than children in earlier generations. Contemporary play is based on non-digital and digital resources and thus works in ways that would not be achievable before. Some contrast non-digital and digital play, claiming play with digital tools does not represent real play (Marsh et al., 2016). Few information found on young children's use of digital technology before 2002, but young children today have a broader array of digital tools to play with—such as smartphones and iPads—than prior generations and are using online resources at a younger age. This is mainly due to the arrival of tablets in 2010 (Marsh et al., 2016).

According to Marsh et al. (2016), this trend has led to worries that digital technology has reduced old-fashioned play in early years settings. Digital play was built on Vygotsky's play theory and principles as an important activity in intellectual and creative growth. The current

digital resources afford experiences to elevate and foster play embedded in young children's

daily lives. Digital play is not a lower type of play but rather has the same value as old-fashioned

play and can facilitate imaginative growth. In an analysis of children's use of digital

technologies, Edwards (2013) argued for reexamining the relation between old-fashioned play

(e.g., social play, object play) and the "converged play" happening now (as cited in Marsh et al.,

2016). Converged play is play associated with young children's common cultural resources and

objects involving digital modes. These forms are not opposed but interconnected, and that old-

fashioned play should not be considered to be of higher level of play, especially since converged

play could promote creativity.

There is some debate about whether digital technology promotes or hinders children's

learning and growth. Some consider digital technology an active element of learning and play

while others perceive it as promoting passivity (Mustola et al., 2018). The appeal of digital

devices could lead to them being implemented inappropriately in early years classrooms. As a

result, it is important for teachers to incorporate them intentionally and selectively with a

consideration of every child's needs (Gjelaj et al., 2020; Lee, 2016; NAEYC & Fred Rogers

Center, 2012).

Differentiating between active and passive use of technology is essential to ensure it

benefits young children (Lee, 2016; Mustola et al., 2018). Passive use appears when children

mechanically and uncritically consume content (e.g., watching a video without associated

participation, imagination, or reflection). Active use refers to creatively interacting with

technology in meaningful experiences. Passive use is an unsuitable replacement for active play,

engagement, and interaction with peers and teachers (NAEYC & Fred Rogers Center, 2012). The

NAEYC and Fred Rogers Center (2012) defined efficient use of technology as active, engaging,

hands-on, and empowering; it provides the child with agency, affords scaffolds to facilitate the achievement of tasks, and is employed as one of several choices to enhance learning. By focusing on technology as a tool, teachers can avoid the passive and possibly harmful use of non-interactive screen devices that would be unsuitable in early years classrooms. The key to developmentally appropriate use is intentionality, meaning the teacher needs to reflect on whether the aims will be better attained through traditional or digital resources.

Digital Technology and Young Children's Development

Digital technology can provide experiences that foster physical, social, emotional, linguistic, and cognitive skills, and there is increasing evidence of its advantages in learning across diverse areas (Xie et al., 2019). Teachers should consider the creative and learning benefits of high-quality interactive technology, particularly when incorporated with skillful teaching and curriculum resources (NAEYC & Fred Rogers Center, 2012). Benefits from children's point of view include providing links with home, being interesting and fun, granting a sense of choice and creativity in learning, and offering competitive elements that increase the desire to learn (Dunn et al., 2018). Such technology can enhance early cognitive development by fostering creativity, inquiry, collaboration, problem-solving, and exploration (Kalaš, 2010; Magen-Nagar & Firstater, 2019). Appropriate digital technology use can develop multiple mental abilities of children, including "visual, analogical, abstract, and mathematical-logical, and their creative thinking, memory, literacy development, motor-visual coordination, vocabulary, and metacognition" (Magen-Nagar & Firstater, 2019, p. 166).

Additionally, digital technology can foster meaningful social interaction and communication among young children; in this context, the teacher's role lies in guiding discussion, which enriches conversation ability (Magen-Nagar & Firstater, 2019). Digital devices

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have been found to develop young children's interactions and social skills. Young children have shown varying levels of verbal and nonverbal social interaction in different types of digital play (Lawrence, 2018). When young children frequently use this technology in the classroom, they interact and play cooperatively, develop their social skills, and show less problematic behavior.

When a device such as a tablet is introduced intentionally, children usually play cooperatively, interact, and learn from each other; these interactions have positive effects on children's language development as they make comments, express themselves, ask and answer each other's questions, share ideas, and assist one another while working with the devices (O'Byrne et al., 2018). Young children's use of digital technology can promote literacy and creativity through creating digital drawings, books, and photography, which can also develop their social skills (Lawrence, 2018). In addition, it can promote increased alphabetical understanding, emergent writing, and print concept awareness (O'Byrne et al., 2018; Xie et al., 2019). Not only can digital technology help young children display more collaborative interactions, it can also increase the quality of that collaboration (Lawrence, 2018).

Digital Technology and Teacher Preparation

The beliefs of teachers reflect and guide their decisions and practices (Pajares, 1992). Pajares (1992) called teacher beliefs a "messy construct" and debated the differences between beliefs, expertise, and awareness and what impact such predictors could have on educational practices. Pajares affirmed that beliefs and expertise are interlinked, with beliefs the more influential predictor for how a teacher will outline activities and select resources. Other studies have likewise found pre-service teachers' beliefs and attitudes to be the most critical predictor of their use and intent to use digital technology (e.g., Anderson & Maninger, 2011). Beliefs and expertise in this regard are especially important for new teachers (Abbitt, 2011; Brinkerhoff,

2006). Future teachers' educational expertise and developing beliefs could therefore help understand and predict their choices and practices.

In a study by Kim et al. (2013), although teachers all had access to the same technology, training, and pedagogical and technical support, they differed in how much they infused digital technology. This suggested their practices were heavily shaped by their beliefs. Similarly, according to Ertmer (2005), even when the basics for fruitful digital technology infusion are provided, high-quality use remains low due to other obstacles, particularly teachers' beliefs. A willing change in practice thus requires a corresponding change in beliefs.

Recognizable images and beliefs about what is appropriate and attainable in the classroom are expected, more so than educational theories, to shape teachers' decisions and practices (Ertmer, 2005). Individual and indirect experiences, in addition to cultural and social patterns, appear able to change the beliefs of teachers, meaning teachers' continuing experiences, influential people, and the ideas and values articulated by those around them constantly shape their beliefs and practices (Ertmer, 2005).

According to Ertmer et al. (2012), a belief in learner-centered teaching was connected to learner-centered practices (e.g., teamwork, authenticity, learner choice), and teachers' personal beliefs regarding the significance of digital technology to leaners' education had the largest influence on using that technology. Furthermore, inner predictors (e.g., motivation to use digital tools, a problem-solving attitude) and external predictors (e.g., support from others) had a powerful influence as well. Cullen and Greene (2011) explored pre-service teachers' beliefs and internal and external motivations to use digital resources in future practice. The biggest factor was their beliefs regarding digital technology use, and they struggled to plan and design effective digital activities.

Blackwell (2013) explored the ways tablets were used in early years classrooms. Teachers held positive views about using digital resources to support children's education and saw distinctive benefits of tablets. Nevertheless, an absence of effective preparation and technical support, personal beliefs, and fears about the suitability of digital tools with young children prevented changes to their practices. Teachers largely used tablets in their activities in ways that aligned with their personal educational philosophies. With this in mind, pre-service teachers need adequate preparation to understand the benefits of digital resources and develop the ability to use them effectively (Anderson & Maninger, 2007). Anderson and Maninger (2007) illustrated how curriculum could shape future teachers' aptitude for, beliefs about, awareness of, and intention to use digital technology.

TPACK is a valuable framework for preparing teachers to use digital resources (Abbitt, 2011). Abbitt (2011) found a positive relationship between pre-service teachers' TPACK measures and their technology-related beliefs. The findings suggested there was a dynamic, complicated interplay between pre-service teachers' beliefs and knowledge about digital technology infusion, which were influenced by TPACK measures. Training pre-service teachers to use digital technology in an engaging, innovative way was a challenge, even when it was incorporated into coursework, and understanding pre-service teachers' beliefs, awareness, and expertise and the way those predictors influenced future practice was difficult as well.

Teachers are expected to have adequate technology, pedagogy, content knowledge but also essential is their ability to combine these three domains (Koehler & Mishra, 2009; Schmidt et al., 2009). Tondeur et al. (2011) and Howard et al. (2021) discussed training approaches that would help pre-service teachers use digital media in their teaching. Some included aligning conceptual information to practice, ongoing feedback, reflection, modeling effective use,

opportunities for designing digital tasks, and authentic hands-on digital experiences. Approaches at the university level included policy development for digital technology infusion, cooperation within and between institutes, access to digital resources, and faculty training and development. It has been challenging for teacher preparation programs to choose and apply the most effective approaches for this purpose. The most common approach has been to offer basic educational technology classes, after which teachers are expected to translate what they learned in class to future practice. Nevertheless, pre-service teachers still feel inadequate in their ability to do this. Thus, it is critical for preparation programs to not just show how to use digital technology but also how that technology can be infused in teaching and learning.

Digital Technology and Early Years Teachers

The use of digital technology in the classroom often remains low even when elements of fruitful integration are provided, including access to digital resources, training, and a favorable environment. Internal factors are usually the cause as teachers' beliefs play a fundamental role in their teaching decisions (Pajares, 1992) and therefore the success of this approach (Eickelmann & Vennemann, 2017; Ertmer, 2005; Mertala, 2019). Teachers' mindsets in this regard are based on their beliefs about the usefulness of digital technology in early years education (Magen-Nagar & Firstater, 2019).

Belief is a multidimensional concept and refers to "psychologically-held understandings, premises or propositions about the world that are felt to be true" (Mertala, 2019, p. 335). Hsu (2016) defined the beliefs of teachers as interior constructs, which help the teacher understand experiences and drive certain pedagogical practices. These interconnected beliefs are the greatest predictor of what resources the teacher will select and how they will teach. Beliefs appear under many different names in research, such as perceptions, preconceptions, judgments, values,

dispositions, attitudes, opinions, conceptions, implicit and personal theories, social strategies, and internal mental processes. Beliefs are formed within certain physical, cultural, and historical situations as well as by observations and chance (Mertala, 2019).

According to Mertala (2019), studies on teacher beliefs have been conducted for more than 60 years, offering evidence that such beliefs guide teaching decisions and activities, including why teachers might or might not integrate a new curriculum, adopt different methods, or implement new resources. Beliefs have the power to identify the ways teachers infuse digital resources into their instruction (Becker, 2000). These beliefs can thus be a facilitator or an obstacle to technology adoption.

Internal Factors Affecting Digital Technology Infusion

Research has found various internal factors related to teachers that affect digital technology integration, including their beliefs, self-efficacy and confidence, knowledge and skills, and personal innovation.

Beliefs

Hatzigianni and Kalaitzidis (2018) found that teachers' teaching philosophy was connected to their beliefs about technology integration. In Otterborn et al. (2019), teachers had a positive belief about using digital technology. They believed tablets encouraged young children to interact and be more engaged in learning tasks and viewed tablets as a flexible educational tool offering rapid access to knowledge. In Hsu (2016), most preschool teachers held constructivist, child-centered pedagogical beliefs about technology use. Teachers' views about the importance and effectiveness of digital technology for young children's learning influenced pedagogical beliefs about digital technology use and were predicters for how and how much teachers used digital technology. In other studies, teachers likewise viewed young children's use

of and access to digital technology in a positive light (Dong, 2018; Nikolopoulou & Gialamas, 2015b). In Xie et al. (2019) and Kara and Cagiltay (2017), preschool teachers found digital technology to be easy to use and useful in class. Thus, usability was a vital factor shaping how teachers viewed digital technology and a predictor of their beliefs about its usefulness and usability. Positive beliefs were linked to positive mindsets, plans to integrate the tool in the future, and how they used it in their lessons.

In contrast, Masoumi (2015) found digital technology was considered a way to keep young children busy without having any clear relevance to the curriculum. Digital technology was considered not only unessential but inappropriate for young children. Nikolopoulou and Gialamas's (2015b) preschool study revealed teachers viewed playing with digital technology as an effective mode of learning and developing children's technological competence. Many new teachers see digital technology as an extra component to their routine requiring more energy and time to implement (Hsu, 2016). In Kewalramani and Havu-Nuutinen (2019), teachers believed early years education had more pressing objectives for which digital technology was less appropriate. In Dong and Xu (2020), most teachers held low positive beliefs and understanding of the role of digital technology for young children but expressed eagerness and readiness to foster young children's digital technology use. Magen-Nagar and Firstater (2019) indicated that a positive mindset led to more and better use of digital technology for learning, while a negative mindset lowered its use. In their study, the refusal to implement digital technology came from the belief that early years classrooms must be based around enjoyment and playtime.

Self-Efficacy and Confidence

Views on self-efficacy can influence digital technology integration (Hsu, 2016). Self-efficacy refers to beliefs about one's own competence to learn or act appropriately in a given setting. In this case, teachers' self-efficacy reflects the level to which they are confident they can implement technology-based lessons and activities given the necessary skills. This self-efficacy involves their views of what they can do with digital technology in the class (Hsu, 2016; Jeong & Kim, 2017).

Self-efficacy plays a vital role in influencing the purpose of technology indirectly or directly through its perceived usefulness and usability (Ailincai & Gabillon, 2018; Jeong & Kim, 2017; Nikolopoulou & Gialamas, 2015a). Hsu (2016) found many teachers had high self-efficacy and confidence regarding digital technology use in teaching as digital integration seemed easy for them to figure out and use with young children. According to Nikolopoulou and Gialamas (2015b), the fewer the years of teaching experience and the higher the teachers' self-efficacy and confidence using digital technology in class, the greater was the view that this technology was not limited to free play. The study concluded that teachers' confidence affected their practices and children's learning.

Aldhafeeri et al. (2016) revealed that while Kuwaiti preschool teachers were capable technology users in their social lives and classrooms had mostly been digitalized, they were very hesitant about integrating digital technology into their practices and curricula because of a lack of adaptability and confidence. Similarly in Kewalramani and Havu-Nuutinen (2019) and Marklund (2019), the majority of teachers articulated a challenge in their uncertainties about using digital technology activities, wondering if integration might be harmful to children and concerned to what extent and how it might be integrated to foster development. In Australia,

preschool teachers were more confident employing digital technology for personal reasons but less so with young children (Hatzigianni & Kalaitzidis, 2018). Teachers' level of confidence with digital technology is thus strongly related to how they use that technology.

Knowledge and Skills

Digital technology is a challenge to teachers' skills and professional knowledge. In Otterborn et al. (2019), increasing expectations to integrate technology-based activities was associated with insufficient knowledge and digital skills and was one of the main limitations of using digital technology with preschoolers. Hsu (2016) reached similar findings. Magen-Nagar and Firstater (2019) went further, claiming teachers' lack of knowledge of teaching approaches, classroom management, learning theories, and diverse strategies of integrating digital technology could be barriers in early years education. Another barrier was teachers' knowledge of child development, including digital technology's contribution to children's learning, interaction, and social relationships. Teachers had a low recognition of the value and role of this technology. Dong and Newman (2016) found similar results. Although preschool teachers had a developing understanding of digital technology and its social effects in early years classrooms, they had limited recognition of its importance for young children and themselves.

In Weng and Li (2018), the majority of Chinese preschool teachers were not literate in the use of digital technology in early years education. As a result, they expressed concerns and difficulties designing age-appropriate technology-based play and activities. Together, these factors reduced high-quality digital technology use. In recent studies (e.g., Alalwan et al., 2020; Crompton et al., 2018; Dong & Xu, 2020), examining teachers' use of new technology—such as robots, virtual reality, and augmented reality—showed they lacked the skills, knowledge, and experience to use it effectively.

A lack of knowledge could be related to age, as Magen-Nagar and Firstater (2019) found that numerous (mostly older) teachers acknowledged that a major factor hindering their use of digital technology with young children was inadequate knowledge. Furthermore, they claimed that if they were more knowledgeable and skilled in this regard, they would implement it more and in different ways. Teachers' lack of knowledge and awareness of the effects of digital technology influenced their integration as many used it in passive ways and created rules limiting children's use of it (Kewalramani & Havu-Nuutinen, 2019).

Personal Innovation

In Jeong and Kim's (2017) study, an influential internal factor in teacher motivation and acceptance to use digital technology was personal innovation, that is, whether they adopted innovations early on relative to other people in society. Active information seekers conducted new activities, better handled uncertainty, and tended to have positive views of innovation. Teachers with greater innovativeness were described as early-adopters and created varied technology-related activities.

External Factors Affecting Digital Technology Infusion

Research has likewise found external factors affecting digital technology integration, including time, resources, support, training and professional development, policies and curriculum, social setting, and children's lack of digital skills.

Time

Hsu (2016) found the greatest obstacle to teachers using digital technology was limited time. Several preschool teachers reported there was not enough time to do everything as they had to follow a schedule limiting time for each lesson and class. Similar results were found in other recent studies (e.g., Alalwan et al., 2020; Dong & Xu, 2020; Kewalramani & Havu-Nuutinen,

2019; Marklund, 2019; Weng & Li, 2018). In these studies, most teachers were challenged by inadequate opportunities and time to use and explore digital technology. As a result, they felt forced to concentrate on their routine.

Resources

Inadequate access to technology, budgetary restrictions, and lack of equipment are external factors reducing the effective use of digital technology. Nikolopoulou and Gialamas (2015a), Hsu (2016), Weng and Li (2018), and Alalwan et al. (2020) highlighted the limited resources for using digital technology in early years education, including tools and funding. Kara and Cagiltay (2017) emphasized that preschools needed sufficient digital technology to incorporate it into the classroom.

Support

Lack of technical support can limit preschool teachers' integration of digital technology as well. Hsu (2016) and Nikolopoulou and Gialamas (2015a) found computers, laptops, and tablets were unreliable and frequently had weak batteries or problems connecting to the Internet in some areas of the school. Recent studies such as Magen-Nagar and Firstater (2019), Kewalramani and Havu-Nuutinen (2019), and Ailincai and Gabillon (2018) found that teachers faced several technical problems using and maintaining digital technology.

Training and Professional Development

Training and professional development can be a major predictor of how much teachers use digital technology with young children. Even though Hatzigianni and Kalaitzidis (2018) found training or a lack of it was not very important, other studies found the opposite. Many preschool teachers felt limited due to a lack of experience with new technology (Hsu, 2016; Otterborn et al., 2019). Lack of practice with digital literacy and lack of professional training

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related to technology are also major barriers (Weng & Li, 2018). Teachers in these studies—as well as in Dong and Xu (2020), Marklund (2019), Magen-Nagar and Firstater (2019), and Ailincai and Gabillon (2018)—expressed a need for sufficient preparation and professional development to learn how some technologies worked and how to use them with preschoolers.

Education Policies and Curriculum

Nikolopoulou and Gialamas (2015a) found that selecting digital technology activities was left up to teachers because preschool curricula did not offer guidelines to support designing or selecting such activities. Otterborn et al. (2019) indicated that preschool teachers needed more explicit curriculum guidelines for using technology in the classroom. Similarly, Dong and Newman (2016) argued for clear polices for early years education that foster teacher learning about digital technology and emphasize young children's creative and active use of it for development and learning. Alalwan et al. (2020) pointed out that limited instructional design was a significant barrier to teachers' effective integration of digital technology. With the increasing emphasis on incorporating digital technology in preschool, it is crucial to improve curriculum and policies to harness its potential (Dong, 2018).

Social Setting

In Jeong and Kim (2017), South Korean preschool teachers' views about suggestions from critical referents (colleagues, leaders) about digital technology acceptance and use represented a significant factor influencing teachers' intention to use that technology. Teachers subjectively assessed others' opinions at school and employed them as a reference to support their decisions. Marklund (2019) listed some indicators related to the social learning setting. In addition to teachers' lack of knowledge or interest, colleagues' limited knowledge or interest, parents' concerns, and the perceived pedagogical impact could all influence teachers' digital

technology integration. Similarly, Ailincai and Gabillon (2018) highlighted the impact of the social context of the school and level of support from administrators.

Children's Lack of Digital Skills

Children's lack of digital skills is another hurdle to learning through digital technology in the classroom (Hsu, 2016). Hsu (2016) found that children were not very competent, especially at a young age, in the essential skills needed to use digital devices, such as typing, logging onto accounts, editing and saving files, and searching the Internet. As a result, much instructional time was spent helping and preparing children for technology-based activities.

Background on Saudi Arabia

The population of Saudi Arabia is relatively young and growing rapidly (Alzahrani, 2011). Based on the most recent official statistics for 2020, the population was 35 million, with 8.5 million under age 14, 2.9 million of whom were under 10 (Central Department of Statistics Information, n.d.). The official language spoken by most of the population is Arabic, and Islamic law has a strong influence on Saudi identity, culture, and education (Alzahrani, 2011).

In 2016, the government launched Vision 2030, a 15-year national development project with ambitious goals to shift the economy away from oil production to a more competitive, knowledge-based economy (Mohamed & Makhlouf, 2021). This process encompasses many different sectors, including education, which is needed to produce a competitive workforce. One of the objectives of these reforms is to integrate digital technology to enhance learner development and improve teacher training and preparation.

High-quality education and childcare in the early years is vital to future development and innovation (Aljabreen, 2016). Vision 2030 highlights the importance of building an education system that contributes to advancing the economy, empowering future generations with

knowledge and skills, providing opportunities for creativity and innovation, and developing talent in response to the changing demands of the 21st century (Mohamed & Makhlouf, 2021).

Early Years Education in Saudi Arabia

The first public preschools in Saudi Arabia were established in the 1980s and have spread throughout the country for children ages 3 to 6 (Aljabreen, 2016; Hussain, 2013). The three levels of preschool are for ages 3, 4, and kindergarten, which recently became mandatory before enrolling in primary school (Aljouf, 2019; Maash, 2021). In Saudi preschools, girls and boys study together and their teachers are all women, in contrast with higher school levels, in which boys are educated by male teachers and girls by female teachers in separate facilities (Aljabreen, 2016; Hussain, 2013). There are three types of schools—public, private, and international—with the Ministry of Education responsible for all aspects of this sector (Maash, 2021). Islam is at the center of Saudi education (Aljabreen, 2016), starting in preschool, when children learn about Islamic principles (Aljouf, 2019). Since the only official language in schools is Arabic (Hussain, 2013), early education follows a unified system appropriate only for Arabic speakers (Aljouf, 2019).

Saudi Early Childhood Teacher Preparation Programs

Fifty years ago, Saudi Arabia hired most of its school teachers from nearby Arab nations (Aljabreen, 2016; Maash, 2021). The first Saudi preschool teacher preparation program began in 1983 via the Gulf Women Association under the sponsorship of the Social Affairs Ministry. An associate of arts degree with two years of theory and one of field-based experience was provided to prepare teachers. King Saud University opened the first bachelor of arts program in 1985 to prepare preschool teachers. That university and the Association of the Gulf Girls established solid standards for early childhood education.

Over the past decade, Saudi universities have provided further early childhood teacher education programs. The Ministry of Education has required that such programs meet higher standards (Hussain, 2013). Currently, over 50 (mostly public) universities offer free education for Saudis, but early childhood preparation degrees are only offered to women (Aljabreen, 2016). Every university has its own teacher preparation program and system (Maash, 2021). The bachelor's degree is a four-year program at all Saudi universities, but courses and hours differ from one institution to another (Aljabreen, 2016). Teachers complete modules in three domains: subject preparation, pedagogical preparation, and cultural preparation. In a university in the Eastern Region, the site of the current study, students complete around 126 credit hours across eight semesters. The program introduces both theoretical and practical foundations with a practicum in each semester (e.g., observing, presenting an activity) and a final internship in the eighth semester. Courses cover general education, psychology, and early childhood.

Currently, several other institutions provide preparation for early years teachers (Aljabreen, 2016). These universities follow the Saudi Education and Training Evaluation Commission's standards for early childhood teachers and what future teachers must be knowledgeable about and capable of applying (Education and Training Evaluation Commission, 2020). These standards include the following:

- Knowing the characteristics of children's growth and needs.
- Knowing the characteristics of children's psychomotor, cognitive, language, emotional, and social development.
- Detecting developmental delay early on and knowing ways to deal with it.
- Planning for the teaching and learning process.
- Preparing the learning environment.

- Using a variety of methods and strategies in line with developmental level.

- Mastering class management and positive interaction.

- Evaluating children's growth and learning.

- Partnering with the family and community.

- Caring about children's safety.

- Familiarity with children's health and nutrition standards.

- Continuous learning and keeping abreast of developments in the field.

- Implementing ethical and appropriate practices.

Digital Technology Infusion in Saudi Arabia

There is a lack of research related to digital technology integration in early years classrooms among pre-service teachers in Saudi Arabia. In fact, I found only three studies on Saudi in-service teachers' perspectives on this topic: one on the benefits and challenges related to digital technology and one on the role of digital intelligence in the early years classroom.

Alasimi (2018) explored the effect of confidence, personal use, technology experience, and age on Saudi early years teachers' perspectives and use of digital technology, mainly in terms of obstacles and procedures needed for integration. The researcher collected the survey data from female in-service teachers in public and private early childhood schools. Participants reported positive attitudes toward using digital technology with young children, and age and technology experience in the classroom had no apparent influence on their attitudes. The study found that teachers' confidence and personal use of digital technology were likely to impact their attitudes toward digital technology use and called for more digital tools to be available in early years classrooms. Additionally, the study found pre-service preparation to develop knowledge,

skills, and beliefs as well as ongoing professional training were essential to increase teachers' confidence and efficacy.

Alsuwidan (2018) surveyed and interviewed early years teachers about digital technology use with young children in Saudi Arabia. Participants came from public and private schools to allow for a comparison of contextual indicators. Teachers displayed diverse views, but overall, digital technology was perceived as a valuable tool, and most participants integrated it into their instruction. A higher level of education and experience was related to a higher rate of digital technology use. Teacher's age and acceptance of digital technology played a major role, and the main obstacles were lack of technical support, training, and professional development.

Hammed (2014) examined the integration of digital technology in early years classrooms in Saudi Arabia and the UK. She adopted Bronfenbrenner's ecological systems theory to explore factors at different levels (system, preschool, and teacher) and collected data from six case studies via semi-structured interview, questionnaire, observation, and document analysis. Teachers in both countries held a positive view of the role and importance of digital technology. The study called for explicit policy for digital technology use in early years education and for continuous training for Saudi teachers. Although teachers in Saudi Arabia viewed digital technology in a positive light, their implementation was traditional and teacher-oriented instead of supporting child-oriented constructive learning. The study showed that pedagogical beliefs as well as school characteristics affected digital integration.

Kharashi (2019) investigated the advantages and challenges of integrating digital technology in early years language instruction in Saudi Arabia. Challenges included insufficient devices and time, lack of preparation or training, and family and teachers' views of digital technology. Benefits included building a community and teachers and students reaching a high

level of digital, cognitive, and physical skills. Teachers needed more training to appropriately integrate digital technology.

Alharthi (2021) investigated awareness of digital intelligence—a new notion added to the multiple intelligence theory—among early years teachers. She sought to improve how teachers perceived digital intelligence and used technology. In-depth interviews revealed teachers were unfamiliar with the concept. However, there was a developing awareness that digital technology had positive and negative effects. Many of the strategies and skills these teachers used with digital technology came from their life experience rather than training. Al-Abdullatif (2022) explored factors influencing future Saudi teachers through the technology acceptance model. The results revealed that future teachers' beliefs were the main predictor of behavioral intention to infuse comics and digital storytelling into their teaching practices.

Theoretical Framework

The theoretical framework of this study was TPACK. It originated from the pedagogical content knowledge (PCK) model (Shulman, 1987), which suggested that teachers should combine content and pedagogical knowledge. Mishra and Koehler (2006) offered a modified version of this model by integrating technological knowledge, creating TPACK.

Origin of TPACK

Historically, teacher education has emphasized subject-matter knowledge (Shulman, 1986). This focus led researchers to assume that when teachers understand the relevant content knowledge, such as math or science, this will enhance learner knowledge. Thus, many studies have examined the pedagogical knowledge of teachers.

Shulman (1986) highlighted the significance of content knowledge and introduced the notion of pedagogical content knowledge (PCK), which contributes to the development of

teacher knowledge. Teacher content knowledge and pedagogical practices were viewed as mutually exclusive in research (Shulman, 1987). This separation resulted in teacher preparation programs that focused on either pedagogy or content. To bridge this divide, Shulman (1987) highlighted the vital connection between pedagogy and content.

Shulman (1986) described PCK as the understanding of approaches and quality practices to promote learning. Based on Shulman's (1987) structure of PCK, teacher knowledge encompasses seven areas: (a) content knowledge; (b) general pedagogical knowledge; (c) curriculum knowledge; (d) pedagogical content knowledge; (e) knowledge of students and their attributes; (f) context knowledge; and (g) knowledge of educational values, aims, and purposes (p. 8). PCK embodies the combination of pedagogy and content into an understanding of how topics, issues, or content are structured, represented, and adapted to different characteristics of learners and presented in teaching (Shulman, 1987). In this way, PCK blends content and pedagogy to produce superior educational practices in diverse content areas.

Shulman (1986) claimed that possessing content knowledge and traditional pedagogical practices, although essential, was not adequate to capture the knowledge of a successful teacher. To portray the complicated ways a teacher believes a subject should be explained, Shulman claimed that PCK is the knowledge of content that deals with the instructional practice and the transformation of topics or content into teaching, comprising how to exemplify and frame the content to make it understandable to learners. In order for teachers to be "good" in this framework, they need to look at pedagogy and content together. Since there are different ways of representation, teachers need a variety of materials and methods. The way content is transformed for instruction should be at the heart of the conception of PCK. This can be approached once teachers understand the content or topic and employ diverse modes to embody it and make it

comprehensible to students. The intersection of content and pedagogy embodies PCK, which includes the following:

> the most regularly taught topics in one's subject area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations—in a word, the ways of representing and formulating the subject that make it comprehensible to others. (Shulman, 1986, p. 9)

For a long time, Shulman's (1986, 1987) model was used to conceptualize teacher knowledge. Shulman's (1986) model divides teacher knowledge into content knowledge (CK), knowledge of pedagogical practices and management techniques (PK), and knowledge of ways to teach certain topics to particular learners in particular contexts (pedagogical content knowledge, PCK). Additionally, Shulman (1987) defined four other groups that frame the knowledge foundation of instruction: teaching materials knowledge, containing media and visual materials (knowledge of curriculum); knowledge of the attributes of learners, containing their topic-related assumptions and conceptions (knowledge of learners); knowledge of learning settings, such as classrooms and schools (knowledge of context); and knowledge of instructional beliefs and objectives.

Technology knowledge and skills are briefly presented in Shulman's (1986) notion of curriculum knowledge. Thus, the theory is embodied in three areas of knowledge: pedagogy and content knowledge, the intersection of which was described by Shulman, and technology, which was represented in isolation from the other two concepts (Mishra & Koehler, 2006). However, the connections between these three concepts are nuanced and complicated (Mishra & Koehler, 2006).

Although teachers regularly employ digital technology, Mishra and Koehler (2006) noticed the original PCK model had no domain for it because computer technology was less ubiquitous when the model was proposed. Nevertheless, its incorporation in educational settings has become crucial, requiring teachers to incorporate different digital technologies into instruction, leading to structures that forefront such technology. Mishra and Koehler (2006) expanded the framework to include knowledge of technology as a third main component, introducing TPCK. Other studies had attempted to describe the role of technology in education before TPCK, characterizing technology as a category of knowledge connected to pedagogy and content knowledge and worthy of consideration due to its growing significance. Mishra and Koehler later changed the name of their proposed framework from TPCK to TPACK, a term that has since been employed in numerous studies (Thompson & Mishra, 2007).

Mishra and Koehler's (2006) model highlights the interplay, overlap, affordances, constraints, and relationships between pedagogy, content, and technology. In this framework, knowledge about all three is crucial for effective education. Nevertheless, instead of considering these as isolated forms of knowledge, this framework underlines their interaction. According to it, technology cannot be meaningfully separated from pedagogical and content knowledge, which led to them extending the PCK concept to produce TPCK/TPACK.

TPACK Framework

Mishra and Koehler (2006) stated that a large body of research on teachers' technological knowledge did not use an obvious theoretical framework. They recognized the impact digital technology can have on educational experiences. As a result, their construct comprises pedagogy, content, and technological knowledge, as they can all improve education. They

represented the interplay between these forms of knowledge as understanding the affordances and boundaries of digital tools to address particular topics.

The TPACK framework refers to a teacher's ability to deliver content by employing appropriate practices and tools. This concept could help analyze pre-service teachers' plans for and understanding of their practices. TPACK's focus is on the domains of knowledge needed to effectively use technology and contextual factors affecting teachers' use of that knowledge (Olofson et al., 2016). In this framework, the teacher should be knowledgeable about the ways digital technology can (a) enrich how a topic is presented and make content simpler or more difficult to learn; (b) be associated with instructional strategies for a particular topic, inquiry, or content area; and (c) build on learners' experience and initiate further knowledge (Koehler et al., 2013; Mishra & Koehler, 2006). TPACK emphasizes the complex interplay between teachers' knowledge of pedagogy, content, and technology, but it has been difficult to link technology to content and pedagogy, especially when teachers do not receive suitable professional training to use digital technology (Koehler & Mishra, 2009).

The interconnecting domains of TPACK are portrayed as a framework in which teachers become knowledgeable about a content area and use techniques to make it accessible to students (Mishra & Koehler, 2006). TPACK defines the foundations of knowledge needed to efficiently teach with technology and outlines the skills necessary for teachers to incorporate it into meaningful experiences to enrich learner knowledge (Mishra & Koehler, 2006). The framework evaluates teachers' technology knowledge and how they apply that knowledge to connect digital technology to a particular topic. Chai et al. (2013) reported that to incorporate technology effectively, all knowledge domains need to be interconnected.

Since TPACK consists of three bodies of knowledge that are reciprocally related as they interact and impact one another, an effective incorporation of TPACK requires educators to know about all three and employ them appropriately. For instance, content might influence which tools are applied (Koehler & Mishra, 2009). Particularly, computing and visualization technologies can enhance such disciplines as mathematics, in which simulation and graphical manipulation are essential (Mishra & Koehler, 2008). Since instruction involves many bodies of knowledge, it is not a straightforward activity but is rather complex, dynamic, and ill-structured (Mishra & Koehler, 2006). Therefore, it becomes difficult to assume a one-size-fits-all approach as different topics might require different pedagogical practices and technology. The relationships of the core areas of TPACK to teacher knowledge are shown in Figure 1, reproduced with permission from Mishra (2018).
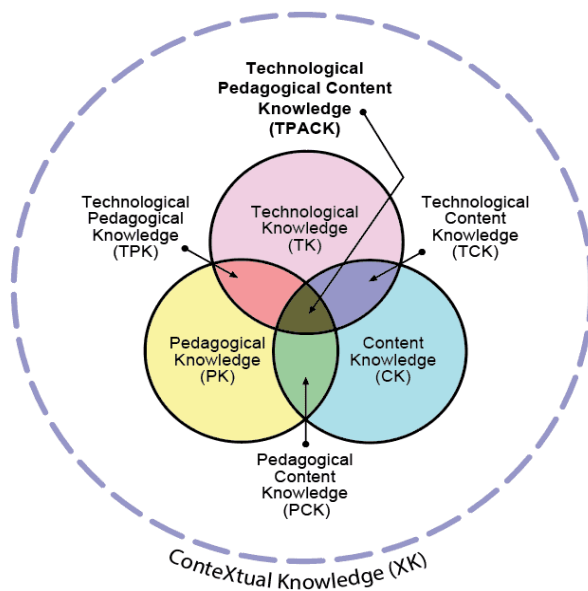
Figure 1: Revised Version of TPACK

This TPACK diagram is the revised version suggested by Mishra (2019) to highlight the context in which technology infusion happens by renaming the external circle "Contextual

Knowledge (XK)." Contextual knowledge comprises a teacher's knowledge of available tools

and resources and their awareness of the institute, district, or nationwide policies they work

within (Mishra, 2019). As shown in Figure 1, the three main circles—pedagogical knowledge,

content knowledge, and technological knowledge—are the main domains of TPACK (Koehler &

Mishra, 2009). Each domain is outlined below.

Pedagogical knowledge is knowledge of teaching and learning approaches, processes,

and practices (Koehler & Mishra, 2009). It involves general instructional values and objectives.

This refers to the understanding of how learners gain knowledge, classroom management, learner

evaluation, and lesson planning. Teachers with an in-depth understanding of pedagogy know

how learners build knowledge, skills, habits of thinking, and positive views of education.

Content knowledge is knowledge of the topic, content area, or subject matter taught

(Koehler & Mishra, 2009). The nature of investigation and knowledge vary between disciplines,

and the teacher should develop a deep understanding of the subject and field in which they teach.

As Shulman (1987) stated, content knowledge involves knowledge of theories, concepts, and

organizational outlines related to a subject and the methods of establishing knowledge in

students. Technological knowledge involves knowledge of traditional technology and new digital

tools. It comprises the skills needed to use specific digital tools (Chai et al., 2013). According to

Mishra and Koehler (2006) and Koehler and Mishra (2009), TPACK comprises seven

components that reflect a teacher's knowledge (see Table 1). The three basic systems are

pedagogical knowledge, content knowledge, and technological knowledge, while their interplay

produces pedagogical content knowledge (PCK), technological content knowledge (TCK),

technological pedagogical knowledge (TPK), and technological pedagogical content knowledge

(TPACK).

Table 1: Elements of TPACK

Domain	Definition
Content Knowledge (CK)	Teachers must understand topics in order to teach them. This content knowledge comprises knowledge of major ideas, theories, and facts in a given field. Example: Wide comprehension of the subject (e.g., science, literacy, or social studies) (Chai et al., 2013).
Pedagogical Knowledge (PK)	Pedagogical knowledge involves knowing instructional practices, processes, values, and objectives. This comprises all strategies for classroom management, learning, lesson planning, and assessment. Example: Comprehension of a range of teaching approaches such as how to apply inquiry-based instruction or collaborative learning (Chai et al., 2013).
Technological Knowledge (TK)	Technological knowledge involves traditional technology (e.g., pens, chalk, and paper) and new digital tools (e.g., websites and digital videos). It comprises the skills needed to use specific digital tools. Example: Comprehension of how to use robots or Web 2.0 resources (e.g., Facebook, blogs) (Chai et al., 2013).
Pedagogical Content Knowledge (PCK)	Pedagogical content knowledge is the connection between content and pedagogy. It means understanding what instructional methods fit a topic and the way components might be organized for meaningful teaching. It involves blending pedagogy and content to realize how topics are planned and modified to suit students' abilities and interests. Example: Comprehension of how to use analogies to explain electricity (Chai et al., 2013).
Technological Content Knowledge (TCK)	Technological content knowledge involves teachers knowing how technology and content are interdependent, what they teach, and how a topic might be taught with technology. Digital tools present new, more diverse representations and more flexibility in navigating these representations. Example: Comprehension of online dictionary, SPSS, or subject-specific technology resources, e.g., Geometer's Sketchpad (Chai et al., 2013).
Technological Pedagogical Knowledge (TPK)	Technological pedagogical knowledge is knowing how digital tools might be employed in learning and how applying certain tools can transform instruction. Example: WebQuest, KBC, applying technology as cognitive resources, and iPad-enhanced collaborative learning (Chai et al., 2013).
Technological Pedagogical Content Knowledge (TPACK)	TPACK involves knowing the complex roles of and connections between the three core components of instruction (pedagogy, content, and technology) and using suitable strategies and tools. It is the foundation of successful teaching with digital technology. Example: Knowing how to use a wiki as a communication resource to promote collaborative learning in literacy (Chai et al., 2013).

As a knowledge system, TPACK has been described as complex, multidimensional, transformative, and integrative (Harris et al., 2009; Koehler & Mishra, 2009). Fruitful technology use is embedded mainly in curricula, content linked to educational processes, and in intelligent application of technology (Harris et al., 2009).

Contextual knowledge was added to the diagram to underline the situational and organizational factors the teacher works within (Mishra, 2019). The success of teachers' work

often relies less on their expertise with technology, pedagogy, content, and its intersections and more on their context knowledge. This leads to viewing teachers not only as designers of lessons but as "intrapreneurs"—conscious of the ways their organization works and the influence they could use to effect change (Mishra, 2019).

Context in TPACK

According to Koehler et al. (2013) and Rosenberg and Koehler (2015), TPACK differs from earlier instructional technology constructs as it recognizes that education does not happen in a vacuum but rather in a context, which affects TPACK and the application of technology. There is an increasing appreciation of the significance of incorporating a contextual understanding within the framework itself (Mishra, 2019), emphasizing the importance of considering holistic settings and social-technical matters for designing and modeling.

Context has been defined with various components, such as the content of a subject, student background, accessible technology, and grade level (Mishra & Koehler, 2006). Chai et al. (2013) noted that technology integration studies have been criticized for limiting the context to the learning setting and ignoring the effects of the larger socio-cultural context. Thus, other researchers have added to the conceptualization of the educational context in which TPACK is implemented (e.g., Chai et al., 2013; Koh et al., 2014; Swallow & Olofson, 2017). Chai et al. (2013), Chai et al. (2014), and Koh et al. (2014) expanded TPACK contextual factors to include teachers' pedagogical and epistemological beliefs, peers, school, and technology dimensions, which were refined to intrapersonal, interpersonal, cultural/institutional, and physical/technological dimensions. The intrapersonal dimension refers to the views the teacher holds regarding teaching, learning, pedagogy, learners, technology, and the interaction of these aspects. The interpersonal dimension refers to peer support via the sharing of thoughts, peer

coaching, groupwork, patterns of collaboration, and collaborative problem-solving. The institutional/cultural dimension refers to an institution's culture, policy, and curricula (e.g., places for cultural reproduction, focus on traditional tests, and stakeholders' expectations for education). The physical/technological dimension refers to the availability of digital tools, the proper performance of the tools, access to technical support, and the use of classroom management techniques. These diverse contextual variables can influence teachers' use of technology (Chai et al., 2013; Koh et al., 2014).

According to the TPACK framework, context shapes the manifestation of TPACK in environments, making it beneficial to understand contexts and related factors to know how TPACK changes from one context to another. However, Rosenberg and Koehler (2015) claimed contextual influences had been given no attention in studies employing TPACK and required more investigation, although contextual factors affecting how teachers implement the seven TPACK components have been recognized.

Scholars, educators, and policymakers have frequently employed TPACK when explaining the expertise needed for education in an era increasingly dominated by digital technology (Chai et al., 2013). According to Chai et al. (2013), TPACK is a useful framework because it integrates contextual environments and is important in research on technology's role in professional training and technology education. Since Mishra and Koehler (2006) introduced TPACK to address the lack of models guiding the use of technology in teaching, it has become a dominant form of inquiry within teacher education and professional development (Chai et al., 2013). Technology use is similar to teaching as both are highly individualized, and thus it has been suggested that technology practices should be considered in context (Altun, 2019; Olofson et al., 2016).

There is an ongoing need for research on how context impacts teachers' TPACK development and design decisions. Factors such as school philosophy and culture, the physical environment, and academic level might influence how teachers employ their knowledge for instruction. Teachers' contextual understanding plays a vital role in students' learning experiences (Swallow & Olofson, 2017). Chai et al. (2014) suggested employing TPACK in a way that reflects a broad meaning of context to develop a deep understanding of technology use.

The term "technology" in education today usually refers to digital applications and devices that are in a state of rapid development, making their implementation challenging for teachers. Koh et al. (2014) stated that using digital technology is not only about expertise and using the newest tools. Successful use requires understanding the ways teachers' technological and pedagogical beliefs impact their digital technology use, instructional decisions, and teaching practices. TPACK affords a theoretical framework to investigate teachers' decision-making to help students learn. Koehler et al. (2013) and Wang et al. (2018) found five methods are often employed to measure pre-service teachers' TPACK: self-reported methods (often on a Likert scale), open-ended questionnaires, performance assessments (e.g., rubrics, performance assignments, lesson plans, reflections, and content analysis), observations, and interviews.

TPACK is built on connecting knowledge domains that arise in dynamic settings (Mishra & Koehler, 2006) and highlights the significance of context in shaping instruction (Chai et al., 2013; Rosenberg & Koehler, 2015; Swallow & Olofson, 2017). It is increasingly employed to define and explain what the teacher needs to understand in order to use digital technology in practice (Schmidt et al., 2009). Therefore, it was deemed an appropriate framework for this study.

TPACK in Early Years Education

The pedagogy and content of early years education has evolved along with notions about child development (Park & Hargis, 2018). Digital technology can be challenging to apply in this context since early years classrooms are unique, being shaped by play-based learning (Edwards & Bird, 2017). As a result, more research needs to explore what developmentally appropriate digital technology infusion looks like and how to help teachers recognize and apply it (NAEYC & Fred Rogers Center, 2012). The absence of TPACK knowledge has been recognized as a primary obstacle to digital technology infusion, as teacher-level factors, especially beliefs about digital technology, have the greatest influence (Blackwell et al., 2016). TPACK competencies of pre-service teachers are related to their technological beliefs, utilization, and skills (Altun, 2019).

Early years education is more interdisciplinary than higher levels, and to assess teachers' content knowledge in TPACK, one needs to consider knowledge of different content areas (e.g., math, science, and language arts). However, studies on TPACK subdomains have recognized and documented teachers' technological pedagogical knowledge more often than their technological content knowledge (Hofer & Harris, 2012). While a range of research has addressed specific subjects employing TPACK, there is very limited research addressing early years teachers (Park & Hargis, 2018). The instruments and focus of previous studies were mostly on assessing either in-service or pre-service teachers' TPACK in elementary and secondary settings, with a lack of early years research (Chuang & Ho, 2011; Park & Hargis, 2018). There is one quantitative study in this context and an exploratory qualitative study on the affordances of iPads within TPACK (Park & Hargis, 2018). Park and Hargis (2018) recommended adding an interpretation of the A in TPACK as affective knowledge and considering this dimension a major element to move educators toward incorporating technical knowledge with pedagogical and content knowledge.

Chapter Summary

Digital technology can be a powerful tool for teaching and learning when integrated in an intentional and appropriate way. Digital technology can enhance physical, social, emotional, and cognitive abilities (Xie et al., 2019). Its infusion in the early years classroom is influenced by teachers' beliefs, knowledge, and confidence about using digital technology. Of these, beliefs are the greatest predictor of what resources teachers will select and how they will teach.

This chapter discussed the impact of pre-service teachers' pedagogical and technological beliefs on technology integration. It noted the benefits of using digital technology with young children and the different predictors for their use of digital tools. The chapter also gave background information on Saudi Arabia and Saudi early childhood teacher education programs, including the goals of Vision 2030, which seeks to develop the education sector by integrating more digital tools.

Chapter 3: Methodology

This chapter describes the research paradigm, methodology, case selection, context, data sources, and analysis process. It also explains the quality criteria and ethical considerations. The study sought to answer the following research questions:

1. How do Saudi pre-service teachers perceive the role of digital technology in early years education?

2. How do Saudi pre-service teachers infuse digital technology in their teaching practice?

Given the focus on teachers' beliefs and practices, I conducted in-depth interviews and observations to obtain descriptive data to answer these questions. Thus, a qualitative case study was an appropriate approach (Stake, 1995). Qualitative research can offer a comprehensive methodology to analyze social phenomena (Marshall & Rossman, 2014). It is pragmatic, critical, interpretive, and naturalistic as it is built from the lived experiences of individuals. In addition, qualitative inquiry takes place in a natural environment, relies on multiple data sources, emphasizes context, and is essentially interpretive.

Research Paradigm

I believe there are multiple truths that are socially and culturally constructed, with each individual being unique. In a qualitative inquiry, interpretivism's philosophical assumption regarding ontology and the nature of reality is that there are many different views of what knowledge and social reality are (Lincoln & Guba, 2013). This study views reality or knowledge as something people create and as a social development influenced by different people's views,

experiences, and interpretations of reality rather than one definition of knowledge. Based on this paradigm, a qualitative, subjective approach was deemed more suitable for conducting this research using multiple methods of data collection, including interviews, observations, and a researcher journal. Since the researcher is the main instrument for collecting and analyzing data in qualitative interpretive research, it was important to acknowledge and be aware of my own values and biases (Simons, 2009). My personal and professional views of the topic and my experience and role at the university as a teacher educator might have affected the way I conducted the research and the relationships with the participating student teachers. Thus, I reflected on how my values, attitudes, and feelings could influence the study (Simons, 2009).

Case Study Approach

This case study describes and analyzes how three Saudi pre-service teachers viewed and used digital technology in early years education. These pre-service teachers and their digital technology infusion represented the cases, and the early childhood program was the context. Studying these individuals helped reveal the adequacy of the program and what aspects need to be changed. A case study aligned with this focus and the data collection methods, as I explored a bounded system and sought to gain an understanding of a specific phenomenon at a university in the Eastern Region in Saudi Arabia by employing several data sources, including interviews, observations, and a researcher journal, which provided thick descriptive information. A case study involves "an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular case, policy, situation, program in a 'real life' context. It is research-based, inclusive of different methods and data sources and is evidence-led" (Simons, 2009, p. 9). Major characteristics of this type of study include being holistic, empirical, naturalistic, interpretive, emphatic, interested in meanings from participants' interpretations, and richly

descriptive (Stake, 1995). This approach requires multiple data sources to understand the case and multiple perspectives and experiences, emphasizing the uniqueness of the case, providing a deep description of the findings, and emphasizing interpretation (Simons, 2009; Stake, 1995). These "studies are particularistic, descriptive, and heuristic and rely heavily on inductive reasoning in handling multiple data sources" (Simons, 2009, p. 9). Thus, a case study involves explaining, understanding, and interpreting multiple truths in a naturalistic context. Following this approach helped me develop a more in-depth, multifaceted understanding of a complex issue in a real-life setting (Crowe et al., 2011).

According to Stake (1995), case studies in education and social studies consist of researchers seeking to understand the unique perspectives, stories, and experiences of individuals and programs in a particular context. There are three kinds of case studies—based on the aim of the inquiry: intrinsic (focusing on the case itself), instrumental (focusing on issues and seeking to investigate and answer questions), and collective (Stake, 1995). This study is an instrumental collective case study because it consists of multiple instrumental cases chosen to gain a general understanding and broader appreciation of an issue while showing different perspectives. Multiple case studies can show how the phenomenon manifests in different environments, in this case, different kindergartens. In contrast to a single case study, this approach allowed me to obtain a more extensive description of the topic, compare cases (cross-case analysis), and more deeply understand pre-service teachers' unique experiences and beliefs as well as what was common across cases (Bruscia, 2005; Stake, 1995). It allowed for a more in-depth exploration of how they planned and used digital technology to support learning during their internships and their understanding of digital technology infusion. As I explored the topic through the research questions, I used the study as a tool to increase my understanding and assess pre-service

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teachers' adequacy, with the ultimate goal of improving digital technology infusion in early years education.

Case Selection

Since "Case study research is not sampling research" (Stake, 1995, p. 4), site selection and participants often start with accessible places (Marshall & Rossman, 2014, p. 113). In contrast to quantitative research, qualitative methods do not require a large number of participations or sampling techniques and are designed to develop an understanding of a particular case rather than generalize the researcher's interpretations of the findings (Stake, 1995). Thus, through the three cases I investigated, I sought to understand the issue from pre-service teachers' unique perspectives. I selected pre-service teachers because of their central importance to the future development of the Saudi education system. Since teachers are in many ways products of teacher preparation programs, it makes sense to study pre-service teachers' perceptions and practices while they are finishing such a program, when its influence on them is still fresh.

The pre-service teachers and university were conveniently selected to allow for easy access and to be able to collect data within a certain time frame. Participants were chosen based on their willingness to participate and share their beliefs and experiences. After gaining permission from the institutional review boards of the University of South Florida and the participating Saudi university, I recruited participants by following these steps:

- I informed the Early Childhood Department (in which I was a faculty member) at the Saudi university about conducting the study.

- I joined a meeting of senior-level students in the Early Childhood Program to share my research topic, purpose, procedures, ethical considerations, estimated time

required from them, and my contact information. I answered any questions they might have regarding the procedures. Students who were interested could contact me.

- I offered all student teachers in the senior level who were working on their internship an opportunity to participate. Participation was entirely voluntary.
- I selected three students who were willing and available to participate and were doing their internships in different schools.

All participants were women since early childhood programs in Saudi Arabia are only offered to women. I selected three participants to gain enough data for thick description and in case someone withdrew. I selected participants who were doing their internships in different kindergartens with different characteristics (e.g., in terms of technology resources and school support). To be included in the study, each participant had to (a) be enrolled in the Early Childhood Program at the target university, (b) be in the senior level, and (c) be working in their final internships. Students who met these criteria were expected to offer insight on the topic since they would have finished all the coursework required for them to teach young children and start their careers. Such participants were also chosen because they were more likely to offer richer information about how they were prepared to infuse digital technology in the classroom as well as regarding their beliefs and practices.

The three participants were studying in the Early Childhood Program in the College of Education at a university in the Eastern Region of Saudi Arabia. The college offers two bachelor's degree programs (Special Education and Early Childhood) with a program plan of four years. All students have field training each semester with their courses. They are required to achieve certain tasks related to their courses that progress as students advance in the program. By the second semester of the fourth year, students are supposed to complete all courses to take their

final internship. In their final internship, they are required to spend the semester teaching in pre-schools and kindergartens. During this time, they create lesson plans and activities for the different portions of the school day (e.g., circle time, center time, outdoor play time) following a preexisting schedule. There is one technology infusion course students are required to take during the program. From my experience in supervision, student teachers mainly infuse digital technology in their lessons to fulfill the technology section in their plan.

The site was a Saudi public university because private universities usually provide different programs for pre-service teachers, have different ways of preparing teachers, and have their own curriculum and program plan. The public university I selected was also where I worked because it would give me easy access to participants. Public universities follow the Ministry of Education's standards for teacher preparation and harbor students from various socio-economic and family backgrounds, all of whom are usually native Arabic speakers. Furthermore, each public university is fully funded by the government; hence, tuition is free, and all students are given a monthly stipend for continuing their education.

Data Sources

Case studies require multiple data sources to understand a phenomenon, develop a rich description, and increase the trustworthiness of the findings (Lincoln & Guba, 1986; Marshall & Rossman, 2014). I collected data from each participant until reaching data saturation, at which point I noticed the same information and patterns were obtained and felt I had gained enough data that covered all study aspects to establish my findings. About one and a half weeks were devoted to collecting data from a given participant. I carried out five classroom observations per participant in a naturalistic setting, conducted three semi-structured interviews per participant, took researcher notes, and kept a journal to provide description and better understand the target

issue. My data collection plan for interviews and observations focused on one case at a time as the first aim of a case study is to understand the case. The three interviews took place at the beginning of the study, after two observations, and when all observations were complete. After receiving IRB approval and the pre-service teachers consented to participate, I started working with the first participating pre-service teacher. Table 2 presents the timeline for data collection.

Table 2: Data Collection Timeline

Week	Teacher Interview (45–60 minutes)	Classroom Observation (45–60 minutes)	Researcher Journal
1	Introducing the study and obtaining consent forms Participant 1	Participant 1	*
2	Participant 1	Participant 1	* *
3	Participant 2	Participant 2	* *
4	Participant 2	Participant 2	* *
5	Participant 3	Participant 3	* *
6	Participant 3	Participant 3	*

Interviews

Since "The interview is the main road to multiple realities" (Stake, 1995, p. 64) and provides the opportunity to explore the experiences and standpoints of others (Patton, 2014), I conducted semi-structured interviews to explore the pre-service teachers' understandings, emotions, and beliefs about digital technology infusion as well as their lived experiences during their internships. Reasons for in-depth interviews included documenting participants' beliefs about the topic, determining issues through active engagement between the researcher and participants, revealing unnoticed emotions and incidents that could not be captured or observed in the classroom, and providing the flexibility to deepen an answer or engage in discussion (Simons, 2009). As noted by Miller and Glassner (1997), in-depth interviews enable the

researcher to explore and theorize about the social world and reveal evidence of the nature of a phenomenon, the situations and context in which it occurs, and the cultural structures participants use to understand these experiences and their social life.

Longhurst (2003) provided a more detailed definition of semi-structured interviews, which informed the present study:

> A semi-structured interview is a verbal interchange where one person, the interviewer, attempts to elicit information from another person by asking questions. Although the interviewer prepares a list of predetermined questions, semi-structured interviews unfold in a conversational manner offering participants the chance to explore issues they feel are important. (p. 103)

Semi-structured interviews can help get to the main issues quickly, investigate them in greater depth, ask follow-up questions, and enable participants to express their stories and ideas in their own words (Simons, 2009). They also help the researcher obtain a richer, deeper, more textured understanding of the phenomenon (Rapley, 2001). They can reveal the personal understandings and beliefs the participants hold. Thus, collecting data through this method was essential to answer my first research question.

After the pre-service teachers consented to participate in the research, I arranged a suitable time and place to interview them one on one about their views and planning of digital technology during their internships. I conducted three interviews with each participant on different days for 45–60 minutes per interview. The participants had the questions prior to the interviews to prepare, reflect on the questions, and think about their views (Simons, 2009). The interviews were audio-recorded, with participants' permission, to ensure accuracy of reporting

and focus on the social interactive nature of the interview (Simons, 2009). I later transcribed all interviews for analysis.

In an interview, building a good rapport with participants and making them feel comfortable expressing their thoughts is vital to produce detailed data (Rapley, 2001; Simons, 2009). At the beginning of the initial interview, I shared a short description of the study, its aims, and my personal interest in it to foster a more interactive and responsive interview (Simons, 2009). Furthermore, simple probes in the form of gestures, body language, words, and follow-up questions can encourage participants to continue speaking to provide more information or to keep them on topic (Simons, 2009). The interviews followed an interactive style and were more like a conversation to show informality and openness and to balance the relationship between researcher and participants (Simons, 2009).

Interviews included open-ended questions linked to participants' teaching experiences during their final internship, their perspectives on technology infusion, and relevant observations from field notes and lesson plans. The interview protocol contained items built on the TPACK domains. It included questions about their background and individual experience for the purpose of rapport building, their general experience with digital technology, their understanding of technology integration, the digital devices they regularly used, their ways of infusing technology to support learning, their classroom technology use, their beliefs about technology use in early years classrooms, views on advantages and challenges, and their perceived knowledge and confidence about integrating technology framed by TPACK (see Appendix A).

The second and third interviews with each participant included some of the field notes to facilitate more meaningful discussion; evoke and link participants' thoughts, beliefs, memories, and emotions; and generate more comprehensive dialogue and other questions related to their

beliefs about and practices using digital technology. As I took field notes during observation, relevant field notes were employed to help them reflect on their understanding, views, and ways of infusing digital technology during their internships (Simons, 2009).

Some field notes were taken immediately after the interviews, including notes on participant reactions and my immediate reflections. Others were taken during the interviews to track the research process and develop my understanding (Simons, 2009). However, I continued listening actively to "hear the meaning of what" participants were saying, "interpretations, and understandings that give shape to the worlds of the interviewees" and did not interrupt the participants to only show agreement or summarize what was said (Simons, 2009, p. 47). Only one interview was conducted per day to give me sufficient time to write reflections and field notes on critical points and issues that happened during the interviews (Simons, 2009).

Observations

I made a schedule to observe each of the three participants' classrooms five times while they were using digital technology, with 45–60 minutes per observation. I observed the ways they used digital technology in their classroom. These observations helped document and understand the pre-service teachers' practices, which could not be achieved by other data sources, such as interviews. Observation is essential in qualitative research to gain a comprehensive picture of the classroom and rich description for analysis and interpretation and to offer a cross-check on data gained from other sources (Simons, 2009).

I wrote field notes during and immediately after the observations, including notes on participant reactions and my reflections on the field experience. According to Emerson et al. (2011), "writing field notes [helps] the field researcher to understand what he has been observing in the first place and, thus, enables him to participate in new ways, to hear with greater

acuteness, and to observe with a new lens" (p. 19). I observed and recorded incidents using jottings to generate data as jottings are "useful for producing vivid, evocatively descriptive field notes" (Emerson et al., 2011, p. 31). Jottings act as a "Brief written record of events and impressions captured in key words and phrases; quickly rendered scribbles about action and dialogue" (p. 29). I employed episodes to build a brief event as a unified portrayal of what I saw that did not involve many individuals, sketches, or dialogue and which consisted of "conversations that occur in [my] presence" (Emerson et al., 2011, p. 63). Right after jotting down my notes in the field, I wrote extended field notes. I wrote down immediate key elements of observed actions and conversation with sensory details and instantiation, and through specialization, I extended my field notes to construct the data.

I conducted no more than one observation per day to have time to write my field notes on critical points and issues that happened during the observations (Simons, 2009). If writing notes during observations was disrupting for the teacher or children, I took mental notes of details about initial impressions, key events and issues, what was important to me, and who was in the setting until I could write full field notes later (Emerson et al., 2011).

Field Notes

As writing field notes contemporaneously is important, I wrote them immediately after each observation to create scenes, a process that helped me understand my in-field analysis. These notes were descriptive and reflective and included forms of in-process analytic writing, consisting of asides to document my initial analysis, understanding, and inquiry (Emerson et al., 2011). According to Emerson et al. (2011), "Asides are brief, reflective bits of analytic writing that succinctly clarify, explain, interpret, or raise questions about some specific happening or process described in a fieldnote or transcription of interviews" (p. 80). Compared to asides,

commentaries are a type of data record that offer "A more elaborate reflection, either on some specific event or issue, or on the day's experiences and fieldnotes" (p. 81).

Researcher Journal

In addition, I kept a researcher journal to keep track of and reflect on my role, biases, and values that might influence the data. It helped to raise to the surface my own dissonance with what was being said or done by the participants, my personal and professional perspectives, and my positionality. This tool was used to record the data documentation process, primary interpretations (in-field analysis), questions, thoughts, and jottings that were expanded on later, as well as reflect on my personal and professional opinions of the topic and the way I saw the data. I used my journal throughout all interviews and observations. My experience and role at the university as a teacher educator might impact the research and the relationships with the participating student teachers. Thus, I reflected on how my values, attitudes, and feelings might influence the study (Simons, 2009).

Data Analysis

As Stake (1995) noted, "There is no particular moment when data analysis begins. Analysis is a matter of giving meaning to first impressions as well as to final compilations. Analysis essentially means taking something apart" (p. 71). My initial analysis, or "in-process analytic writing" (Emerson et al., 1995, p. 105), began during data collection to interpret what I experienced and observed and better understand each of the teachers as a unique case. These initial interpretations and my ongoing analysis during data generation informed my subsequent data collection and understanding.

Qualitative case study research appreciates the differences between participants. As multiple cases would allow me to make comparisons and explore the topic from diverse

perspectives using multiple sources of rich descriptive data, I not only looked for common themes but was more interested in the uniqueness of each case. Stake (1995) highlighted that "Each [case involving people and programs] is similar to other persons and programs in many ways and unique in many ways. We are interested in them for both their uniqueness and commonality" (p. 1).

Stake (1995) described two typical strategies to deal with data, emphasizing seeking expected and unexpected patterns and relationships. My main data analysis approach involved direct interpretation and categorical aggregation. Direct interpretation involves looking at a single event and drawing meaning from it by asking myself what it meant and looking for deeper meanings through writing annotations in the margins. Categorical aggregation (thematic coding) means seeking a collection of themes by identifying words, key phrases, patterns, and repeated commonalities (coding). I applied inductive coding to openly review the data without the use of pre-established codes, explore the patterns that emerged from the data, and consider different possible interpretations (Braun & Clarke, 2019). I used my research purpose, questions, and theoretical framework as a lens throughout the analysis process.

My analysis began by applying direct preliminary interpretations in process analysis, which I wrote in my researcher journal via analytical memos during data collection, and categorical aggregation (thematic coding), which I employed throughout the analysis process (Stake, 1995). The data for each teacher were analyzed as a single case study before making cross-case comparisons (Stake, 2006) to deeply comprehend each participant's infusion of digital technology. Following Stake's (2006) recommendations for final data analysis, before starting the analysis, I arranged the data for each participant in separate sections to acquire a greater understanding of them individually. I read the data from the transcripts, observation field notes,

and researcher journal several times to immerse myself in it and build an understanding of the data as a whole. I analyzed each case separately to identify key words and phrases (coding) to find patterns and identify themes. My main focus was on key information that could provide critical insights for the research questions.

I created a codebook that included the name of each code and a detailed description of its meaning, following Saldaña's (2009, 2021) coding manual. My coding analysis comprised of two cycles. For each case, I followed Saldaña's (2009, 2021) steps of coding using a three-column table for data, preliminary codes, and final codes to identify the main codes and eliminate or combine redundant ones. During the coding phase, I went back to my data multiple times to find new codes until no more codes emerged and I reached saturation. After that, I combined several codes into categories and generated themes. The report of each case included rich and detailed descriptions of the case, case context, important events, and quoted extracts to support the interpretations and allow the reader to obtain an experiential understanding and build their own interpretations (Stake, 1995).

After categorizing the codes throughout my data sources to generate common themes for each case (within-case analysis), I reviewed and titled the determined themes of every individual case. After the individual case analysis, I combined all the data and analyzed them employing cross-case analysis to identify similarities and differences among cases. I compared all cases to identify codes, categories, and themes that transcended single cases. I determined the themes across the three cases employing deductive coding by referring to the predetermined TPACK code protocol. The cross-case analysis emphasized the common relationships and themes across cases. Themes were connected to the TPACK framework to provide a comprehensive picture of the participating pre-service teachers' infusion of digital technology.

As shown in Table 3, I used TPACK (Koh et al., 2014) as an interpretive approach in cross-case analysis to acquire a comprehensive overview of the adequacy of digital technology infusion. I studied the participating pre-service teachers through the lens of TPACK dimensions found to have a crucial impact on overall efficacy. Several such dimensions appeared to contribute to teachers' digital technology integration in classrooms.

Table 3: Coding Protocol

Dimensions	Description
Contextual influences	
Technological/physical	Statements related to the circumstance of the university and school's software, hardware, and physical environment or access to technology by teachers and students.
Institutional/cultural	Statements related to national educational initiatives, school policies, syllabus lesson goals, and logistical issues related to lesson application.
Intrapersonal	Statements related to teachers' personal beliefs regarding teaching, learning, learners, or themselves as a teacher.
Interpersonal	Statements related to collaboration or interaction with peers or stakeholders (teacher educators, parents).
TPACK factors	
Technology knowledge (TK)	Statements regarding different tools and their features.
Content knowledge (CK)	Statements regarding subject content.
Pedagogical knowledge (PK)	Statements regarding the processes or strategies of teaching.
Technological content knowledge (TCK)	Statements regarding subject matter representation with technology.
Technological pedagogical knowledge (TPK)	Statements regarding applying technology to utilize diverse teaching approaches.
Pedagogical content knowledge (PCK)	Statements regarding teaching approaches for diverse kinds of subject matter.
Technological pedagogical content knowledge (TPACK)	Statements regarding applying technology to utilize teaching approaches for diverse kinds of subject matter.

Trustworthiness

In collecting and analyzing the data, I followed Lincoln and Guba's (1986) trustworthiness criteria of credibility, transferability, dependability, and confirmability.

Credibility consists of prolonged engagement, persistent observation, triangulation of data (cross-checking), peer debriefing, negative case analysis, and member checks (Lincoln & Guba, 2007). I was not able to spend an extended period of time with participants in their natural environment, internships, and daily experiences. However, I expected to gain insights by being from the same culture and employing different methods of collecting data to reach a deeper understanding of how their beliefs and practices were influenced by their context.

As in many qualitative interpretive inquiries, the researcher was the main instrument, and it could be challenging to separate the researcher from the research. Therefore, I used member checking to decrease misunderstandings. Member checking was defined by Tong et al. (2007) as "ensuring that the participants' own meanings and perspectives are represented and not curtailed by the researchers' own agenda and knowledge" (as cited in Birt et al., 2016, pp. 5–6). One of the main ways of conducting member checks is to return the interview transcript to participants to check whether what is written represents their beliefs and what they said in the interview. For this purpose, I shared the transcripts with participants so that they could review their responses, which I transcribed after the interviews.

In many case studies, generalizing the findings is not the objective; instead, researchers determine how the results may be transferable to different settings or used by others (Simons, 2009). Transferability is associated with thick descriptive data (Lincoln & Guba, 2007). In this study, a rich description of the data was provided to ensure transferability. The pre-service teachers' perspectives and applications of digital technology in their lesson plans offered greater understanding but might be restricted to teachers in similar socio-cultural settings.

To increase dependability and confirmability, I kept a researcher journal to observe and be aware of my values, biases, and professional attitudes. Furthermore, I explained any changes

or unexpected factors that arose during the study and how they affected the findings. I clearly described the data collection and analysis process, paradigm, and my role and biases as a researcher. In addition, I followed by research procedures and kept records of all study preparations, interviews, observations, activities, and processes throughout the research. To ensure the conclusions were based on the participants' descriptions and views instead of my values, biases, and assumptions, I triangulated the three data sources to analyze the data more objectively. I combined and compared the data and interpretations from different sources (i.e., interviews, observations, and researcher journal) to increase the quality and trustworthiness of the emerging themes. I also highlighted any connections to previous studies with similar participants and topics to see whether my findings supported other studies. Table 4 presents a summary of the data sources and quality criteria.

Table 4: A Summary of Data Sources and Trustworthiness

Data Source	Trustworthiness	Reason for using the source
Interviews	- Audio-recorded interviews - Used member checks by participants	To gain insights into pre-service teachers' beliefs about digital technology in early years education.
Observations	- Took field notes - Kept record of each participant	To obtain data on their practices and TPACK when using digital technology in the classroom.
Researcher Journal	- Increased my awareness of my values and beliefs and documented my initial interpretations - Increased rigor and dependability and controlled researcher subjectivity	To document my values, assumptions, and initial analysis as part of the analysis.

Ethical Considerations

Informed consent, which guarantees participants' privacy and the option to withdraw, was obtained before collecting any data (see Appendices B and C), and before that, approval from the IRB of the University of South Florida and the participating Saudi university was obtained before beginning the study (see Appendices D, E, and F). I provided participants with information about the study's purpose, process, and focus beforehand; read the consent form with them; and allowed them to ask questions and express any concerns before signing it. Their

participation was voluntary, and I informed them that they were free to withdraw at any time with no questions or consequences. I did not ask the participants for their ID numbers or transcript information during the study. I ensured the confidentiality and anonymity of the data by limiting access to information about the participants and using pseudonyms for participants on the data records and when writing this study. All data were stored on a password-protected computer. Member checking was conducted, so participants had the opportunity to ensure the transcriptions of their interviews represented their accurate understandings and ideas and to check whether there was anything they would like to add, adjust, or eliminate.

Chapter Summary

This chapter discussed the methodology and paradigm of the study. It explained how the methodology was appropriate to answer the research questions. It also presented the procedures for selecting participants, collecting and analyzing the data, and ensuring ethical steps were followed. The chapter connected each research question with the data source that was used to answer it and explained the quality criteria to ensure the accuracy and creditability of the data.

Chapter 4: Loyalty to Traditional Teaching

"I show them something and they sit and watch it. I apply the digital activity and they watch it and verbally direct me."

Najd was in her fourth year of the teacher preparation program at the time of the study. This was her first experience teaching children, since she had not worked with children before, even in her personal life. She was affable, smiled often, and talked about many college friends. She always brought Arabic coffee with dessert to school and called her friends during break to sit together and talk about their day in school or assignments they had for the Seminar class. She showed an eagerness to work with young children. She was assigned to teach in the Stars classroom, which had only one teacher and about 15 5-year-old children at Sky School. I did not know Najd personally, but she was always enthusiastic, interactive, and energetic every time I met her.

During her internship, she had to teach four days a week at school and take a Seminar class one day at college. The school provided her with a schedule to follow, so she taught three activities per day. When teaching her activities, the classroom/supervising teacher sometimes left the class or went to finish some work in a corner.

Najd talked about herself and the pressure of studying during the program. This first interview helped me build a rapport with her. She talked about her final internship and the seminar course she was required to take. She also opened up about difficulties she had faced since the beginning of her internship. She indicated that "This is considered as my first experience in the field since I and all the student teachers did not have the opportunity to do any

practicum during the program because of COVID-19 and the transformation of all kindergartens to online platforms." I asked her to explain more, and she elaborated, as shown in the following excerpt:

> When I was a student, we explained and presented our work to our classmates as we did micro lessons. But working with children is totally different. I faced difficulties in managing the children and presenting my teaching materials and tools for young children. It is completely distinct from what I have imagined and practiced in micro lessons. On the other hand, since our lectures were through an online platform due to COVID-19, all the educators transferred their assignments to be done in digital format, which was very beneficial for us to learn more how to use technology when teaching our lessons. For example, instead of doing a tangible story book, we were required to do a digital story.

She also said the following:

> Before the pandemic, we used technology only rarely and in a simple way. But the day Corona started, we relied on technology in general for everything. Even after Corona, we got used to applying technology and prefer to do everything in a digital format.

In my journal, I jotted down that Najd was an enthusiastic participant. The first time I met her, she opened up and talked about herself and her experience in the program. She expected the classroom teacher to guide and support her during her teaching experience, but instead, Najd said the teacher only did her part and activities and left Najd to teach without any advice, support, or guidance. As a result, she reported not having a teacher role model to help her during this first unique experience working with young children. Najd was also frustrated by the classroom layout:

We do have different centers but with very limited materials. We have a whiteboard, but

the classroom teacher covered it with a large poster for attendance, weather, today's date,

so I cannot use it. The classroom has a smart TV, but the classroom teacher told me that

she never used it.

Najd said in her first interview that "the classroom teacher did not like me to utilize the

TV in my teaching, but I kept utilizing it because it keeps children interested in the lesson, and

then she started utilizing it too for teaching." She said, "I like using technology, and I rarely plan

for a lesson without the use of technology, but I do now know if I am utilizing it in a right or

wrong way." In fact, after most of the observations, Najd asked me several questions about my

opinion of her teaching with technology and the related activities, but I avoided sharing any

opinion or related information that might bias her beliefs about technology infusion and thereby

affect the findings.

I noted in my journal that Najd seemed to be struggling to balance her internship with

course assignments required in the last semester, and she seemed unconfident with her planning

and teaching while infusing digital technology, even though she showed a high enthusiasm for

using such technology in her teaching. She seemed to need guidance regarding her performance

in the classroom, especially with technology.

Themes from Najd's Case Analysis

The themes that emerged from Najd's case analysis are presented in Figure 2.
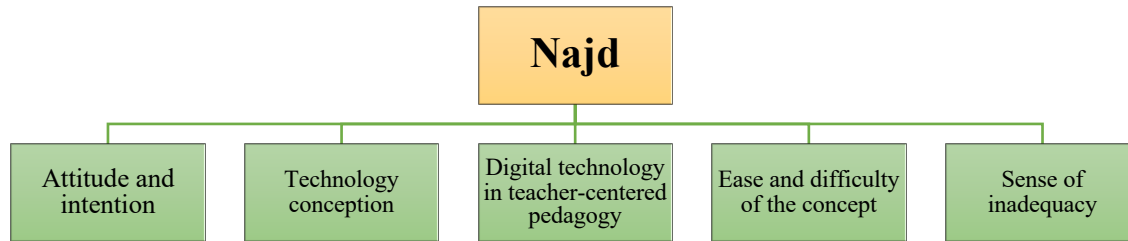
Figure 2: Themes from Najd's Case Analysis

Attitude and Intention

Najd appeared to hold a positive view of digital technology infusion. She tended to use digital technology regularly in her teaching and valued PowerPoint slides and videos in the classroom via the smart TV, laptop, and smartphone. She felt the iPad was less beneficial in school than the other digital tools she mentioned. The following extract from her interview exemplifies this belief:

Researcher: How often do you integrate digital technology into your lesson plans and teaching during your internship?

Najd: Almost every day. I usually use animated songs or stories during the closing meeting and circle time.

Researcher: What types of digital tools do you integrate into your lesson plans?

Najd: The laptop and the TV. I do not feel using the iPad is useful in the school. I mostly use the TV screen that I connect to my cellphone or laptop.

Furthermore, Najd believed that digital technology offered several benefits for children. She believed it is important and useful to use such technology in early years classrooms as it could foster children's thinking and learning. She expressed that "I believe that children should physically move and play to develop their motor skills and meet their needs and nature, but technology on the other hand develops the mind." She suggested that digital technology could favor cognitive development at the expense of physical development possible through

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"traditional play." When I asked, "How do you think digital technology supports children's learning and play?" she noted that "Digital technology can develop their thinking and at the same time presents the concept in a simpler way, so it helps them to understand and learn the concepts better." She believed that digital technology could help children achieve a higher comprehension of the lesson compared to traditional tools.

Another main reason for her infusion of digital technology was to get children to focus on the lesson. She stated that "They are children, and [technology] stimulates their attention because their life is increasingly depending on technology, so I feel that I have relied on it for so much recently." She believed children became more curious when digital technology was utilized. In her view, digital tools were superior to traditional tools. Najd's comments suggested she thought she needed to compare digital and traditional tools and pick one over the other. This ran counter to the researcher's opinion that the appropriateness of a tool for a given situation depends on how, when, and why the tool is used. Fruitful digital technology infusion depends on how effectively teachers use that technology in lessons and activities (Dong & Xu, 2020). The teacher plays a crucial role in making informed decisions regarding when, what, how, and why to select and infuse technology (NAEYC & Fred Rogers Center, 2012). The following extract from the interview exemplifies this belief:

Researcher: Do you think the use of digital technology in the early years of education is essential for young children, and if so, why?

Najd: Certainly, it is very important for children because it attracts them to learn. The child sits concentrating when technology is employed. Technology is the thing that attracts them the most. They sit and listen quietly. I agree that the traditional tangible things have value in children's classrooms, but using, for example, a digital story via

PowerPoint in which I input my voice, different sounds or melody, and then I follow with a digital assessment would be a successful activity, unlike when I grab a book and read to them and give them traditional activities after that. I know this [traditional] type of activity supports their learning, but I feel [digital] technology supports their learning more and increases children's concentration.

Researcher: What do you think of the benefits of digital technology for young children's learning and development?

Najd: I believe it is useful in terms of attracting their attention and developing their thinking and imagination.

Researcher: Why do you integrate digital technology into your lesson plans? What goals are behind your use of this technology?

Najd: As I told you, for attracting children, because children will not pay attention to me if I am only explaining the lesson using traditional tools, but when I put on the screen songs, colorful pictures, or things that look attractive, they will listen and pay attention to what I am explaining and will understand the concept that I present to them in a simple way, unlike when I sit and say such words using some tangibles, or I say a story and change my voice. They would not like my voice, but when they hear a rhythm or watch a video, they become more interested.

Researcher: You can attract children in different ways other than technology. Could you explain more about why you select technology in particular?

Najd: I chose it because they are children. I think they do not enjoy traditional structured activities as much as they do when we have a digital game or video. Most of them, they spend their time at home on iPhones or iPads. They are obsessed with

technology. Even their side talks are about digital games and YouTube kids' bloggers. I feel they no longer can easily engage in traditional activities.

After the interview, I jotted down the following in my researcher journal: "I felt that Najd was not using digital technology for enhancing children's learning and development. She seemed to utilize technology as an attraction tool." In other words, she was using it to get students attention rather than to improve their learning.

Moreover, Najd considered digital technology a way to make her planning and teaching easier. She indicated that "Sometimes the teacher finds it difficult to explain some ideas or concepts for children, but when she uses technology, it makes it easier for her to plan, prepare, and deliver the concepts." Najd believed digital technology was useful for her as a teacher. She used digital technology to develop her knowledge about a topic when preparing for a lesson. She believed digital technology helped her with planning because she used it as a research tool to access ideas, descriptions, and videos she could use to teach a lesson. She treated digital technology as a tool like the textbook but with more information and visuals:

> During every lesson planning, I use technology to look up ideas from sites, for example, Pinterest. When I enter the concept in the search box, I search for related pictures, videos, or something that gives me ideas to teach my lesson. It helps me so much and saves time.

Technology Conception

During the interview, Najd told me she was a good user of social media (e.g., Snapchat, TikTok, Twitter, and Instagram). However, she appeared confused or unsure about the meaning of digital technology use in early years classrooms. While discussing her experience, Najd said she viewed digital technology infusion as including using screen media, such as TV and laptop screens, linked with non-interactive digital activities. Her use of digital technology was largely

restricted to PowerPoint and YouTube videos, which she employed to create digital content learning. She recognized that success with digital technology is determined by the extent to which children are attracted to an activity, while passive use occurs when digital resources simply fill free time or lack an educational objective. She discussed her experience infusing digital tools in the following extract:

Najd: I am good at using Microsoft and mainly rely on YouTube and PowerPoint in doing everything since we only have a smart TV in school. I use PowerPoint to create puzzles or visual multiple-choice questions to teach children a concept or assess them.

Researcher: What is your definition of digital technology integration in children's learning?

Najd: Um, I don't know. But I use a program or digital games or video and provide a simple technological activity for the child to teach something. Children are interested in games and songs. It is about providing a game, a song, images, or a video, as I usually do. I think this is the meaning of technology in kindergarten.

Researcher: Can you give an example of a positive use of digital technology in early years classrooms?

Najd: Umm, I think the use of technology is positive when children become attracted to and interested in the lesson.

Researcher: Does your utilization of technology represent a positive example?

Najd: Yes, I think so.

Researcher: What do you think passive use of digital technology means?

Najd: You use a song or video and keep the sound too loud and annoying. When it is used to fill free time or at an inappropriate time or the choice is based on the children's desire and is not educationally purposeful.

I noted in my researcher journal that Najd took quite a long time to think about positive and passive uses of technology. Distinguishing them appeared difficult for her.

Digital Technology in Teacher-Centered Pedagogy

Najd said things such as "[children] listen," "[children] watch," and "keep [children] quiet" several times during the interview. When I asked Najd about her roles and children's roles when she was planning to use digital technology in the classroom, she said, "I show them something and they sit and watch it. I apply the digital activity and they watch it and verbally direct me." Despite ongoing reforms in the Saudi education system, Najd appeared to favor instruction using a one-way information flow from the educator to the children.

Najd considered herself the source of knowledge in this context, with children relegated to knowledge recipients. During the observation, when technology was infused, this teacher-centered model was dominant. She was the only one using such technology to present information. Children, in contrast, were there exclusively to watch and listen, relying on Najd to explain a concept and assess their understanding through a digital puzzle, visual multiple-choice questions in PowerPoint, or a set of verbal questions. The following observation notes reveal the way Najd employed digital technology to support this type of pedagogy:

In the classroom at 10:30 AM, the closing meeting started. Najd called the children to sit in a circle to start their last period of the day. The teacher was sitting on the carpet and there was a TV to her upper left and her laptop on her lap. Najd was trying to cast her

computer screen to the TV, but it was not working. Once all the children were sitting properly, Najd asked, "What was our topic today in circle time?"

A girl with short hair: Habitats.

Najd: You're right. Thank you! So now we will watch a story on the TV about animal habitats.

She tried to project her laptop screen to the TV again, but it still did not work.

Najd: I do not know why my screen does not reflect on the TV. Okay, children, we will watch the story via the laptop screen.

Najd played the story, and children started to move and become closer to the screen. It looked very crowded and unorganized as each child was trying to get closer, and some were obscuring the screen for others. Najd asked them to go back to their places so everyone could see. The children moved back, watching the screen. A few moments later, some children were not paying attention to the story as one was playing with his mask and another with his glasses. Also, one girl was playing with her hair band by tossing it to the girl sitting next to her. As the story finished, Najd asked a follow-up question.

Najd: What was the story about?

The children: Habitats.

Najd: What habitats did you see in the story?

One child: Rabbits live in a burrow and camels in the desert. I saw them when my family and I were camping in the desert.

Najd: Great, what else?

Another child: Fish are in the sea.

Najd: Good, what other habitats did we see?

A girl: Horses live in a stable and birds in a nest.

Another girl: Spiders live in a web.

Najd: excellent! So today we learned about different animals' habitats. Now we will do a puzzle game. I have an image shown on my computer screen that is divided into four parts and I need you to tell me where I should put each part in the frame to complete the image.

Children gathered around the laptop, some telling Najd where to put each of the four parts. When the picture was completed, the children identified it as depicting a horse and stable.

Najd: True, now the game is done and so is our school day, so go pack your stuff and get ready to go home.

After the observation, I jotted down further notes:

I felt disappointed. I thought Najd's technology use would be more active. Najd seemed to see herself as the knowledge expert. She was utilizing digital technology for non-interactive activities in which children were passively learning via watching videos or solving simple puzzles.

Najd showed a lack of knowledge about effective pedagogies that can be utilized with technology in early years classrooms. Sitting and watching seemed to be the only way she embedded technology in the young children's classroom, and technology was utilized for explanation. She did not make a relationship between her technology knowledge and her pedagogical knowledge when planning or teaching content. The instruction model she used was based on a traditional approach of one-way knowledge transfer from educators to children.

I explored this concern in the interview:

Researcher: Give me an example of digital technology use that you have planned or applied in your classroom practice during your internship?

Najd: For example, Mecca. When I taught them about Mecca and the Hajj, they look at me and give me a look that tells me, "What are you talking about?" They are children and I think they cannot comprehend just words about this topic or through showing them a tangible model of Mecca and the Kaaba. But when I showed them a video that illustrates the Hajj as one of the pillars of Islam, how it is performed, and how people walk around the Kaaba as one of the rituals of the Hajj, I think it helped them to understand the lesson.

In this extract, the children did not have an opportunity to use digital resources to explore the Hajj and create contents and products. Her lack of pedagogical knowledge was demonstrated through her use of only teacher-centered instruction. Najd had not recognized contemporary play, which is based on non-digital and digital resources (Marsh et al., 2016). She showed no understanding of a digital play-based learning approach in early years classrooms, in which children explore and use digital tools and resources in active play, which is considered to have the same value as traditional play (Edwards & Bird, 2017).

The Ease and Difficulty of the Concept

Najd indicated it was challenging to know what digital resources were suitable with each subject, as she taught social studies or science concepts during circle time and math or language during learning activity time. She said the aims of the lesson guided what type of digital content she used. She infused digital technology mostly for religious and social concepts and language.

She described her experience integrating digital technology with different subjects in the interview:

Najd: For example, in the learning activity period, we teach children letters or numbers, and I like to play songs or stories on the TV as I think they are more appropriate for such subjects. I prefer to use technology such as PowerPoint and videos to teach children some religious and social concepts and the letters and vocabulary. But I do not think digital technology would be appropriate to use for science, and I don't know how to integrate it unless in a few concepts about animals or plants.

Researcher: Could you explain why you feel that way about using digital technology to teach science?

Najd: Because I don't feel that its content and concepts can be easy to teach with technology, especially complicated concepts. I can use a digital story about nature and animals, but the rest of the concepts, I don't think it would be appropriate and support their learning about the topic unless I find a good PowerPoint or video on the Internet. Also, not just science concepts. There are some other concepts that I think are difficult for me to teach with the use of technology.

Researcher: Could you please explain?

Najd: In kindergarten, we teach a different concept every day and some of them are difficult to understand for children and not easy for me as a teacher to find digital content that fits with the concept. For example, wealth in Saudi Arabia, the conception of the national anthem, Saudi ministries, the national language, the flag, and the constitution and so on… Such concepts were never easy for me to explain with the use of technology. In fact, I do not know how to integrate technology when teaching them because these

concepts are hard themselves and there are no available ideas on the Internet. Unlike the concept of nature in the homeland, the founder of the kingdom, King Abdelaziz, may God have mercy on him, and the currency, I think I can use technology to teach them.

I noted that Najd's digital content selection was based on availability and interest. Some videos she used to facilitate her teaching were good, but some were not easy to understand or were not culturally relevant for the children. This is reflected in the extract below:

During the observation at 10:20 AM, the closing meeting started. Najd was sitting on the carpet and the children were sitting around her in a circle.

Najd: This is the closing meeting of the day and I am going to show a video about different customs.

She played a video about traditional customs, which was the day's topic. The video was a cartoon fashion show in which a man and woman walked on a stage wearing their national clothes. The video showed the customs of countries such as Spain, Italy, Nigeria, Japan, and India. She followed the video with a question:

Najd: What country custom did you like and what was its name?

The children were quiet.

Najd: What country custom did you like?

A child: Hindi clothes.

Najd: Good! What was its name?

The child was silent.

Najd: Sari, right?

The child: Yes.

Najd: Who wants to tell me what custom they liked?

A girl: The purple dress.

Najd: What country was it from?

The girl: I don't know.

Najd: It was from Spain. It is called the flamenco.

Najd then said the name of each country and described its custom.

Najd did not appear to have a general criterion for selecting digital content. The video was clearly chosen because it looked like it would be interesting to the children and was available. The video was not culturally relevant, as no Middle East or Arab countries were included. During the interview, I asked her why she chose this video:

Najd: I think it is interesting for children.

Researcher: Do you think the children have understood the video?

Najd: I think they understood the idea that each country has its own traditional custom but did not recognize all the names of the countries and their customs' names shown in the video because when I asked them after the video, they did not answer me.

Sense of Inadequacy

Najd claimed it was challenging to have children work individually on digital tools or have more than one device in the classroom. She described feeling inadequate about her use of digital technology with young children but also discussed what types of digital resources she was able to work with:

Researcher: To what extent do you feel confident using digital technology in your future practices?

Najd: Not much. I feel I need to develop myself on using technology with young children. I do not feel that I can use technology in children's activities, but I think I am

somewhat good at using it to help me to teach. I usually plug the mobile phone into the TV and play for them a video, song, a story, or PowerPoint, and the children sit, listen, and watch, but without holding the device and working on it, because it would be difficult to provide each child with a device and have them all working, but via a TV they can all watch, and I can keep them quiet.

Najd discussed technical problems she encountered related to casting her laptop screen to the TV and connecting to the Wi-Fi. As a result, she sometimes failed to use a digital resource:

Sometimes I am not able to continue the technology activity because of some technical issues, and most of the teachers in the school do not know much about technology. So I tell the children that we will watch it later.

Based on this response, Najd appeared to lack the technical expertise needed to resolve such problems.

Najd reported that some factors related to her teacher education program impacted her infusion of technology. These included a lack of preparation with and exposure to different digital tools, lack of specialized technology courses, and lack of practice applying digital activities. She felt inadequate because of her low experience with digital technology during four years in the program. She said she only had two general technology courses. She discussed how it was a challenge to translate the theory learned in such courses into practice in the field. The following extract illustrates the contextual factors in Najd's technology infusion:

Najd: I have learned several theories and strategies, but I do not know how to apply them in practical field when using technology.

Researcher: What do you think about your program's preparation for you to use technology in teaching?

Najd: We have two courses, but all of them are general and not a specialty in kindergarten. They were all explanation and more explanation; we did not learn how to apply or present any technology activity with children during these courses. I have learned how to design using PowerPoint, Word, Wordwall, and other similar programs on my laptop, but it would be better if they added a course on technology use with children to teach us using different types of technologies, how the teacher should use technology, and when she can use technology to support children's learning.

Researcher: How might the program have better equipped you to infuse digital technology in the early years classroom?

Najd: The method of teaching the technology courses does not help us to learn. For example, if I design technological activities and then implement them, the information will be more established in my mind, and I will be able to apply it in the future with the children. Unfortunately, if they give us information, it is only theoretical, and then I do not know how to apply it because they gave me the information, I memorized it and wrote it in the test, and everything is over. There is no technology equipment or laboratory in which we can apply what we have learned during the semester.

Explaining her sense of inadequacy, she cited the lack of a university lab to practice digital technology and create an effective technology-infused activity. Her learning about how to infuse digital technology in education was based on lectures and readings, with no opportunity to apply it to see what would work in practice. Furthermore, her learning relied on using programs such as Microsoft Office and Wordwall. Her experience with digital tools was thus very limited, framing them as a way to prepare lesson presentations.

Chapter Summary

Although Najd recognized the importance of digital technology educationally, she did not utilize effective pedagogies that would foster technology-infused activities for young children. Instead, she used digital tools to facilitate teacher-centered instruction. Her lack of technological pedagogical knowledge led her to predominantly employ digital technology to find and explain information instead of enhancing child-centered learning. Her goals for infusing digital technology were to stimulate children's interest and curiosity, increase children's concentration, and to make her planning and teaching easier.

Najd viewed digital technology as a valuable tool that was appropriate when used to facilitate teaching young children but not to support children' s learning. She saw herself as the knowledge expert in the classroom, and her belief in teacher-centered instruction led her to apply digital technology in low-level passive-learning activities, such as showing videos or solving simple puzzles. Traditional pedagogy was embedded in her technology infusion. She cited a lack of experience and implementation, technology courses, and facilities that could enhance her infusion of digital technology. There is thus a need for experience with a variety of tools and strategies and for practice translating strategies into effective activities.

Chapter 5: Passive Consumption

"I usually use technology after I finish the last meeting time. I show children songs they like to sing and dance to or a cartoon they love to watch to keep them waiting quietly until the arrival of their parents."

At the time of the study, Alula was in her fourth year in her early childhood program. She was teaching in the Willow class with 18 5-year-old children in Trees School. She was 22 years old but looked much younger. During her college years, she had a few experiences working with children from volunteering in summer children's clubs run by local organizations. She was a middle child, and her relationship with children began at home as she helped her mother take care of her two younger siblings. She said she was not sure what she wanted to major in and hesitated about majoring in early childhood education, fearing that from her personal experience, working with children required a lot of patience and could be exhausting. She shared the following:

> Despite my personal interest and concerns, I believed that early childhood in Saudi
> Arabia is still a recent major in education, not like mathematics, social studies, science,
> and so on. So I assumed I might have more job opportunities available once I graduated.

In the first interview, the aim was to become acquainted with Alula and to build a relationship with her. Alula introduced herself as ambitious and wanting to develop her skills. She described her goals, her willingness to continue her master's degree in the field, and plans to improve her abilities in different areas. She said she had registered in the College Continuation Program funded by Saudi Aramco, which followed her education progress, paid any study tuition

inside or outside Saudi Arabia, provided medical care and a monthly stipend, and would end with her employment in one of the company sectors based on her bachelor's degree major. Her first conversation with me reflected many sides of her thinking and opinions. In my researcher journal, I jotted down that Alula told me many things about herself, more than I expected or asked for. She seemed to be a friendly, goal-oriented person who thought about future success the most regardless of her personal interests or concerns.

Alula was talkative and sociable, so it was easy to become acquainted with her. The first time I met Alula, however, she looked upset. She started the conversation by telling me that she felt agitated because of another student teacher, who was always complaining about the school's rules for student teachers, their collage assignments, and the program. This person also compared every situation they encountered with other student teachers' experiences in another kindergarten or university program. I did not say anything to her and let her continue. She finished with the following:

> It is my first time working and teaching in the actual field and school, and at the same time it is my last semester in the program. I want to enjoy this experience regardless of any challenges we face and without comparing our experience and situations with other students in other schools or programs because this puts me in a bad temper and makes me frustrated.

After this, she apologized, "Sorry, I did not want to give you such negative vibes, but I felt I needed to talk. Today we took the same car to come to school and she was complaining all the way to school." Alula tried to see life through a positive lens, and negative views of her situation made her upset.

Another issue Alula discussed was her supervisors. She was very disappointed that the professors supervising them that semester were from the Curriculum and Instruction Department and were not specialized in her field, early childhood education. As a result, it was challenging for her to understand what her professor was looking for:

All the student teachers here and I noticed that the supervisor's focus was more on class management and how well I […] made materials, not on how I teach and present the lesson or the activity for children. She does not prefer us to use technology when she is there for evaluation. In fact, I do not know if what I am doing or how I am teaching is good or not. She does not give me feedback to help me develop my teaching.

Alula felt she was missing a lot in her internship. She liked teaching young children, but the experience was not easy for her. She said she always tried to make teaching and learning entertaining for the children, so she liked using digital technology as part of instruction, particularly games. Her experience with digital technology started from a young age: "Since I was young, I always played [video] games, and I owned devices such as PC and Gameboy and PlayStation. I love [video] games and the sense of challenge." Alula's digital technology background was related more to video games, and she appeared to believe such games were always appropriate and successful in school.

Themes from Alula's Case Analysis

The themes that emerged from Alula's case analysis are presented in Figure 3.
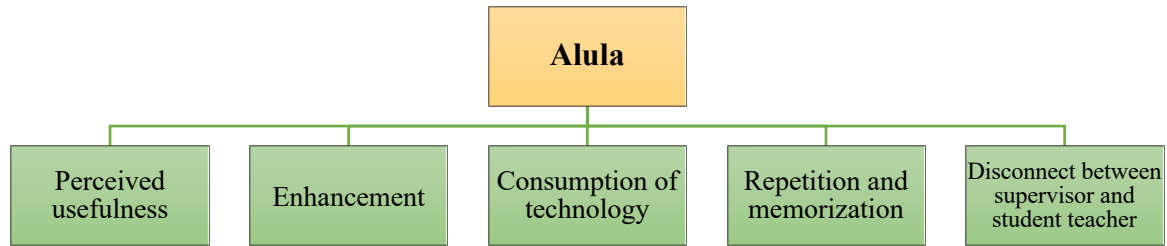
Figure 3: Themes from Alula's Case Analysis

Perceived Usefulness

Alula expressed positive views regarding the usefulness and importance of digital technology in early years classrooms and its role in enhancing instruction. She said, "We live in the digital age and the use of technology has become a necessity and a main element in children's world, and teachers should use [that technology] for teaching and daily group assessment." However, after I observed her use of digital technology during the closing meetings, I asked her during the interview about her frequent use of digital games. Her perceptions of the usefulness of digital technology for children had impacted her behavioral intention to use it in her daily lessons. She believed that digital technology could help children memorize information, entertain them, and keep them quiet during lessons and busy during free-time. She stated that "Even children, their lives are surrounded by technology, so they quickly engage with it, contrary to what I do myself without technology. They memorize the anthem quickly, such as the song for classroom rules and the song for the seasons of the year, months, and days of the week." Alula shared her opinion about the usefulness of digital technology and her preference for digital activities in the following extract:

Researcher: Why did you frequently use digital games? What goals are behind your use of games?

Alula: It is not the first time I use [digital] games in teaching, and I like to use ready-made [digital] games in my teaching. They are easy to find and apply with kids. I think

the digital games are suitable and attractive for children. I saw children's enthusiasm and focus is more than paper and pencil activities, and I believe the information will remain in their memory for a long time when technology is used.

Researcher: Have you tried to use something else different from digital games?

Alula: Yes, I love using songs from YouTube and PowerPoint slides related to our lesson, and the children like them. PowerPoint helps me to present visuals related to the lesson and easily create a question-and-answer slide for daily assessment.

Researcher: How often do you integrate digital technology into your lesson plans and teaching during your internship?

Alula: I usually use technology five to six times per week. I use it every time I present the circle and closing meeting and also if the children have some free time during the day. I mean, I present circle Sunday and Monday and do the closing meeting on Wednesday and Thursday. Most of my use of technology is songs to help children learn and memorize the concepts I am teaching and digital games or PowerPoints that have some questions to assess children's learning.

Researcher: Have you used technology during center time?

Alula: I never use technology during center time. But I use it when children have free time and to display something they like.

Researcher: What do you think are benefits of digital technology for young children's learning?

Alula: Children develop their knowledge and learn faster. It is super fun for children. During the observations, Alula' reliance on games to infuse digital technology in her teaching was clear. The way she used digital technology was distinctive from the other student

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teachers I observed. She appeared to favor video songs, games, and PowerPoint slides, which are all basically screen use. For example, Alula used digital matching games, visual questions created via PowerPoint, and digital puzzles. I jotted down in my journal that Alula's use of technology was very quick and simple. Her lessons were usually fast and short (less than the expected daily routine time). She mostly used digital games and songs in her teaching and infused digital technology five to six times per week by playing a song related to the lesson and following up with some low-level recall questions or by using digital games or a hyperlinked slideshow via PowerPoint.

During the second interview, Alula said she used digital technology to entertain the children. Alula indicated that "children interact with the YouTube songs and videos and digital games more than with the teacher and printed images or handmade teaching aids. Technology attracts everyone, it must attract children too." According to her, if she explained the lesson with traditional tools and activities, children would not get excited about the activity. Digital technology captured their interest, however, especially activities that involved profit/loss and sounds. Technology got their attention and kept them focused on the lesson, so they became more interested in the upcoming information. She believed digital technology was entertaining for children and at the same time was simply fun. Alula started the interview saying, "I just finished my lesson and used technology. It is fun for children. They don't get bored of technology and give me their full attention." She felt children interacted more with digital technology and digital experiences than with printed images or oral explanation. In her opinion, older teaching materials did not get children's attention, which she felt made children less interactive with the lesson.

After the first observation of the closing meeting, she asked me to wait for a few minutes to show me how children had fun and became more active with the song that she played for them several times. She displayed an unrelated song and told me, "See, they like it," as the children were singing and dancing to the song. I wrote in my journal that what Alula was focusing more on was getting children to have fun while learning, but she did not appear to give as much attention to what they were learning or if they learned what she had taught them. Alula's understanding of digital technology's affordances appeared limited to being a means of keeping students busy, entertaining them, and helping them memorizing knowledge. I jotted down in my journal that she thought only the materials made her lesson; she had not thought of how, when, and why these materials were used regardless of whether they were digital or non-digital and the role of the teacher in making good decisions to present a high-quality, engaging activity.

Enhancement

Alula used digital technology to enhance lesson preparation, teaching, and assessment. Alula explained that "Technology helps me in lesson preparation and teaching and makes regular evaluation more effective and easier. It is a time saver and makes teaching young children very much easier." Digital technology facilitated her explanation as she displayed images, videos, and diverse visuals. She said she used technology to help teach, look up information, and find teaching ideas:

> I cannot imagine teaching and assessment without the existence of technology. Technology makes teaching simpler. I usually find tons of ideas, resources, and games and just download them and display to children in class. I do not need much time thinking of the activity or finding and creating teaching aids.

She thus employed digital technology to search for visuals and present them to children, which simplified the teaching process for her and saved her time. We talked about her purposes for using technology in the following extract:

Researcher: Why do you integrate digital technology into your lesson plans?

Alula: Umm…simplifying information for children and saving me time and effort. I mean it is easier and faster for me in preparation and easier for the child to see images and videos and then learn the information quickly.

Researcher: Could you please explain more?

Alula: For me, if I had not studied online, I would not use technology, but I used to study online. I attended only one kindergarten class during COVID-19 in which all the lessons were presented via an online platform. I felt I learned how the teacher asked questions, how to answer children's questions, and how to present a whole lesson using technology. I felt it is much easier than finding tangible means.

Researcher: How do you think digital technology supports children's learning, development, and play?

Alula: [Technology has] helped me explain difficult concepts. For example, when the lesson was about sand, I asked the children, "Where do you find sand?" And on the TV I showed two pictures of places in which we can find sand. If I hadn't put it up, many things would come to their minds. I displayed a picture of a desert and a beach, and I asked them the question as they saw [those images]. I mean, they see the answer and say it.

Researcher: So you gave them the question and you presented the answer on screen? Do you not think you should hear their answers and scaffold them to get to the right answer if they could not by doing a search with them on the Internet?

Alula: Oh no. You know they are children, and everyone will say different answers, and some might be off topic. This will take a long time and I don't have much time to spend because I have other information I plan to teach them.

Alula believed that digital technology could enhance her teaching by making instruction faster and easier. Alula expressed that the main disadvantages of using digital technology in class for teaching and assessing were related to technical issues that sometimes prevented her from continuing with an activity:

What is hard about using technology is that I face some technical problems I do not know how to fix or lose the Internet connection, unlike traditional tangible means. One of the disadvantages of technology is that some clips are not shown on the TV from the laptop as there might be a problem. So I usually prefer to display everything from my phone, as I borrow a connection piece from the next-door class to connect my phone to the TV.

Consumption of Technology

Alula described digital technology in the early years classroom as an entertaining tool. She primarily used screen media, such as the TV, and screen-based activities, such as digital games, videos with songs and cartoons, and PowerPoint slides. The digital technology and media were used for educational and non-educational aims. Her purpose for it was to display materials that would facilitate instruction and entertain the children. She listed different visuals she presented to support her lessons but tended to use PowerPoint and digital games.

Before observing circle time, I arrived early at 7:15 AM. Alula told me I could wait in the classroom until she began. I agreed and said she could call me when she was ready. At 7:25 AM, she told me she was ready, so I entered the classroom and noticed it was a bit small and very bright. There was a big window in the back where sunlight spread across the class, and there was a carpet in the middle and four shelves that separated the centers. A whiteboard was to my left and a TV to my upper left. I sat on a chair close to the door in the art center. Alula was standing next to the TV. She greeted the children and took attendance. Then she read Qur'anic verses and the morning du'a (a type of prayer). She asked the children about the unit's name, and they said it was the clothes unit. Alula told them that "Today we will be learning about summer and winter clothes." She held her phone and projected its screen to the TV screen, where the PowerPoint presentation appeared. Each slide showed a cartoon image of a type of clothing. The first was a shirt, and Alula asked the children for its name. After the children gave the correct answer, she pressed on the image to pronounce the name aloud and asked the children to repeat. Alula showed nine slides following the same procedure. After each slide, she asked for the name of the clothing depicted and let the device pronounce it, e.g., pants, jacket, skirt, dress, scarf. When she finished the slides, she displayed a digital matching game with 10 boxes showing five pairs of clothing types. Alula told the children to match each image on one side with the corresponding image on the other. The children pointed out and named each type of clothes to match it. Alula matched them using her phone. After that, she played a video depicting images of different types of clothes along with a recording of their names, and she asked the children to repeat after the recording. After repeating it twice, she transitioned to the next activity.

Alula believed digital technology could help her keep children busy during their free time. During several observations, I noticed that her infusion of digital technology in general and

digital games in particular was associated with passive, unengaging, and low-level digital technology use, such as matching games, playing videos and songs, and showing illustrations, while some uses were for non-educational purposes, such as keeping children busy and filling their time. Alula's infusion of digital technology was sometimes not connected to classroom lessons, especially when filling children's free time. She told me, "I usually use technology after I finish the last meeting time. I show children songs they like to sing and dance to or a cartoon they love to watch to keep them waiting quietly until the arrival of their parents."

Playing a song and having children dance could be considered digital play as it encompasses some components of playful activities, such as being engaging, voluntary, enjoyable, and physically active. However, in Alula's case, this activity could not be defined as authentic digital play experience because it was missing critical elements, such as learning skills and progress, thereby failing to be a purposeful and meaningful digital experience that supported learning (Fleer, 2017). This could have happened accidently or by coincidence but not as expected, as some videos were randomly chosen. Such an activity is an inadequate infusion of digital technology into early years classrooms. Low-level digital technology use includes using it as a reward or free-time activity (Hus, 2016). Additionally, when Alula presented such activities, children were not learning to use digital technology through play, as those activities did not include exploration, skill acquisition, or problem-solving (Edwards & Bird, 2017). The following extract from our conversation concerned her conception of digital technology:

Researcher: How do you define digital technology integration in children's education?

Alula: Displaying pictures, videos, large words, and games using laptops or smartphones to create content and a TV to display on.

Researcher: Could you please explain more?

Alula: Umm…it is the use of one or more technological devices, in which the role of the teacher is a clarifier, and the child is a receiver. From my understanding, technology integration for children is connecting modern media in teaching and learning, such as computer programs, TV, the Internet, and others.

Researcher: As you talked about modern media, what do you think about using programmed toys, robots, or cameras in children's education?

Alula: Absolutely not. I do not think they need to use them in school. In fact, I have not tried, but I do not think they are necessary, and I do not know how to use them.

Researcher: What types of digital resources and tools do you integrate into your lesson plans?

Alula: The classroom TV and my phone, and sometimes I use a laptop.

Researcher: Can you give an example of a positive use of digital technology in early years classrooms?

Alula: Positive when the teacher links the technological materials to the lesson.

Researcher: What do you think passive use of digital technology means? Please give an example.

Alula: When [the teacher] displays a random clip or one not suitable for young children. Once, the classroom teacher played a song, but the sound was not clear and there was audio distortion. The children did not like it at all. Also, total dependence on technology all day. Some teachers play a long, boring clip and force the children to watch it. This is illogical and boring for the child and does not get them excited and does not enhance any motivation in children, so diversification must be done in order to enhance the child's learning.

I jotted down in my journal that "I am shocked that our future teachers still see their role as a provider of knowledge and do not give agency to children in their learning." Alula used digital technology with young children via passive screen activities in which children absorbed information from a song, video, or closed-design digital game. Advanced digital technology infusion, in which children create, interact, and explore the technology, would be more recommended. Nevertheless, the NAEYC and Fred Rogers Center (2012) position statement asserts that digital technology and media become efficient instructional tools in instruction when infused to facilitate educational purposes instead of using them in isolation and the use comprises involvement between teachers and learners. The digital technology Alula usually used consisted of screen-based devices, including her smartphone and a TV, resulting in more screen time. Her infusion was clearly limited to passive and low-level activities and digital games with a closed design, such as shadow matching and puzzles, which do not provide young children with opportunities to actively learn through digital resources. Consumption occurs when the child passively, mechanically, and uncritically consumes the content of a game, while production occurs when the child actively and creatively uses and interacts with the content of a game (Mustola et al., 2018). Production is associated with "engagement, activity, learning, and topicality" (p. 241).

Repetition and Memorization

Alula appeared to consider digital technology as a tool for presentations and employed traditional pedagogies, such as repetition exercises using digital flash cards though Quizlet and question-and-answer PowerPoint slides. She presented material by projecting her phone screen to the TV screen. It was evident that she valued digital games as she used them every time I observed her. She was standing up next to the TV holding her phone every time I observed her

displaying songs, games, or slides and then asking children simple questions. For example, in her occupations lesson, she used digital flash card games in which one side of a card illustrated the occupation and the other side gave its name. In another observation, she played a song about different countries' traditional clothes and the children had to repeat the names after the song, and when the song was over, she played it again. Using technology for drill and practice in teaching is considered a low-level infusion of technology and a teacher-centered approach (Bice & Tang, 2022; Hus, 2016).

During my observation of the last meeting at 10:15 AM, Alula was standing next to the TV trying to project her phone screen. The children were playing on the carpet and Alula asked them to sit quietly so she could start playing the video. After each child sat in their spot, she told them she would play a video about home furniture as this was their concept for the day, and they needed to focus because she would ask them questions afterward. Alula played the video in which a young boy gave a tour of his house and asked what things were missing in each room. The boy in the video walked through the living room and named some furniture, at which point Alula paused the video and asked the children what was missing. The children randomly answered sofa, table, and TV. Alula thanked them for their answer and said, "Let's continue the video and see what's missing." The sofa, light, table, and TV appeared as the boy in the video named them. Alula played the video and the boy walked into a bedroom, naming his play area and bookshelf. Alula paused the video again and asked the children what they thought was missing. The children gave bed, closet, and pillows as answers. Alula said, "Good answers, let's see," and resumed the video. The boy pointed out the bathroom, and Alula paused the video to ask what was missing. Children suggested the sink and bathtub. She played the video and the same pattern repeated with the kitchen and dining room until the end of the video. Next, Alula

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told the children they were going to play a puzzle game. She displayed a four-piece puzzle on the TV, and the children told her where each piece should go to reveal what room the puzzle illustrated. The children were moving around, some standing and others kneeling, as they directed the teacher to put the pieces into place. When it was complete, Alula asked, "What is this room called?" They answered, "living room," and she asked what furniture the room had, to which they answered table, TV, sofa, and lights. Alula started another puzzle and asked the children to arrange its pieces. Once the second puzzle was complete, she again asked them what room it depicted, and the children identified it as a kitchen with an oven, cabinets, sink, and dishes. Alula praised the children and asked them to pack their things and get ready to leave for the day.

After this observation, I wrote in my journal that "Alula was very quick in teaching. She valued digital games, but she did not seem to have explored the concept of gamification/digital game-based learning when using digital games." Being selective and having guidelines for game selection is critical when integrating digital games in education. In game-based learning, the teacher provides rich, meaningful gaming experiences and challenging tasks in an interactive atmosphere in which active engagement, attention, and feedback occur (Lamrani & Abdelwahed, 2018; Sanchez et al., 2020). Afterward, we talked about her use and selection of digital technology:

Researcher: What are your roles and children's roles when you plan to use digital technology in the classroom?

Alula: Children listen to me and answer the question, and I present, discuss, clarify, and ask questions.

Researcher: As early years education involves teaching different subjects, how do you choose your digital tools and teaching practices for a lesson?

Alula: I only have a TV and one iPad in the classroom, but I have not used the school iPad and use my phone to connect to the TV. I mostly use technology when teaching social studies concepts as there are lots of things available online related to social studies concepts and follow my presentation with questions and sometimes use it with math as they have to count how many in an image and select a choice or addition from 1 to 10 question. There are ready games or programs available on the Internet for that, and sometimes I make PowerPoint slides for them to practice as a group.

Researcher: Could you explain more about why you do not use the iPad?

Alula: I do not think I need an iPad in the classroom for children because I usually use my phone.

Researcher: Have you tried to set an activity for children using the iPad?

Alula: Never tried because I think the lesson will be a mess…it will take me time. Honestly, I use technology in teaching because it is easier, faster, and the children like it. It saves me time from thinking of activity ideas, preparing tangible materials, or creating teaching aids. Usually, I come to school with everything I need for my lesson on my phone: a video, a game, ready-made hyperlinked PowerPoint questions related to my lesson, but mostly I prefer games because it is more attractive to children and songs because children get enthusiastic about them.

Researcher: How do you select your digital games or songs? In other words, are there any guidelines you have?

Alula: Actually, I don't have much time, so as soon as I find a puzzle, matching pictures, related to my lesson I use it. Definitely, it should have clear sound and images…umm…have sound effects like clapping.

Alula infused digital technology consisting of her own smartphone and a TV screen in the classroom. This occurred most frequently when she taught social studies concepts, such as customs or foods of different countries, the history of Saudi Arabia, and other communities. She also sometimes used digital technology for math practice. However, she preferred using digital games and PowerPoint slideshows with social studies and math. Her selection of digital games and resources was based on availability. However, being selective and intentional about what digital game to apply with young children and ensuring its appropriateness is critical. She stated that it was sometimes challenging for her to modify a topic to be explained through digital technology. As she noted, the school units were not planned to be taught using digital technology:

> There are no suggestions or technological ideas to integrate with the lesson. Some of the lessons and concepts I cannot present via technology. I mean, the truth is, they are difficult, and some of them are hard to comprehend for children. I feel some concepts are big for children and I cannot find good technological resources to use them.

Disconnect between Supervisor and Student Teacher

During the last interview, Alula shared diverse thoughts on student teachers, teacher educators/supervisors, and technology infusion. Having a supervisor from outside her department could have caused a disconnect between the student teacher and supervisor, which could negatively affect her internship experience. Alula expressed some ideas about how she saw the supervisor's role in an internship. She had a supervisor from outside the Early Childhood

Department, and in the first interview she said that because of this she felt her supervisor did not provide constructive feedback on her teaching and use of digital technology. In the last interview, Alula clarified that her supervisor was very kind and cared about them, but having a supervisor from outside the department made her anxious. We had the following dialogue when talking about her use of digital technology and her supervisor:

> Alula: I feel I cannot freely talk and express my concerns with my supervisor. The supervisor is not one of the early childhood faculty. She is from a different department, and in fact she seems like she came from a different world and does not really know what I am doing. She attended two lessons in which I used technology, but she did not give me feedback on my teaching and technology activity. The only feedback she usually gave me is about the teaching aids that I brought and classroom management like "you need to control the children more" or "attendance should not take a long time." While studying in the program, I designed some technological activities but did not apply them, which made it hard for me to do so now, and I feel I need my supervisor's advice on the ways I use technology.

> Researcher: Have you asked her to give you feedback regarding your technology use?

> Alula: Yes, and she just said "good." Once I used technology to teach my lesson during circle time and she stayed for about 10 minutes and then left. When I asked her about my activity, she just told me she prefers to see handmade materials to assess my ability to create educational aids. So I usually keep using technology to display visuals and evaluate children's learning every day at the end of my lesson and sometimes in children's free time.

Researcher: Have you talked to the department about the difficulties you faced regarding having a supervisor from outside the department?

Alula: I have not because I heard that most of the teacher educators who are now supervising early childhood students are from different departments. Also, I was afraid she would hear that I talked to the department about that and would take the issue personally, and I would lose my relationship with her. I was worried it might affect my grades.

Researcher: Do you think she expects you to integrate digital technology in your teaching?

Alula: I don't think so because she never mentions it, but it's my preference to use it.

Researcher: How about your teaching rubric. Does it not include such elements related to your teaching strategies, technology integration, and so on?

Alula: I have seen the rubric once, but it was mostly about my characteristics as a teacher, such as proper clothes, clarity of voice, and some general standards about class management and teaching materials, but there is nothing about technology use. What I know is the rubric has changed this semester and they are using the general rubric of the Curriculum and Instruction Department and not one for early childhood education as most of the supervisors this year are not early childhood professors.

Some of Alula's statements reflected that she was expecting a supervisor to guide her all the way through her internship. These expectations were different from what she was experiencing. She preferred to integrate digital technology in her teaching and felt she needed more guidance during this learning experience, but her supervisor was not helpful in this regard. Although Alula

viewed herself as largely prepared to integrate digital technology into her teaching, applying the knowledge in the field seemed to be difficult for her:

> I feel that I am 70% ready. If the internship was not face to face in schools, I would not expect that I would be as ready as I am ready now. I don't know, I sincerity feel reality is different from what I studied in college about teaching children, using technology, and applying teaching strategies.

Lack of practice applying digital activities during her study in the program and lack of feedback had an impact on her use of digital technology. During the interview, Alula said she had not received any feedback, negative or positive, regarding the ways she used digital technology or how she could improve it, although she integrated digital technology in most of her lesson plans. As her supervisor was not specialized in early childhood, the feedback on her practices and activities with digital technology was limited and broad. Alula thought she would receive more detailed feedback on her lesson plans and teaching practices during her internship and was shocked that her supervisor had not given her any feedback related to her teaching:

> Most of my supervisor feedback is on my design materials and classroom management. She focused on how the children are sitting and how I keep them under control and how my teaching materials look. I have not received any advice on if my technology use or teaching materials and strategies are appropriate for a certain concept or topic or how I can develop my teaching with them.

It is critical to provide continuing relevant constrictive assessment and feedback to foster student teachers' ability to infuse digital technology. The TPACK framework emphasizes that interpersonal relationships can have an effect on how technology is used. Therefore, supervisors, previous education and experiences, and ongoing constructive feedback on planning and

integration of technology during the internship can improve how student teachers use that technology and increase their awareness of what high-quality digital technology infusion looks like. I jotted down my opinions in my journal:

> Having a supervisor from a different department caused an issue for Alula. I ought to consider the supervisor role during the internship and the importance of assigning a supervisor from the same field who knows about young children's education and the student teachers and the knowledge they have learned and been exposed to during their study in the program. I must debate the importance of having a rubric customized to early childhood education that has more details related to pedagogies, technology, children's assessments, etc. Alula did not feel free to talk with her supervisor as she felt she would not understand or provide relevant constructive feedback. However, the supervisor may have left Alula to learn from experience, trial and error, and self-reflection and to not make this experience too overwhelming and stressful.

Chapter Summary

Alula held a positive view of digital technology infusion in teaching, using it for explanation, assessment, entertainment, and convenience. She believed such technology had become a necessity in education. She preferred showing PowerPoint slides, digital games, and videos (songs and cartoons) on a TV screen. When using digital technology, she employed a drill-and-practice teacher-centered approach. This use of digital technology was evidently passive, not engaging, and not seeking higher-level learning. Having a supervisor from outside the Early Childhood Department and a lack of constructive feedback and practice impacted Alula' s knowledge and ability to engage in higher-quality infusion of digital technology during her internship.

Chapter 6: Replacing the Teacher with Technology

"I use technology every day to present videos, images, songs, stories. If I present a concept without technology, children will not listen, and I would forget to explain many things."

At the time of the study, Reem was in her last semester of the program and was assigned to teach 10 5-year-old children in the Ross class at Flowers School. She always displayed a calm demeanor and spoke in a soft, calm voice. She was very welcoming and greeted me warmly every time we met. During her introductory interview, she expressed her feelings and interest regarding working with young children, which I think helped me establish a rapport with her. She said she loved children's adventures and innocence and liked spending time and working with them. Even sometimes during her break, she stayed with children in the class instead of going to the student teacher room. She was the oldest of her sisters at home and came from a big family, so she had a lot of experience with her sisters and brothers' children. Reem described herself as a good listener and patient, which she felt had fostered her relationship with children.

Reem told me she adored using digital technology in her personal life but that "for sure using technology in personal life is different from using it in school and with young children." Reem described feeling constrained by her routine, saying she had limited time for each period and could not extend or shorten any of them, especially since she was a student teacher and did not have the same power as a classroom teacher to modify class time:

> With COVID-19, the school day had become shorter than before. We have about three
> and a half hours a day with six periods, including circle time, free play, breakfast, math or

literacy activity, centers, and closing meeting. So each period lasts about 30 minutes and the transition from one period to another also takes time.

Themes from Reem's Case Analysis

The themes that emerged from Reem's case analysis are presented in Figure 4.

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│ Myths about   │ │ Misconceptions│ │ Technology as │ │ Role model:   │
│ digital       │ │ about         │ │ a             │ │ theoretical,  │
│ technology    │ │ technology    │ │ replacement   │ │ not           │
│               │ │ infusion      │ │               │ │ practical     │
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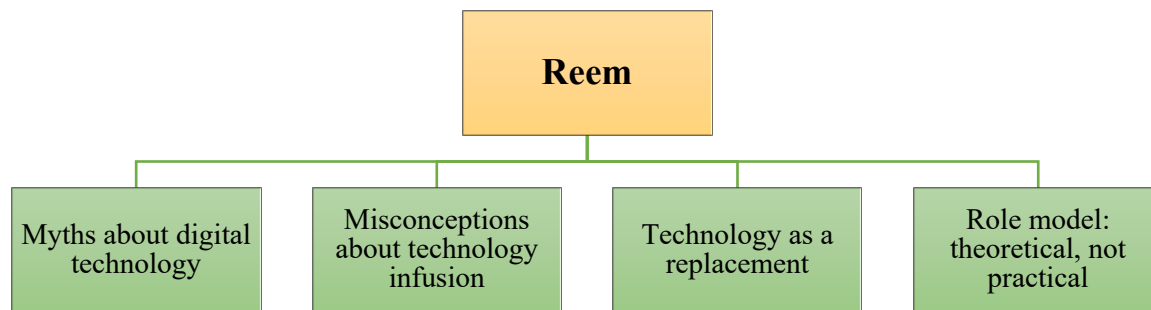
Figure 4: Themes from Reem's Case Analysis

Myths about Digital Technology

Reem believed infusing digital technology was not beneficial for children but was still critical in early years classrooms:

> Nowadays, our life depends on technology. Most of my college work is done with the use of technology. Everything in terms of my teaching is usually easily done with my laptop, so I usually do not use traditional teaching aids to explain a lesson during circle time and closing meeting unless I already [had those aids]. But I use different tangibles during other periods because these traditional materials are important for learning diverse skills.

Reem said digital technology was useful to her as a teacher to enhance lesson preparation and instruction but not essential for children to explore in the classroom. She believed it would be challenging for young children to work with digital technology, and the result of allowing them to utilize that technology in school could be depriving them of traditional learning and essential skills, such as manipulating writing instruments and hand-eye coordination.

Nevertheless, Reem indicated that she used digital technology on a near daily basis in the classroom and preferred PowerPoint slides as this provided an opportunity to insert visual and auditory elements, including videos, illustrations, sounds, and other effects that could promote children's understanding. The following extract illustrates Reem's infusion of digital technology:

Researcher: How often do you integrate digital technology into your lesson plans and teaching during your internship?

Reem: Almost every day. I usually use technology during the two periods of the day, including circle time and the closing meeting. It depends on what period the classroom teacher assigns me to teach.

Researcher: Do you think using digital technology in early years education is essential for young children? Why?

Reem: I do not think it is important for children to use technology in the classroom, but it is necessary for teachers. I use technology because it makes it easier for me to teach children. I think it is hard for [children] to work with technology and learn. Also, I don't want them to become completely dependent on technology. I want them to learn the basic skills, such as holding a pencil, flipping paper, and knowing how to read using paper books.

Researcher: How do you think digital technology supports children's learning and play?

Reem: It does not support them that much because technology sometimes could be harmful to them, but it helps them learn some concepts faster, such as seasons and animals.

Researcher: Why do you think it is harmful?

Reem: I mean harmful for their health, their eyes, brain, and physical skills. From my experience. We have two kids in the family who are socially awkward and isolated because of using the technological devices every day and for very long hours. I feel [technology] ruins children's nature and innocence.

Researcher: Why do you integrate digital technology into your lesson plans when you think it is harmful? What goals are behind your use of this technology?

Reem: The purposes for you to use because it helps in presenting concepts and helps children to better understand the concept. Presenting technological things to children is an easier and more comfortable way for the teacher.

Researcher: Could you please explain more?

Reem: It saves me time during planning. It's easier for me. If there is no technology, I would take more than two days to plan and prepare the materials if they are tangibles. But the technological materials are easier and more economical. Less paper and less tangible materials that I would need to buy for teaching my lesson. Traditional materials will cost me money to provide them compared to technology resources.

Researcher: How do you think your teaching has changed with technology use?

Reem: I use technology every day to present videos, images, songs, stories. If I present a concept without technology, children will not listen, and I would forget to explain many things. Without technology, I usually forget the things I will be teaching. But with technology, I present my lesson better. The presentation helps me remember the things I will say, what should be next, and what I have prepared to teach. I show the digital calendar, rules songs, pictures of the classroom rules, and PowerPoint slides.

Teaching becomes easier for me with technology. Without technology, there is nothing

that reminds me of what I should start with and say next.

There seemed to be a disconnect between Reem's beliefs about the potential harm of

digital technology at a young age and her passive infusion and reliance on it for teaching because

it made her work easier. According to the NAEYC and Fred Rogers Center (2012), "teachers can

avoid the passive and potentially harmful use of non-interactive, linear screen media that is

inappropriate in early childhood settings" by being intentional, considering technology as a tool

and being mindful of how it should be used in developmentally appropriate ways (p. 8). The

NAEYC and Fred Rogers Center (2012) thus recommend against the kind of non-interactive,

passive digital technology use seen in Reem's classroom. Instead, digital technology should be

used to achieve educational goals and allow children to engage actively, take agency in their

learning, and create products that they cannot produce without that technology. Thus, much

depends on how teachers use digital technology since it, as with any educational tool, should

meet the students' age level, interests, learning needs, and educational objectives. The

whiteboard, for example, is a tool that could lead to passive or interactive learning depending on

how the teacher uses it in classroom activities. Reem further discussed her opinions about digital

technology in teaching and learning:

> Technology is necessary for the teacher to facilitate her teaching; it is not very necessary
>
> for the child to use it themselves in school because of the negative effect of technology
>
> on children's health and development. They are too young to use technology.

This statement illustrates that Reem undervalued the importance of digital technology and its

affordances for young children in learning and underestimated children's ability. She claimed

that digital technology should be used by only the teacher, appearing to hold an image of a child

as innocent. This construct can influence teachers' practices and decisions in the classroom (Mustola et al., 2018). In the past, such views have limited children's learning opportunities and restricted their exploration of the world. While this social construct is often meant to protect children from harm, it also shelters children from acting with agency. It could lead to giving less consideration to the child's active participation and power and seeing the child as a passive recipient of information (Mustola et al., 2018). In this way, protection can turn into control, while children are not given rights or opportunities to act on their own behalf.

In addition, Reem said, "I think allowing children to use technology might impact children's play and their imagination and interaction with each other." Although she had some concerns about the negative consequences of digital technology, she believed it was essential for teaching because such technology had become integral to children's lives. However, she noted that "The child should not be accustomed to it, as it will cause great harm to them." Reem was very worried about the negative impact on children's health and development. Play is valued in early years education, and technology can act as a tool in play, so digital play could also be seen as an implementation of Vygotsky's concepts about imagination in play (Marsh et al., 2016). Although Reem preferred not to allow children to work directly with digital technology in her classroom because of perceived negative effects, such technology could represent a new kind of platform for children's play.

I wrote in my journal that "Reem is overusing technology, and she does not seem to recognize that whether she is using the screen media, or the children use it themselves, it is still passive screen time and not recommended for young children." In Reem's case, young children's digital technology use was related to many negative ideas about that technology. Even though Reem believed digital technology was important for her as a teacher, she stood against allowing

children to use it. She thus viewed digital technology as a tool for the teacher rather than supporting children's exploration and higher-level learning. Reem believed digital technology saved her time and money and helped her remember things and plan lessons more easily, while her perceived benefits of digital technology for children were limited to getting their attention and improving their comprehension.

Moreover, Reem used technology to expand her knowledge of the concepts she was going to teach and to look for ideas and activities about a concept: "I need to use technology to prepare for my lessons and do more investigation on the concept I will teach." She thus used digital resources to look up, organize, and present information, but the children did not engage in any technology-based activity. Her digital technology use was in science and social studies. During the interview, Reem articulated the following:

> The PowerPoint presentations I do are attractive to children in terms of images, shapes, sounds, and effects. They make it comfortable and easier for the teacher to use and to explain the concept. Children see the information, absorb it, and are attracted to it. Technology helps to present the concept, for example, a geographical concept, in simpler and different ways, videos, songs, pictures, which [children] enjoy more than traditional materials and presentations.

In Reem's opinion, the objective of using digital technology with children was to facilitate a presentation of concepts and help them understand the content. She believed that without such technology, she would not be able to hold children's attention to learn the lesson. In this way, Reem felt digital technology supported her explanation of a concept as digital presentations could increase children's motivation, making the lesson more enjoyable and stimulating. The following extract illustrates Reem's opinion in this regard:

Researcher: Give me an example of the use of digital technology that you have planned or implemented in the classroom during the internship period.

Reem: In the closing meeting, I showed them a video clip with a song. They watched and learned the method. Then I presented it to them. Then the children applied it. It became easier for them to watch the video, as they remembered how to do it.

Researcher: Could you please explain more? Why did you utilize technology instead of presenting the activity yourself?

Reem: For attracting children, the voices in the clip, colors, and visual effects. Such things attract the child. I mean, if I only presented with my voice and acted for them, they would not have learned as with the video. Also, I think children learn faster when I utilize technology.

Reem felt that digital technology increased children's interest in and retention of information. I jotted down in my journal that digital technology was used for the benefit of the teacher. I wanted to mention the affordances of technology when used in an interactive way to achieve goals that cannot be reached by using any other tool.

Misconceptions about Digital Technology Infusion

Reem's conception of digital technology in early years classrooms was as a presentation tool to facilitate the teaching process. Most of her digital technology use relied on a TV screen to present PowerPoint slides, songs, and digital stories. Reem displayed images on a screen, played the morning exercise song on the TV and sang along with the children, read Qur'anic verses from the screen, and showed a story with visuals on the left and words on the right in PowerPoint.

During one of the observations, Reem was explaining a lesson about plant needs. She brought tangible materials including sand, soil, seeds, water, two basins, and a flashlight. However, at the same time, she presented on the TV screen each of these materials when talking about them and pictures of planting as she was doing it. I wrote in my journal that I thought science should be a more hands-on activity. Her use of digital technology was not appropriate and did not add to the lesson. I felt the children were confused about what to look at: her talking, what she brought, or the visuals on the screen. Digital technology was infused in a way that was beneficial for the teacher but not for the children, merely increasing their screen time. During the interview, we discussed the following:

Reem: When digital technology is linked to an educational goal, it is positive.

Researcher: Could you please explain more?

Reem: Umm…the positive use could be through a presentation of scientific concepts. If I want to show children something like a volcano, or any scientific concepts, I cannot bring them tangible things, so for sure I will use technology. I mean, it would be positive when I employ it for an educational purpose, and the teacher participates after the clip is over, explaining again to help the children understand what they do not understand.

Researcher: How about the passive use, what do you think it is?

Reem: It is negative use when the teacher fully uses it without intervention from her. I mean the same way was used in the Madrasati platform during COVID-19. When I attended the lessons on the digital platform for observation, it was very bad, the children were not focused, and the teacher showed them some videos, and that was it.

Researcher: What is your definition of digital technology integration in children's learning?

Reem: It is a tool that helps the teacher to explain the lesson and present the concept, and at the same time attract children. I usually used the TV and computer to display Qur'anic verses, songs, images, and videos related to the topic.

Researcher: What types of digital resources and tools do you integrate into your lesson plans?

Reem: In school we have a laptop, TV, and iPad. The iPad is placed in one of the centers and I have not tried to use it in my teaching. As I only have a TV and laptop, I prefer to use PowerPoint, videos and songs, and digital stories to facilitate my teaching.

In Reem's classroom, she was the only one allowed to work with digital technology, although the class had a school iPad in one of the centers. Reem's use of digital technology was limited to screen media (a laptop and TV), which she used to display visuals. Therefore, her conception of digital technology in early years classrooms was as a screen-based teaching tool. In addition, she reported encountering technical challenges using these devices:

Like what happened to me today. The PowerPoint presentation slides somehow changed, and I got confused. Sometimes the device or the software becomes suspended or frozen. As it has advantages for the teacher, it has many negatives. Also, sometimes the subscription suddenly ends. Although I feel its advantages more.

Technology as a Replacement

During several observations, Reem used digital technology from the beginning of circle time and closing meeting to the end. Digital technology was reportedly employed as a replacement for other teaching materials and tools. Contrary to her opinion, however, digital technology does not need to displace other types of active learning and, when incorporated intentionally, can be another valuable learning tool (NAEYC & Fred Rogers Center, 2012).

Clearly, in Reem's classroom, digital technology became not just a replacement for other tools but at least partially for the teacher's role as well. Digital technology should be used to offer something that cannot be offered by any other tool or by the teacher, not just to make teaching easier. Digital technology's advantages and disadvantages are based on the way it is used. Reem viewed such technology as a tool that could sometimes replace the teacher's role, for example, displaying a digital story instead of reading a story or displaying a video instead of explaining how to make art, and sometimes she would simply repeat what was being displayed.

In this way, Reem took on the role of repeating or explaining something introduced with digital technology when the children seemed not to understand what was displayed. She indicated that "When some children did not understand the concept presented via TV, I have to repeat again in order for them to understand the lesson, although it takes time." Reem's philosophy of teaching relied on teacher-centered, screen-based instruction in which children passively listened, watched, and learned, and her role was to present and explain information through a digital medium. The following extract describes Reem's practices in detail:

It is 7:25 AM. I was in front of Reem's classroom. The class door was a double-sided door, and the classroom was large. When I opened the door and entered the classroom, Reem and the classroom teacher welcomed me and asked me to sit anywhere that is comfortable for me. There was a small area on my right side in which there was a children's closet and small sink and a table with four chairs that had tissues and air freshener on it. There was the TV and a rectangular carpet where children sat during circle and closing meeting. The left side was larger and had all the centers. The classroom teacher and Reem welcomed me and told me to sit any place I wanted. I sat on a chair on the right side where I could see them clearly. Reem was sitting on the carpet, and the

classroom teacher was sitting across from Reem, with the children around her in a circle. To the right of Reem was a medium-sized TV hanging on the wall. Her laptop was on the carpet, and on the left side there was the small handmade attendance board. There was no whiteboard in the class. Reem was projecting her laptop screen to the TV, which showed the words "circle time."

At 7:30, Reem greeted the children, telling them that "Now we are going to start our circle time with a verse from the Qur'an." She pressed a button on her laptop to play a Qur'anic verse on the TV. The screen showed the words as a recording of the verse played, and the children watched and repeated after the audio. When it was done, Reem chose some children to say the verse without seeing it. After that, Reem played the day's song, and the children sang along with the video. When the song ended, Reem took attendance and then presented a digital calendar on the screen and asked the children, "What is the day today?"

Heba: Monday.

Reem pressed a button and the day appeared on the screen.

Reem: Good. What is the date today?

No one answered. Reem said, "What is the date of yesterday?" and nobody answered. She said it was the "Twenty-sixth. So what is the date today?"

Sara: Twenty-seven.

Reem pressed a button and the number showed up on the screen.

Reem: What is the month and year?

The children: Rajab, 1443 [in the Hijri calendar].

The date appeared on the screen.

The teachers kept asking daily questions they usually repeated before starting the lesson, such as "Who is our God?" "What is our religious book?" "What is the country capital?" "Who is our king?" "Who is the crown prince?" and "What is the color of our flag?" After each question appeared on the screen, the answer was displayed on the screen in the form of pictures, words, or both.

Reem took about two minutes to work on her computer and then played a song and asked the children to stand up and do a quick exercise with the song to get energized and refreshed. The children stood and started moving with the video. Two of the children (Ahmad and Khalid) were not doing the movements and just stood still. The classroom teachers held Ahmad's hands and tried to get him to move. When this song ended, Reem asked the students to sit down and played another song about the circle time rules. Children were sitting quietly and watching. Two children across from each other were whispering and smiling to each other and another child was playing with his facemask. Reem asked them to be quiet and listen to the song. Reem held the attendance board and started calling out children's names and divided their pictures into present and not present pockets.

At this point, the teacher showed the unit illustration and name on the screen and asked, "What is this week's unit name?" The children responded that it was the "my country" unit. The teacher then displayed a video about a family going on a trip to the two holy cities of Makkah and Madinah in Saudi Arabia, where the parents were teaching their children about local religious landmarks. Reem followed up the video with a few questions:

Reem: What are the cities the family visited in the video?

Children: Makkah.

Reem: Excellent. What is the other city?

No one responded, so Reem told them the cities were Makkah and Madinah, and pictures of the two cities were shown on the TV screen. Reem displayed a picture of Makkah and told the children that "This is Makkah a long time ago, and the other portrait is for Makkah now. Who has gone to Makkah?" Faisal and Noor raised their hands, and Reem asked what they had seen there.

Faisal: Kaaba.

Reem: Good. [A portrait of the Kaaba was shown on the TV.] What else?

No child responded, and Reem kept silent. She seemed to be confused as she started clicking through the slides and going back and forth for a few seconds. I jotted down that it seemed she was not sure what the next slides were, or perhaps the slides were not well organized.

Reem presented pictures of the Safa and Marwa hills, explaining they were one of the main places people visited on the Umrah pilgrimage. Then Reem presented a picture of Hera Cave, saying it was one of the main places visited when going to Makkah. Lastly, Reem displayed landmarks in Madinah, such as the Quba Mosque and Mount Uhud, saying the name of each. To close circle time, she displayed the du'a (a type of prayer) Muslims say after any congregation and then played a transitional song to get them ready for the next period. I wrote in my journal that she had not taken a critical role in teaching, and most of her use of digital technology was screen-based. Digital technology had not just replaced the traditional materials but had partially taken over the role of teacher.

Reem's purpose for infusing digital technology was for illustrating, demonstrating, or explaining information, not for the children to investigate and learn on their own. A more productive use of digital technology would have been to facilitate constructivist and higher-level

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learning involving inquiry, collaboration, and problem-solving. High-quality infusion of digital

technology requires knowledge of different pedagogies. Reem had learned how to design digital

activities but not how to apply them, as illustrated in this exchange:

> Researcher: What do you think about your program's preparation for you to use
>
> technology in teaching?
>
> Reem: Sometimes during the technology course, for example, we designed a
>
> WebQuest for children, such as the electronic knowledge journey. I designed and
>
> created technological activities, but I do not know how to present them to the
>
> children. How can I use them to support children's learning? In fact, I don't know.
>
> I have some technological skills, I learned how to design some technological
>
> activities, but I don't know ways of presenting and implementing them with
>
> children.

It was obvious that Reem needed more preparation on how to apply digital technology

with young children. Teacher-centered instruction was dominant, and I did not observe any other

type of pedagogy, such as inquiry learning or digital play. Furthermore, I do not think Reem had

been introduced to such pedagogies since she did not agree with letting children explore and

learn using digital technology. In her classroom activities, she did not appear to recognize digital

play, in which digital technology can let children make choices and take an active role in their

learning. Instead, she appeared to concentrate more on classroom management, children's

behavior and attention while digital technology was infused in the lesson, and how to keep

children under control.

Role Model: Theoretical, Not Practical

Reem noted that the two courses she took about digital technology were not enough to prepare her to effectively use it in the classroom, especially since the courses were general and not designed for early childhood education. A critical point she highlighted many times was that she had learned about digital activities in theory but lacked any practice applying them. Reem felt she needed more experience designing and presenting those activities. I asked Reem what she thought she needed to learn about using digital technology with young children, and she said the following:

> I would like to learn how to present simple content to children using technology, scientific, numerical, or linguistic content, how to present through technology. I took a class on information technology that taught me about some applications for educational games, but the digital games were not suitable for kindergarten level because it was not a specialty class in early childhood education. They were more suitable for higher primary.

Offering student teachers experience designing digital educational material and implementing activities with digital technology during their internships and preparation courses can foster their practical ability and their digital competences (Howard et al., 2021). Instead, a lack of practice and experience made it challenging to know what high-quality digital technology infusion should look like in early years education.

Reem said that during her four years in the program, the teacher educators' infusion of digital technology was limited to presenting information via PowerPoint to provide a summary of what was written in the book, supported by images or videos. Offering role model and quality examples are critical strategies for developing digital competences of preservice teachers (Howard et al., 2021). The lack of feedback or university role models using high-quality active

learning thus influenced her pedagogy and conceptualization of digital technology use. She described her preparation to use digital technology in the following extract:

Reem: Our teacher educators are keen to teach us such teaching theories and practices but have not given us an opportunity to learn how to apply them in the field. Our professors have not shown us how to effectively use technology.

Researcher: Could you please explain more?

Reem: They were using PowerPoint or videos to present their lectures. But in fact, we the students usually explain the course as they divide the lectures among students during the term, and they just explain the first and second lecture.

Researcher: How might the program have better equipped you to infuse digital technology in the early years classroom?

Reem: There was no application in which they let us try applying technological activities multiple times. When they explained the course to us, they explained to us technology utilization, but we were just listening. We sometimes designed digital things like digital story hyperlinks in PowerPoint, but they did not give us feedback, and there is no opportunity to learn how to apply them with children, so I feel that if we apply, we will be better and more adequate.

Reem felt insufficiently prepared to use digital technology in her future classroom practices:

I give myself 6 out of 10 in design ability, but in application I give myself 4. I know how to design basic technological activities, such as a digital story, PowerPoints, and WebQuest, but I feel I need to learn more and I do not know how to effectively integrate them for children to learn through them.

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She noted that her ability to design digital content was better than her ability to infuse it in the classroom. During her final internship experience, Reem said she needed to develop her expertise with effective strategies that would allow children to explore content using digital technology. Furthermore, she described difficulties during presentations related to what she had planned to display and technical issues with software subscriptions or the system freezing up.

Chapter Summary

Reem had a positive view of teachers using digital technology but did not agree with letting children work with it by themselves for educational purposes. Most of Reem's digital technology use relied on screen media, mainly PowerPoint presentations, to facilitate her explanation of science and social studies. Reem appeared to have not explored or perhaps not been introduced to how digital technology could make young children's learning more active. Instead, she treated digital technology as a replacement for traditional materials that made planning and teaching easier for her. This reduced the teacher's vital role and made learning less active, depriving children of the chance to explore digital and non-digital tools. She cited the low infusion of digital technology by her teacher educators in their lectures and the lack of a role model, courses, and facilities that would have empowered her to use digital technology differently.

Chapter 7: Cross-Case Analysis

This case study explored three Saudi pre-service teachers' beliefs and practices regarding digital technology in early years education. Participants were in their final internships in kindergarten classrooms. The infusion of digital technology in this context is a multidimensional phenomenon that requires understanding the beliefs, stimuli, and attitudes regarding teaching, learning, and technology. It requires intentionality and integrating different domains of knowledge, including technological, pedagogical, and content knowledge, and its implications could be influenced by various contextual factors.

Digital technology can be challenging to apply in early years education, with its benefits hotly debated (Edwards & Bird, 2017). Nevertheless, the national development program Saudi Vision 2030, together with the Saudi Ministry of Education, are seeking to integrate digital technology into all school levels and make it an integral part of the education system. Teacher education programs, however, have long valued traditional tangible methods of teaching; even if a school has digital technology, it is up to the student teacher to employ it in instruction. Pre-service teachers' beliefs therefore guide how they use digital technology in practice (Eickelmann & Vennemann, 2017; Mertala, 2019).

Many studies have reported teachers encountering difficulties infusing digital technology due to a lack of preparation, knowledge, and experience (Al-Abdullatif, 2019; Donohue & Schomburg, 2017; Magen-Nagar & Firstater, 2019; Marklund, 2019; Palaiologou, 2015). One of the main causes of unsuccessful infusion is insufficient and low-quality teacher preparation. This has been a challenge in early years education, and pre-service teachers often feel insufficiently

prepared to integrate digital technology (Alelaimat et al., 2020; Marklund, 2019). High-quality infusion requires expertise in different technology, pedagogies, and content. Research on early years education is in its early stages in Saudi Arabia, with a lack of studies on technology use and teacher preparation. Research has mostly been in a Western context (Dong & Mertala, 2020), focused on in-service teachers, and extracted self-reported findings (Hsu, 2016; Wang et al., 2018).

In my experience supervising pre-service teachers, I noticed them struggling with how to appropriately use digital technology in young children's classrooms. Their use basically consisted of displaying a slideshow of images and a video, and they focused on ensuring that children followed the rules and stayed quiet. Thus, their practices were teacher-centered, they held generally negative beliefs about children's use of digital technology, and they undervalued children's ability to work and learn using that technology. Furthermore, digital technology became a replacement for traditional materials to make lessons faster to prepare, easier to teach, and more economical.

My experience as an education supervisor at the beginning of my work as a teaching assistant inspired me to investigate digital technology infusion in Saudi early years education. When I was supervising student teachers who had not recognized how to appropriately use digital technology in classes during their internship and how to make connections between theoretical knowledge and practice, I felt disappointed, especially given digital technology having become such an integral part of modern life. They told me they did not know how to use digital technology in early years classrooms. As a result, I investigated three student teachers' preparation, beliefs, and practices regarding this topic during their final internship.

This chapter gives an overview of the methods, theoretical framework, and participants of the study, followed by an analysis of each of the three cases separately and a cross-case analysis to determine commonalities and differences between cases. It ends with recommendations for future research and implications for early years teacher preparation programs.

Study Overview

The study sought to answer the following research questions:

1. How do Saudi pre-service teachers perceive the role of digital technology in early years education?

2. How do Saudi pre-service teachers infuse digital technology in their teaching practice?

I applied a qualitative methodology, as it would be a pragmatic, critical, and naturalistic approach built from the lived experiences and perspectives of individuals (Stake, 1995). In addition, qualitative inquiry takes place in a natural environment, relies on multiple data sources, emphasizes context, and is essentially interpretive (Simons, 2009; Stake, 1995). A case study involves explaining, understanding, and interpreting multiple truths in a naturalistic context. This approach helped me develop a more in-depth, multifaceted understanding of a complex issue in a real-life setting (Crowe et al., 2011). My role was the main instrument for collecting and analyzing data, as is typical in qualitative interpretive research; thus, it was important for me to acknowledge and be aware of my values and biases (Simons, 2009). My personal and professional views of the topic, prior experience supervising student teachers, and role at the university as a teacher educator influenced the way I conducted the study and my relationships with the participating student teachers.

An instrumental collective case study was employed to gain a deep understanding and broad appreciation of pre-service teachers' digital technology infusion while showing different pre-service teachers' perspectives and practices. I investigated the diverse ways digital technology has been used in different activities and kindergartens. I used multiple data sources to acquire further insight and generate an in-depth understanding of the experiences of the three participants. The data sources comprised semi-structured interviews, observation field notes, and a researcher journal.

TPACK has been used in teacher education to advance and measure teachers' knowledge of technology integration practices (Rosenberg & Koehler, 2015). TPACK contains seven domains derived from the interplay of pedagogical knowledge (PK), content knowledge (CK), and technological knowledge (TK). Other domains include pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK), and technological pedagogical content knowledge (TPACK).

The aim was to investigate perceptions, knowledge, and beliefs to enhance learning in Saudi Arabia. TPACK would be a good fit for this purpose as it has explanatory power and heuristic value (Buss et al., 2018). These domains of knowledge are a crucial variable in TPACK as they strongly influence teaching processes and decisions. TPACK was thus more appropriate to my topic and interest because it provided the opportunity to understand pre-service teachers' preparation to integrate digital technology by evaluating the three core knowledge domains along with contextual factors.

Previous chapters described each pre-service teacher's use of digital technology, explaining the themes that arose from their experiences and understandings. Each pre-service teacher was unique, but they also shared an array of expertise, understanding, experiences,

feelings, and beliefs and helped me understand their abilities. Exploring the cases individually

helped me acquire a more in-depth, accurate view of the data. My analysis started by applying

direct interpretations in process analysis, which I wrote in my researcher journal during data

collection, and categorical aggregation (thematic coding), which I employed throughout the

analysis process (Stake, 1995). The data for each teacher were analyzed as a single case study,

applying inductive coding before making cross-case comparisons (Stake, 2006). I applied

inductive coding to openly review the data without the use of pre-established codes, explore the

patterns that emerged from the data, and consider different possible interpretations (Braun &

Clarke, 2019).

Following Saldaña's (2009, 2021) coding manual, I created a codebook that included the

name of each code and a detailed description of its meaning. My coding analysis comprised of

two cycles. For each case, I followed Saldaña's (2009, 2021) steps in coding (a three-column

table for data, preliminary codes, and final codes to identify the main codes and eliminate

redundant ones). During the coding phase, I went back to my data multiple times to find new

codes until no more codes emerged and I reached saturation. After that, I combined several codes

into categories and identified themes for each case (within-case analysis). After within-case

analysis, I combined the data from the three cases and analyzed them for cross-case analysis,

comparing them to identify common themes using a code manual based on TPACK. I

determined the themes across the three cases through deductive coding by referring to the

predetermined TPACK code protocol and found extracts that fit those codes.

I investigated the participants according to areas of TPACK known to have a critical

impact on the quality of pre-service teachers' integration of digital technology. TPACK explains

the knowledge domains essential for effectively using digital technology in teaching (Mishra &

Koehler, 2006), has had a critical impact on inquiry and practice in teacher education and training (Mishra, 2019), and has been employed to explore the contextual factors and knowledge domains required to effectively teach and engage children with digital technology (Swallow & Olofson, 2017). In the present study, Najd, Reem, and Alula all demonstrated different experiences, uses, and beliefs regarding digital technology. The cross-case analysis was organized based on relevant TPACK framework domains. Digital technology in early years education can be challenging, but several domains in the TPACK framework appear to have a powerful impact on its effectiveness. This interpretive model helped me reach a more comprehensive understanding of Saudi pre-service teachers' digital technology infusion, how it has been influenced, and their overall preparation and adequacy in this regard.

Overview of Each Case

Najd: Loyalty to Traditional Teaching

During the study, Najd was teaching and working with children in the field for the first time. As she was in the middle of her first experience and trying to adapt and learn from it, she was trying to do whatever she thought was effective. Najd showed loyalty to traditional teaching pedagogies but was relying on screen media when teaching. Najd faced conflicts between her way of teaching using digital technology and that of the classroom teacher. At the same time, Najd faced an inner conflict between her education that the children's role was to absorb information passively and higher-quality approaches incorporating active learning through digital technology. She compared the different methodologies and decided digital tools were superior. During her experience, Najd combined traditional pedagogy with screen media. Najd reported feeling anxious because she did not know if this was appropriate as she was trying to create a nice atmosphere and relationship with the children by providing technology to make

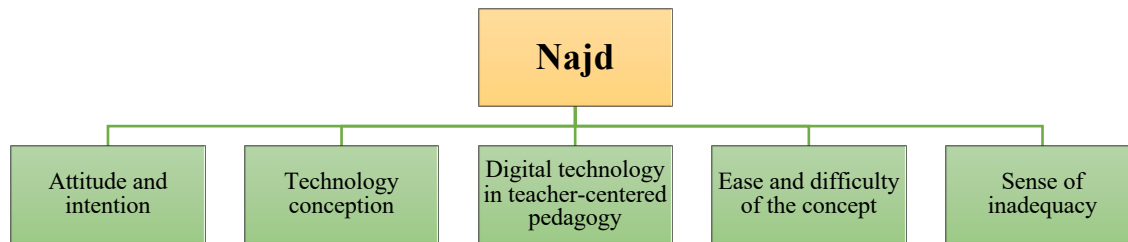them happy and engaged. The themes that emerged from Najd's case analysis are presented again in Figure 5.

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│and      │ │conception│ │technology  │ │difficulty  │ │inadequacy  │
│intention│ │          │ │in teacher- │ │of the      │ │            │
│         │ │          │ │centered    │ │concept     │ │            │
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Figure 5: Themes from Najd's Case Analysis

Alula: Passive Consumption of Knowledge

The themes from Alula's case analysis are presented again in Figure 6.

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                              ┌─────────────┐
                              │    Alula    │
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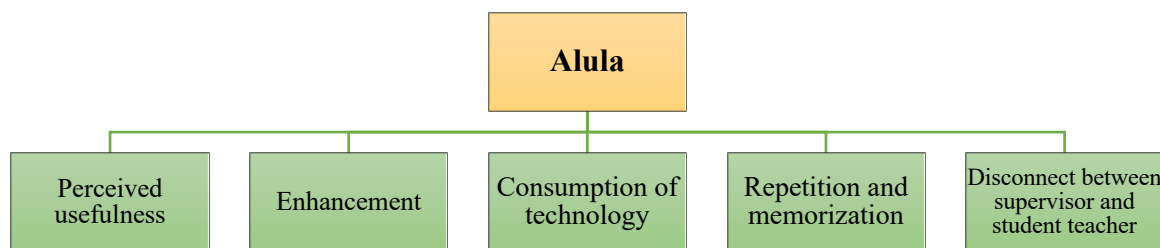
Figure 6: Themes from Alula's Case Analysis

Alula came off as friendly, positive, sociable, and ambitious. Her relationship with children began at home helping take care of her younger siblings. Alula worried that teaching children would be overwhelming but fell in love with it, despite difficulties during her internship. She showed a desire to fulfill her students' needs and make learning fun. She noted that since children had grown up with digital technology, incorporating it into teaching could be useful. Her classroom practices were also informed by her experience playing video games from a young age, and she thought they would help children focus on the lesson and be entertained at the same time.

Reem: Replacing the Teacher with Technology

Reem introduced herself as a good listener and patient as well as having a passion for teaching children and an affection for their adventures, spontaneity, and innocence. She enjoyed using digital technology in her personal life and sought to integrate it into teaching. Her view of children as innocent prevented her from seeing them as active learners who could explore digital technology directly in class. She also believed that allowing children to use digital technology could deprive them of traditional learning and essential skills. She primarily saw digital technology as a tool to make lesson preparation and instruction easier and to motivate students. As a result, she attempted to integrate digital technology in every part of her teaching. The themes that emerged from Reem's case analysis are presented again in Figure 7.
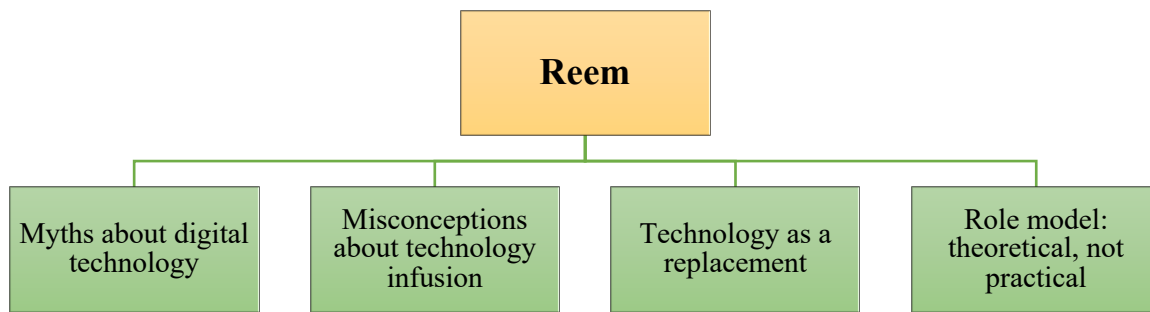
Figure 7: Themes from Reem's Case Analysis

Cross-Case Themes: TPACK Domains

In this part, the findings are organized based on based on relevant TPACK domains, which offer a framework for effectively infusing digital technology. TPACK focuses on teachers' domains of knowledge (technological, pedagogical, and content knowledge), other contextual factors, and how they interrelate to promote the understanding and skills required for digital technology integration (Kihoza et al., 2016; Koehler et al., 2013; Olofson et al., 2016). It is designed to ensure all the main knowledge domains are considered when planning a lesson or activity. It can act as a tool for investigating pedagogically robust methods in which digital

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resources facilitate teacher and learner comprehension by balancing pedagogy, content, and technology (Kihoza et al., 2016). TPACK was helpful in establishing an overall picture of the pre-service teachers' use of digital technology and led me to a deeper understanding. The following is an exploration of their experiences based on TPACK.

Technological Expertise (Basic Design Skills)

Technological knowledge concerns digital tools and resources (e.g., websites, videos, tablets, robots, augmented reality, virtual reality) and the skills needed to use those tools. In TPACK, technological expertise is a critical competence influencing the infusion of digital technology.

Participants held a misconception about technology infusion in early years education, associating it with TVs, computers, tablets, and smartphones—all screen media. None of them recognized how digital technology could facilitate active, student-centered learning. They used these tools for displaying slideshows, videos, games, and other visuals. Najd felt the success of technology was determined by the extent to which children were attracted to a digital-based lesson while passive or unsuccessful use occurred when digital resources simply filled free time or lacked an educational objective. Reem conceptualized the positive use of digital technology as being associated with educational objectives, becoming a problem when the teacher merely uses it to display material without participation. Alula defined the positive use of digital technology as linking digital materials to the lesson, which could become passive when the content is irrelevant or unsuitable for young children or when the sound is unclear. Their knowledge was therefore limited to a few digital tools used to present information with limited experience solving technical problems.

Najd, Alula, and Reem were all capable digital technology users in their social lives and used it in their teaching, but they felt they needed to learn how to more effectively integrate it for children to learn. They also viewed themselves as good users of social media, such as Snapchat, TikTok, Twitter, and Instagram, and Alula noted her experience with video games. They all had the ability to design basic screen activities, such as a digital story and PowerPoint slides, while Alula could use Quizlet, and Reem could design digital content via WebQuest. Nevertheless, their infusion of digital technology was mostly restricted to PowerPoint, YouTube videos, and visuals linked to non-interactive digital presentations. Furthermore, technical issues sometimes prevented them from continuing an activity, as participants lacked the expertise to solve some basic technical issues. Finally, they expressed their lack of experience using innovative digital tools such as robots and even interactive whiteboards.

Pedagogical Expertise (Traditional Approach and Student/Teacher Roles)

Knowing a range of effective teaching approaches is vital in TPACK. Pedagogical knowledge involves comprehending instructional practices, processes, values, and objectives. This comprises all strategies for classroom management, learning, and assessment, such as how to apply inquiry-based, play-based, and collaborative learning (Chai et al., 2013).

When infusing digital technology, participants did not apply effective teaching practices such as game-based learning, digital play-based learning, and inquiry-based learning. They considered digital technology a tool strictly for visualizing, presenting, explaining, and entertaining that could facilitate their teaching process. This was passive, non-interactive, low-level infusion. After the Vision 2030 national development project was announced, there have been many calls by the Saudi Ministry of Education to exchange this dominant traditional method with a more constructivist, learner-centered approach, where the teacher prepares the

educational environment and acts as a collaborator and facilitator who employs a variety of strategies and tools that develop students' thinking skills and creativity (Ministry of Education, n.d.). Nevertheless, in all three cases in the present study, a teacher-centered model was dominant as pre-service teachers used a one-way flow of information while children sat and received knowledge passively. Children were not given the opportunity to explore, engage, and work with digital technology, as only the pre-service teachers were allowed to work with those devices. This practice followed from participants' belief that digital technology should only be used by teachers in the classroom, not by the children. In all three cases, digital technology had not been employed to allow children to take agency over their leaning and create new digital products.

Digital technology infusion is conceptualized as the use of digital technologies for educational reasons (NAEYC & Fred Rogers Center, 2012). Digital technology should be infused in ways that foster creativity, inquiry, collaboration, problem-solving, and exploration (Kalaš, 2010; Magen-Nagar & Firstater, 2019) through creating digital drawings, books, and photography (Lawrence, 2018). Digital technology can afford children agency in their learning if used intentionally and appropriately. Successful digital technology infusion facilitates educational objectives that would not otherwise be possible (Cifuentes et al., 2011).

Despite the national movement in Saudi education to transition from passive to active learning, the participants all followed a dominant teacher-centered model. This revealed an absence of knowledge about more effective pedagogical strategies. Differentiating between active and passive use of technology is essential to ensure it benefits young children (Lee, 2016; Mustola et al., 2018). Despite this, all of them had difficulty making that distinction and viewed themselves as the main source of knowledge in the classroom. Instead of being used as a stand-in

for traditional materials, digital technology would be more useful if adopted to reach goals that would not be possible without digital technology.

In Najd's classroom, children were there exclusively to listen and watch, relying on her to explain a concept and assess their understanding. She thus favored instruction using a one-way flow of information. Despite this passive learning, she was worried that allowing young children to use digital technology would prevent them from physically moving around, playing, and developing their motor skills.

Similarly, Alula employed a drill-and-practice approach. While she valued digital games, she did not appear to have explored the concept of gamification in learning. As a result, the digital games she used were not engaging or interactive and did not facilitate exploration. They had a closed design, followed a question-and-answer strategy, and were chosen based on availability. This suggested that repetition and memorization still dominate in education and influence the way digital technology is used, in alignment with the findings of Aljabreen (2016). Alula acknowledged digital technology benefited her as a teacher and often served non-educational purposes to keep children busy. This reflected a lower-quality use of digital technology as a reward or free-time activity, as described by Hus (2016).

Reem's class displayed a traditional teacher-centric pedagogy but with digital tools replacing traditional tools. Digital technology not just replaced traditional tools but also reduced the role of the teacher to merely presenting the material, asking questions about it, participating in exercise activities, and transitioning from one topic to another. She often merely repeated what had just been shown on the screen.

Content Expertise (Islamic and Social Studies Concepts)

Teachers must understand a topic in order to teach it effectively. This content knowledge comprises information about major ideas, theories, and facts in a given field (e.g., science, literacy, social studies). In Saudi kindergartens, children learn math, science, language arts, Islamic religion, and social studies. The three participating pre-service teachers primarily used digital technology to teach Islamic and social studies concepts. Najd and Reem used it for displaying verses of the Qur'an and the morning du'a, Alula did so when teaching math, and Reem used it for teaching science. They presented slideshows, videos, games, and visuals but primarily in social studies, with limited use in science, math, and language arts.

Participants said digital technology helped them develop their content expertise for several topics by enabling them to more easily search for information, activities, and resources. They appreciated digital technology's role in lesson preparation and for making teaching easier and more convenient. Digital technology was referred to as a tool, like a textbook but with more information and visuals. The ease or difficulty of concepts played a critical role in their decision to use digital technology in their teaching.

Their content selection relied on the accessibility of digital content related to the lesson. They did not appear to have a general criterion for selecting digital content. However, being selective regarding what digital content (videos or games) to use when teaching young children and ensuring its appropriateness and cultural relevance is a critical point teachers should take into consideration.

Contextual Factors

Mishra (2019) noted the importance of incorporating a contextual understanding within the TPACK framework, including the setting and social-technical matters. According to Koehler

et al. (2013) and Rosenberg and Koehler (2015), TPACK recognizes that education does not happen in a vacuum but rather in a particular context, which affects teachers' formation of TPACK and the application of technology. According to TPACK, diverse contextual variables can influence teachers' use of technology in different environments, making it beneficial to understand different contexts and related factors to know how TPACK changes from one context to another.

Contextual elements can impact the digital technology practices of the teacher. Mishra and Koehler (2006) defined context with various components, such as student background, accessibility of technology, and grade level. Chai et al. (2013), Chai et al. (2014), and Koh et al. (2014) expanded the conceptualization of context in TPACK from the learning setting to the larger socio-cultural context, including intrapersonal, interpersonal, institutional/cultural, and physical/technological dimensions:

- The intrapersonal dimension refers to the views the teacher holds regarding pedagogy, teaching, learning, learners, and technology.

- The interpersonal dimension refers to peer interaction via the sharing of thoughts, peer coaching, groupwork, and patterns of collaboration.

- The institutional/cultural dimension refers to an institution's culture, policy, and curricula (e.g., places for cultural reproduction, focus on traditional tests, and stakeholders' expectations for education).

- The physical/technological dimension refers to the availability of digital tools, the proper use of the tools, access to technical support, and use of classroom management techniques.

These diverse internal and external contextual variables can influence teachers' use of digital technology in their lessons (Chai et al., 2013; Koh et al., 2014). Koh et al. (2014) stated that evaluating digital technology integration should not only be about teachers' expertise and using the newest tools; it should require understanding how contextual factors impact digital technology use, teaching practices, and instructional decisions. A critical pillar of promoting successful digital technology infusion and knowledge is understanding the impact of a teacher's pedagogical and technological beliefs on implementation, practices, and instructional decisions (Koh et al., 2014). Beliefs can work like knowledge in their effect on how digital technology is used. In this study, the participating teachers were discovering teaching with digital technology and struggling to identify the elements essential to infuse it into instruction. Their pedagogical and technological beliefs, supervisors, classroom teachers, and the accessibility of technology in the university and schools where they did their internships all impacted how Najd, Reem, and Alula used digital technology in the classroom.

All pre-service teachers had planned and presented lessons through digital technology in micro lessons during the COVID-19 pandemic, but this was their first experience using digital technology in the field with young children. All of them encountered some challenges and concerns. The dominant contextual factors influencing pre-service teachers' decisions, practices, design, and use of digital activities were the intrapersonal dimension (pedagogical and technological/personal beliefs), which is an internal aspect of the pre-service teacher, and a lack of adequate training, which is an external aspect. These included their beliefs about what teaching should look like, their and children's roles in the classroom, their image of children and their ability, and their views about their and children's use of digital technology. In contrast, cultural/institutional factors centered around inadequate training, time, and supervisors. The

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participants' beliefs were the main driver of their classroom decisions, while the preparation program context and demands were the primary contextual factor influencing their TPACK formation and infusion of digital technology in different ways.

Intrapersonal Dimension (Pre-Service Teachers' Beliefs)

In TPACK, the intrapersonal dimension refers to the views and personal beliefs the teacher holds regarding pedagogy, teaching, learning, learners, and technology (Chai et al., 2013; Koh et al., 2014). Beliefs were considered a contextual internal predictor influencing the pre-service teachers' infusion of technology, in keeping with the literature (Cheng & Xie, 2018; Xie et al., 2019). Their beliefs about the infusion of digital technology in early years education were a dynamic component affecting how effectively digital technology was used. Recognizing their beliefs is thus crucial to understand their decisions. Their generally positive beliefs about digital technology in teaching coincided with their high use of that technology, while their concerns about children using digital technology was reflected in their passive, teacher-centric approach that did not support children's exploration of digital technology.

The participants asserted that digital technology could benefit children's comprehension and academic learning. However, they believed digital technology was more efficient than traditional tools and justified its usefulness by noting that children demonstrated more enthusiasm and curiosity. They claimed digital technology alone could engage young learners and enhance their learning because of the attractiveness of PowerPoint slides and digital games, with multimedia better able to attract and maintain young learners' attention than traditional resources. They appeared to view digital technology as superior because of its multimedia features, and digital games were perceived as beneficial because they were both entertaining and challenging, which could promote learning.

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Najd, Reem, and Alula agreed on the importance of digital technology in general and relied on it for quick and easy access to resources and knowledge, preparing and delivering lessons, making lessons more enjoyable, and holding children's attention. However, there were major differences between how the three viewed and used digital technology.

Najd held a largely positive view of digital technology and used it regularly. She said it could help children achieve a higher comprehension of the lesson compared to traditional tools by getting them to be curious and focus more. She also felt it could help with assessing children's comprehension of a concept. While she believed digital tools were superior to traditional tools, she thought digital tools could favor cognitive development at the expense of physical development.

Alula saw digital technology in early years classrooms as critical for teaching and learning. She said it facilitated her explanations and helped keep children busy during free time. Like Najd, she also felt digital technology made children more engaged with the lesson and made daily assessment more convenient.

Like the other two, Reem saw digital technology as a necessary tool in early years classrooms but disagreed with letting children explore it themselves. This negative view was clear from her interviews and how she used digital technology in her classroom, due to her concern about children's health, eyes, brain, imagination, and physical and social skills. Her undervaluing the importance of digital technology and its affordances for young children in learning were associated with her image of a child as innocent. She saw them as too young to use digital technology in school and, as a consequence, kept them from taking agency in their learning. Her belief that children were not prepared to work with digital technology by themselves stopped her from employing effective strategies and using that technology as an

instructional tool that could enhance their learning, creativity, and engagement. She preferred to rely on digital technology because it saved her time and money and helped her remember what she was planning to teach.

Interpersonal Dimension (Outside Support)

TPACK views interpersonal aspects as fundamental external contextual factors. This dimension is related to collaboration, peer support via sharing thoughts, and interaction with peers or stakeholders (e.g., educators, parents) (Chai et al., 2013; Koh et al., 2014). In this study, the three participating pre-service teachers stressed aspects of their preparation program and teacher educators. Their educators, supervisors, and classroom teachers all impacted their digital technology infusion.

Another issue was how the lack of a strong role model affected their understanding and use of digital technology in the classroom. Najd and Reem said their teacher educators did not show them how to effectively use digital technology or implement different pedagogies when using it. Furthermore, they said their teacher educators' use of digital technology was limited to presenting PowerPoint summaries of the textbook. During her internship, Alula did not feel compatible with her supervisor, as that person came from outside her department. Reem and Alula said their supervisor feedback on their practices and activities, including digital technology use, was limited and general. Furthermore, they said there was no expectation for pre-service teachers to use digital technology in teaching as their rubric did not include standards for this competence. Similarly, Najd said her classroom teacher, who did not use digital technology at all in class, did not provide needed feedback about her use of digital technology. It appeared the school teachers and administrators did not provide support or guidance for digital technology infusion in the early years classroom. Instead, some of the class teachers used digital technology

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in passive, teacher-centered ways, such as for non-instructional objectives, or did not ensure the reliability of the digital content. This led to the reproduction of those practices among the pre-service teachers.

Institutional/Cultural Dimension (Teacher Preparation Program)

The institutional/cultural dimension refers to an institution's culture, policy, and curricula (e.g., places for cultural reproduction, focus on traditional tests, and stakeholders' expectations for education) (Chai et al., 2013; Koh et al., 2014). The teacher preparation program appeared to be the main institutional factor that impacted their way of technology infusion.

All three pre-service teachers reported a lack of preparation to use digital technology for teaching young children. They learned about it in theory, including historical information, general importance, benefits, and goals. However, they had no practice or experience designing and presenting active, engaging digital activities, and the program had not prepared them with knowledge of practical methods and strategies in this regard. Instead, their training focused on digital resources and design skills rather than pedagogy and implementation. They reported relying on digital technology in their personal life and having some aptitude for PowerPoint and a few other programs. However, they did not see or learn how they could more meaningfully infuse digital tools into their lessons with young children or how to establish activities in which children had agency in their learning and could explore diverse digital technologies.

Najd and Reem expressed a desire for specialized courses on how to design and apply technology-infused activities that would be appropriate for young children. Because of the absence of such courses, the pre-service teachers developed misunderstandings about what digital technology infusion in early childhood ideally involved. Although the university provided one or two optional courses, these were very general and not specialized for an early childhood

setting, They included old information focusing on the history of technology and some basic software rather than teaching approaches and how to use digital tools to involve children in an activity.

Moreover, having a seminar course that had to be taken during the internship semester was stressful for the pre-service teachers as they had to work hard inside and outside the classroom, which negatively influenced their use of digital technology. To have more time to work on their seminar assignment, they sought to use digital technology in simple, passive ways that would save time during lesson preparation and teaching.

Physical/Technological Dimension (Environmental Obstacles)

The physical/technological dimension refers to the availability of digital tools, the proper use of tools, accessibility, and classroom management (Chai et al., 2013; Koh et al., 2014). The availability of up-to-date digital devices and classroom management appeared to be the main physical and technological factor that impacted their technology infusion. However, this dimension was not as dominant as the other contextual factors.

In the classrooms where the participants did their internship, they only had screen-based devices, including TV screens, computers, and iPads. Moreover, participants only had limited available digital technologies in their university. Additionally, the participants lacked confidence with classroom management, fearing they would not be able to manage or safeguard students if children were allowed to use digital technology themselves. Najd and Alula feared it would be difficult to manage the classroom if children had the opportunity to work directly with digital tools, and Reem felt children were too young for these tools in the classroom. This issue appeared to prevent the pre-service teachers from considering giving young children the opportunity to learn and work with digital resources.

Chapter Summary

This chapter revealed the beliefs and practices of the Saudi pre-service teachers (Najd, Alula, and Reem) regarding digital technology infusion in early years education through a TPACK lens. The chapter emphasized common relationships across cases and identified common themes. Figure 8 summarizes the common themes from the cross-case analysis. The next chapter concludes the study with implications, recommendations, and an overall reflection.
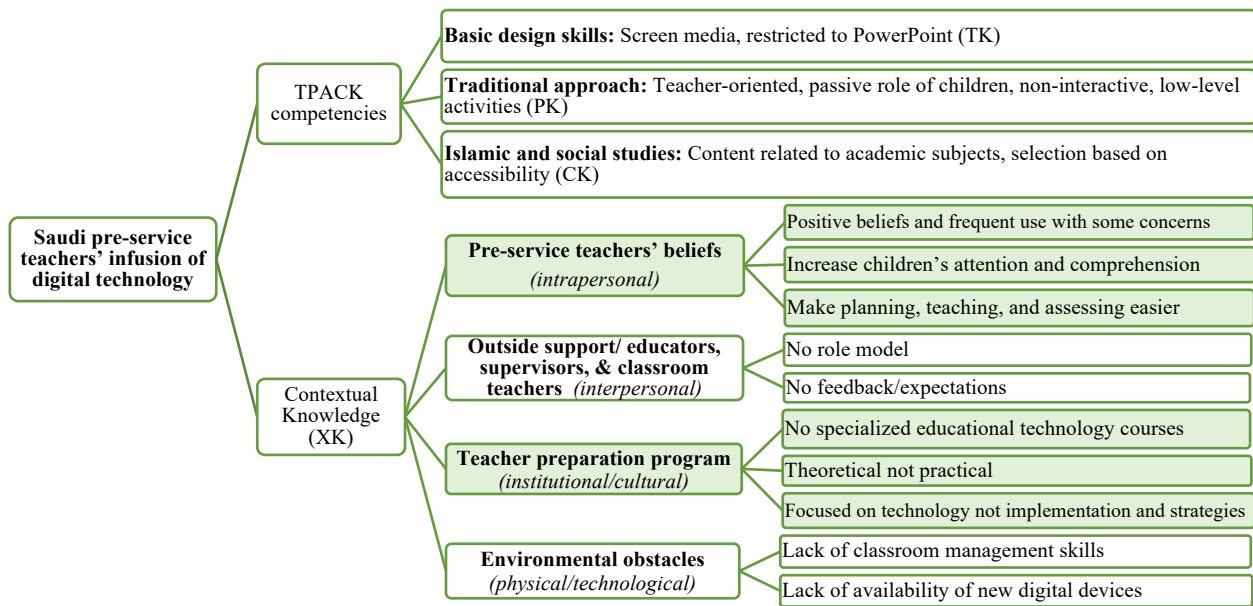
Figure 8: Summary of Cross-Case Analysis Themes

Chapter 8: Conclusion

Discussion

With the rapid development of digital technology, it has become a necessity for pre-service teachers to be prepared with the knowledge and experience to use that technology in practice. Despite this trend, few studies have examined TPACK within early years education (Park & Hargis, 2018). What research has been done on early years teachers' beliefs and practices regarding technology infusion has mostly been conducted in a Western context, concentrating on in-service teachers (Dong & Mertala, 2020). Digital technology can enhance education and achieve objectives that would not be possible otherwise. For this reason, this research investigated the practices and technological and epistemological beliefs of pre-service teachers regarding digital technology infusion in early years classrooms. This research broadens the TPACK literature by examining early years education in the Saudi context through a qualitative inquiry.

Participants held a somewhat positive view of teachers using digital technology for instruction, although some voiced concerns about its potential negative impact. Some considered it unnecessary for children to use digital technology in the classroom, and some saw it as inappropriate as well. Their digital technology infusion was quite basic, and their experience and knowledge related to digital technology infusion in early years education was inadequate. Pre-service teachers were the only ones allowed to work with digital devices in class. The children were often sitting and staring at a screen, being passive receivers of knowledge while watching a video or listening to a song that did not require them to produce ideas, be creative, or interact to

improve their skills and learning experience. This resulted in passive learning in which digital technology was not used intentionally and appropriately as an educational tool but rather for presenting information, replacing other tools, and in some cases even partially replacing the teacher. The participants apparently lacked pedagogical knowledge as the approach they employed with digital technology was teacher-centric, and their technological skills were at a low level, mostly limited to PowerPoint. There was no interplay between their technological knowledge and pedagogical knowledge as digital technology was not used to provide children with exploration and a creative experience. Digital technology was thus not infused as an educational tool, and their technology infusion was at the beginning level of development.

The TPACK domains of technological and pedagogical expertise offered greater insight into the adequacy of Saudi pre-service teachers than content expertise. Regarding technological expertise, the main digital tool available in the three classrooms was a TV screen, and PowerPoint was the main proficiency that seemed important. All three expressed having good design skills, mainly related to PowerPoint, but sometimes including other resources such as WebQuest and Wordwall. However, the only resources I noticed them using during observations were PowerPoint and YouTube. Regarding pedagogical expertise, the three participants showed teacher-centered practices with unengaging, passive digital activities, such as videos, stories, songs, images, and matching or puzzle games, in which the children's role was to watch and listen. Thus, the main purpose of digital tools was presenting information or assessing children's content knowledge, and child-centered learning that facilitated exploration was not observed in the pre-service teachers' use of digital technology. In contrast, content expertise (i.e., regarding religion, social studies, math, language, and science as the subject areas being taught) did not appear to offer much insight. However, the participating pre-service teachers tended to value

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digital technology more with Islamic concepts and social studies. For them, digital technology seemed to afford more in some contents but was not connected with strategies that would empower children and evoke creativity and higher-level thinking.

The main contextual factors were participants' pedagogical and technological beliefs and preparation. The findings illustrated that intrapersonal factors like personal beliefs were used to justify instructional decisions and behavior and shaped digital technology infusion. Technological/physical and interpersonal factors appeared to have less of an impact than other contextual factors. Saudi education has long been based on rote learning in which students have been expected to passively receive and memorize information to answer questions and take tests, while the teacher's role has been seen as imparting knowledge. Generation after generation, this pattern has slowed or prevented advancements in high-quality education as many continue teaching as they were taught. Amid ongoing reforms in the Saudi education system, digital tools in the classroom might change the appearance of early years education, but the process of teaching and learning remains based on a one-way flow of information. Factors influencing Saudi pre-service teachers' digital technology infusion included a lack of effective pedagogy, technical knowledge, positive personal beliefs, role models, experience, feedback, and practice, which made participants ill-equipped to teach with digital tools. As a result, the pre-service teachers were media consumers instead of media creators.

Based on the findings, the TPACK model could put more emphasis on TPK to better align with an early childhood context, as this was the subdomain most critical to understanding the pre-service teachers' beliefs and practices. In addition, TPACK could include the affective domain for learning, as suggested by Park and Hargis (2018), since this plays an essential role in

infusing technological, pedagogical, and content knowledge. The TPK subdomain appeared vital and multifaced in an early childhood context, which is shaped by play-based learning.

The participants' lack of knowledge on how to use digital technology to support effective strategies was the most influential subdomain of the implementation of digital technology. The interplay between technology and pedagogy is dynamic, with an understanding of one influencing the other. Technological competence is critical but not enough to engage children to explore and learn through a digital tool when the teacher lacks the knowledge to use appropriate strategies. Participants did not apply digital technology with different strategies that would allow children to explore the content, take agency in their learning, and create products using digital tools. Thus, TPK is vital even when teachers have decent skills using some digital tools. Such tools are a waste of resources if teachers fail to use them or only use them passively. The participants did not appear to clearly understand the benefits and drawbacks of different digital tools or effective strategies to increase children's intellectual engagement. Their TPK decisions were instead based around a screen-based and teacher-centric pedagogy.

Implications

This study investigated three Saudi pre-service teachers' experiences using digital technology with young children during their final internship, and the findings provide valuable insights for future practice. The participants' experiences and practices were influenced by diverse contextual factors and TPACK domains. The National Transformation Program (2020) in Saudi Arabia seeks to improve teacher training, recruitment, and professional development as high-quality student education requires high-quality teacher education. As such, the findings of this study have substantial implications for Saudi policy, training, curriculum, practice, and educators. One is the need for practical work with digital tools in teacher training to meet the

Saudi Vision 2030 aim of education that promotes creativity, critical thinking, and innovation. Accomplishing this goal requires reforming the way university programs prepare early years teachers for the classroom, especially in terms of how they view and use digital resources. Part of these changes could be made by adjusting the standards for university programs to enhance digital technology preparation.

Saudi Vision 2030 seeks to integrate digital technology, improve the learning environment, and stimulate creativity and innovation in authentic learning experiences in which the teacher plays a facilitative role and the learner is a creator of knowledge. Despite efforts to promote digital technology in education and providing digital tools in classrooms, traditional expectations for education persist, in which good students are passive and the teacher imparts knowledge. Pedagogical behavior is guided by intrinsic factors, including values and norms, such as Saudi expectations of a "good student" who is obedient, sits still, listens, follows class rules, memorizes information, and gets high grades on tests. Such expectations influenced how participants used digital technology in practice, as they did not give children opportunities to practice meaning making or take agency over their learning. As a result, opportunities for imagination, critical thinking, and creativity remained limited in the presence of digital tools.

Teacher preparation programs have a huge responsibility to promote authentic digital activities. To develop the agentic capacity of children through this technology, there is a need to prepare future teachers to use digital tools in playful and creative ways. In this environment, students should be empowered to explore the content, use different resources, and learn through hands-on experiences in which learning develops and they improve a range of skills with the informed engagement of the teacher. Future teachers need training to learn how to work as a facilitator, not imparter, of knowledge. Their training should equip them with the technological

and pedagogical knowledge to use digital technology to give children opportunities to take a leading role in their learning. This preparation should also help teachers become critical thinkers who can reflect on how societal expectations have limited children's agency in learning. Teachers prepared in this regard should be more likely to support Saudi Vision 2030 educational objectives related to digital technology.

Despite these concerns, the participants' university program offered few chances to turn theory into practice and lacked digital technology courses tailored to early childhood education, leading to a perpetuation of traditional teaching methods. To address this lack of practice, teacher preparation programs could offer a lab and more specialized courses. Such labs and courses would need to be continuously updated to keep up with changes in technology. Practical learning about digital tools throughout teacher training would help pre-service teachers realize the uses for such tools in the early years context before working with them in the field. In response to Saudi Vision 2030, the Ministry of Education has placed different types of digital tools in different schools, but this does not necessarily lead to higher-quality education. In this context, it is important to examine connections between what is available in Saudi schools and what pre-service teachers are introduced to in their preparation programs. Such research could ensure teachers are aware of the affordances of digital technology and prepared to provide authentic learning experiences to children.

Saudi early childhood teacher preparation programs would benefit from a specialized rubric that addresses what has been learned during the internship. The rubrics in this study were overly broad and did not reflect necessary skills and knowledge. General standards are needed (e.g., personal characteristics, ability to create handmade teaching aids, classroom management), but a rubric should also include standards related to teachers' technical skills and ability to

integrate pedagogies that are appropriate to the children and content. Moreover, the university and schools did not offer a detailed policy requiring pre-service teachers to use digital technology in practice.

A variety of approaches could be used in teacher preparation programs to improve the conceptualization and use of digital technology in early years classrooms. This research recommends that teacher educators consider the essential contextual influences on pre-service teachers' digital technology infusion and employ different strategies for enhancing digital skills, such as being a good role model, using quality examples, encouraging reflection, providing feedback, instructional design, and practice (Howard et al., 2021). In contrast, the participants' preparation concentrated more on technology skills, design, and using digital resources rather than effective strategies and how to infuse the digital tools into educational activities. Because participants lacked TPK, as they appeared to know little about appropriate strategies to integrate digital tools to deliver content, teacher educators are advised to provide practical opportunities to turn theory into practice while designing and implementing digital activities. An awareness of how digital tools can be used to support different approaches to delivering different content is vital to enhance the quality of digital integration. Teacher educators are thus recommended to give students opportunities to use diverse strategies that actively engage children, allow them to take agency in their learning, and empower them to create products they could not produce without digital technology.

Another reported challenge was a lack of meaningful feedback from teacher educators and in-service teachers. Teacher educators should help future teachers develop their technological, pedagogical, and content expertise and learn how to merge them in early years activities. In this capacity, they should help future teachers understand digital technology as an

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educational tool and practice how to design and apply meaningful digital activities that progress children's learning. Furthermore, it would be beneficial if the supervisor assigned to guide the pre-service teacher during such a critical experience were specialized in early years education so they could offer better guidance. Offering continual constructive feedback on digital technology infusion and scaffolding authentic practices would have made the pre-service teachers' internships more meaningful. Simple, broad feedback, such as "good work," "I like the video you used," or "your slides look good and colorful," is not enough. Also, it is vital to have an early childhood instructor as the supervisor, as they would know what the student has learned in the program.

Teacher educators should reflect on their current practices, develop a better understand of digital technology in early years education, and exemplify high-quality digital technology integration. They should also enable pre-service teachers to practice integrating digital technology in authentic, constructivist, hands-on tasks. They can do this by making connections between different digital tools and teaching practices in university classes.

During the observations and interviews, participants revealed no clear guidance on their digital technology use from the schools where they did their internships. Some were expecting at least some guidance from the classroom teacher on this topic but did not receive any. Additionally, the digital tools provided in the schools where participants did their internships were screen-based devices. Thus, when the Ministry of Education selects the digital tools that schools have access to, they should carefully consider whether a given tool is appropriate and useful in the early years environment. Providing appropriate tools with efficient training for teachers on how to integrate them successfully into practice could improve how digital tools are used and how teachers perceive those tools. Increasing in-service teacher awareness and

knowledge about effective technology integration would help shift away from less useful teaching methods. These implications could help Saudi educational institutions better prepare pre-service and in-service teachers to use digital technology effectively with young children.

Recommendations for Future Research

This qualitative case study explored digital technology integration at only one university in only one region (the Eastern Region) of Saudi Arabia. Future research could employ quantitative or mixed methods; draw data from other sources, such as surveys, focus group interviews, or visual elicitation interviews; and have a larger number of participants from different parts of the country and different universities. This would help gain greater insight into how well student teachers are prepared and what actions are needed nationally to develop their digital technology awareness and aptitude. Saudi education is segregated by gender, with male and female teachers and students using separate facilities. In addition, early childhood programs are only offered to women, and I was only allowed to work with female teachers. So similar research could be conducted in Arab Middle Eastern countries in which men can major in early childhood educator to see if male teachers have distinctive beliefs and ways of infusing digital technology in their instruction.

Additionally, this study applied TPACK as a theoretical framework, so future studies might employ other frameworks related to digital technology infusion, such as TIM or SAMR. This study did not focus on how pre-service teachers' TPACK developed during their study in the program. A longer study could examine TPACK development or use an intervention by providing a workshop on digital technology infusion in early years education and do pre- and post-intervention interviews and observations. Also, this study concentrated on pre-service teachers' during their final internship, so future studies could examine first-year students during

their practicum and compare the findings. Because of the inadequate training in early years teacher preparation programs, future studies could propose approaches to improve such programs and support pre-service teachers' awareness, knowledge, and positive outlook about using digital technology effectively in early years education.

Participants' digital technology infusion was impacted by their teacher educators. Future research could thus study Saudi teacher educators' beliefs and use of digital technology in the university. Specifically, it would be helpful to understand their current TPACK expertise and attitudes and analyze contextual factors preventing them from preparing future teachers to use digital technology more effectively with young children. Other contextual factors like accessibility and availability of technology in public schools, learners' technical abilities, curricula, and school context call for more study as well. As the participants' use of digital technology included only screen-based tools, future work could concentrate on the usefulness of such devices for teaching and learning in a Saudi early years context.

Moreover, the teachers in the classes where the participants did their internships did not support or advise them about digital technology, and some participants said the teachers had not used digital technology in teaching at all. This suggests a need to conduct research on in-service teachers' digital technology beliefs, applications, and TPACK levels to develop research-based training that can improve their digital technology infusion and prevent the reproduction of passive, low-level teaching practices in Saudi schools.

Reflection

Researching digital technology in early years education was inspired by my educational and professional experience. My views have evolved since my master's thesis on the use of iPads in the early years classroom, and working in a teacher preparation program sparked many

interest in teachers' preparation to integrate digital technology into their lessons. Previous incidents with pre-service teachers encouraged me to explore this topic further, particularly given the ongoing Vision 2030 reforms, which have made integrating digital technology into public education—including early years education—a crucial goal. Furthermore, digital technology is common among Saudi children outside the classroom, meaning the culture of play has shifted considerably.

Culture is a powerful force shaping the educational system of any country. As such, the history of education and culture in Saudi Arabia provided insights into the pre-service teachers' beliefs and practices. Before collecting the data, I was expecting to see higher-quality infusion of digital technology, so I was surprised by the participants' beliefs and practices. Their passive use of digital technology and insistence on teacher-centered pedagogies was likely shaped by those norms being reproduced from one generation of teachers to the next, despite newer teachers learning about other pedagogies and tools in their preparation programs. The Saudi cultural and social context in which the participants grew up likewise impacted their beliefs about digital technology and the expected roles of a teacher and learner. Replicating how they were taught and the teachers around them, their use of digital technology was associated with presenting information and recall tasks instead of child-centered tasks.

Education in Saudi Arabia has come a long way from the small informal groups that gathered in mosques to memorize the Qur'an and study Arabic, but even today, memorization and high grades are still seen as the ideal. Teachers continue using teacher-centered strategies and children grow up seeing the teacher and textbook as the only sources of knowledge in the classroom. Children are expected to sit still, listen, follow classroom rules, and memorize information. As such, opportunities for imagination, critical thinking, and creativity remain

limited. Therefore, teacher preparation programs have a huge responsibility to break this tradition as they prepare a new generation of teachers for a new kind of classroom.

Digital technology in early years education should be used in creating novel experiences in which children learn in authentic ways and learning evolves during an activity. Digital play as a concept includes the play process and the resulting product. It is about using the digital tool in playful and creative ways to explore, use different resources, and learn through hands-on authentic experiences in which the learning develops and children improve a range of skills with the informed engagement of the teacher. Digital technology gives children opportunities to take a role in their learning within authentic, child-oriented learning experiences.

A core takeaway of this study is that traditional teacher-centered learning persists in Saudi education. Saudi teachers are still not prepared to use digital technology, especially more innovative tools such as robots, augmented reality, and virtual reality. To address this issue, university programs could change how they prepare future teachers, as traditional beliefs and practices are delaying the modernization of the education system. Part of that process should involve teacher educators learning more about digital technology in early childhood education and adjusting their practices going forward.

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Appendix A: Interview Protocol

Introductory questions
1. Tell me about your experiences with digital technology in your personal life.
2. Do you think you are a professional user of digital technology? Why?
3. What types of digital technology do you have the opportunity to work with?
4. Have you taken any courses or workshops on infusing digital technology in early years classrooms?

Questions Related to Beliefs Regarding Digital Technology's Significance and Benefits
5. How often do you integrate digital technology into your lesson plans and teaching during your internship?
6. Why do you integrate digital technology into your lesson plans? What goals are behind your use of this technology?
7. How do you think your teaching has changed with technology use?
8. Do you think young children need to use digital technology in school? Why?
9. What do you think about young children's ability to use and learn from digital technology?
10. What do you think are benefits of digital technology for young children's learning and development?
11. What do you think are disadvantages of digital technology for young children's learning and development?
12. Do you think using digital technology in early years education is essential for young children? Why?
13. How do you think digital technology supports children's learning, development, and play?
14. What do you think about the current policy and curricula regarding the use of technology in early years education?

Questions Related to Practices and TPACK Expertise
15. What is your definition of digital technology integration in children's learning?
16. What types of digital resources and tools do you integrate into your lesson plans?
17. Give me an example of digital technology use that you have plan or apply in your classroom practice during your internship?
18. Have you faced any challenges planning for technology integration in your teaching practices? If so, what are they? Why?
19. What challenges do you think you might face when using digital technology with children?
20. During observation, I noticed that you infused digital technology in your lesson. Do you think using digital technology was important to teach that lesson? Why? Can you tell me how you think it enhanced your lesson in ways that would not be possible otherwise? (A scene from the observation will be shared.)
21. How did you decide on what digital tools to integrate into lessons and activities?

Appendix A (continued)

22. Do you know about some digital tools or resources that are helpful when teaching a specific subject? What are they?
23. What are your roles and children's roles when you plan to use digital technology in the classroom?
24. As early years education involves teaching different subjects, how do you choose your digital tools and teaching practices for a lesson?
25. Can you give an example of a positive use of digital technology in early years classrooms?
26. What do you think passive use of digital technology means? Please give an example.

Questions Related to Their Preparation and Adequacy

27. To what extent do you feel you are prepared and confident to use digital technology in your future classroom practices?
28. What recommendations do you have for developing teacher preparation for technology use?
29. What do you think about your program's preparation for you to use technology in teaching?
30. How might the program have better equipped you to infuse digital technology in the early years classroom?
31. What influence do you think the program has had on your technology infusion in teaching?
32. What do you think teacher educators need to take into consideration when preparing students for technology use?

Closing Question

33. Do you have any final thoughts or ideas you would like to add about digital technology use in early years education?

Appendix B: Informed Consent (English Version)

UNIVERSITY OF SOUTH FLORIDA
USF RESEARCH & INNOVATION

Informed Consent to Participate in Research Involving Minimal Risk
Information to Consider Before Taking Part in this Research Study

Title: Saudi Pre-Service Teachers' Beliefs and Practices Regarding Digital Technology in Early Years Education: A Qualitative Case Study

Study # STUDY003615

Overview: You are being asked to take part in a research study. The information in this document should help you to decide if you would like to participate. The sections in this Overview provide the basic information about the study. More detailed information is provided in the remainder of the document.

Study Staff: This study is being led by May Alyaeesh who is a Ph.D. student in Early Childhood Education at the University of South Florida. This person is called the Principal Investigator. She is being guided in this research by Dr. Ilene Berson, a USF professor of Early Childhood. Other approved research staff may act on behalf of the Principal Investigator.

Study Details: This study is being conducted at ▮▮▮▮▮▮▮▮▮▮ University, Dammam, Saudi Arabia. The purpose of the study is to understand and explain Saudi pre-service teachers' beliefs and practices regarding digital technology in early years education. The researcher will collect data through interviews (two to four per participant), classroom observations (two to six per participant), documents (e.g., lesson plans), and a researcher journal written by the researcher. The estimated time for each interview and observation is 30–60 minutes. The interviews will be conducted online or face-to-face by the researcher in a place and time suitable for each participant. The interviews will be audio-recorded, and the participant's permission for recording will be taken before starting the interview. The documents will be collected once a week.

Subjects: You are being asked to take part because you are enrolled in the Early Childhood Education Program at ▮▮▮▮▮▮▮▮▮▮ University, in the senior level, and currently working in your final internships.

Voluntary Participation: Your participation is voluntary. You do not have to participate and may stop your participation at any time. There will be no penalties or loss of benefits or opportunities if you do not participate or decide to stop once you start. Your decision to participate or not to participate will not affect your student status, course grade (e.g., internship grade), recommendations, or access to future courses or training opportunities.

Benefits, Compensation, and Risk: We do not know if you will receive any benefit from your participation. There is no cost to participate. You will not be compensated for your participation. This research is considered minimal risk. Minimal risk means that study risks are the same as the risks you face in daily life. Because of the coronavirus pandemic, there is a risk of transmission of the novel coronavirus from these procedures. While precautions will be taken, I cannot guarantee that the participant will not be exposed to the virus.

Confidentiality: Even if we publish the findings from this study, we will keep your study information private and confidential. Anyone with the authority to look at your records must keep them confidential.

Why are you being asked to take part?

The purpose of the study is to understand and explain Saudi pre-service teachers' beliefs and practices regarding digital technology in early years education. You are being asked to take part because you are (a) enrolled in the Early Childhood Education Program at ████████████████ University, (b) in the senior level, and (c) currently working in your final internships.

Study Procedures:

If you take a part of this study, you understand that:
- You will participate in two to four interviews. The interviews will be conducted by the researcher online or face-to-face based on the preference of the participant and researcher. The interviews will be audio recorded for analysis purposes, and your permission for recording will be taken before starting the interview. The interviews will be semi-structured interviews, and the estimated time for each interview is 30–60 minutes. Interviews will include open-ended questions linked to participants' teaching experiences during their final internship, their perspectives on technology use, and relevant observations from field notes and might include some follow-up questions based on the participants' responses that are intended to clarify and/or expand upon a response.
- The researcher will observe you two to six times in the classroom while you are using digital technology in teaching and learning. The estimated time for each observation is 30–60 minutes. The researcher will take field notes during the observation.
- The researcher will collect a copy of your teaching documents (e.g., lesson plans).
- The duration of the study will be approximately 8 weeks. One to two weeks will be for collecting data from one participant. To ensure the confidentiality and anonymity of the data, I will limit access to information about you and use pseudonyms for all participants on the data records and when writing this study. All data will be stored on a password-protected computer.
- The finding of the study might be used for educational purposes. Furthermore, the study findings might be presented at local or international conference.

Total Number of Subjects

About 3-5 individuals will take part in this study at ████████████████ University in Dammam in the Eastern Region of Saudi Arabia.

Alternatives / Voluntary Participation / Withdrawal

You do not have to participate in this research study. You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study. Decision to participate or not to participate will not affect your student status or course grade.

Benefits

You will receive no benefit(s) by participating in this research study.

Risks or Discomfort

This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. There are no known additional risks to those who take part in this study. However, because of the coronavirus pandemic, there is a risk of transmission of the novel coronavirus from these procedures. While precautions will be taken, I cannot guarantee that the participant will not be exposed to the virus.

Compensation

You will receive no payment or other compensation for taking part in this study.

Costs

It will not cost you anything to take part in the study.

Privacy and Confidentiality

We will do our best to keep your records private and confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Certain people may need to see your study records. These individuals include:

- The research team, including the Principal Investigator, study coordinator, and all other research staff.

- Certain government and university people who need to know more about the study. For example, individuals who provide oversight on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety.

- Any agency of the federal, state, or local government that regulates this research. This includes the Office for Human Research Protection (OHRP).

- The USF Institutional Review Board (IRB) and its related staff who have oversight responsibilities for this study, and staff in USF Research Integrity and Compliance.

We may publish what we learn from this study. If we do, we will not include your name. We will not publish anything that would let people know who you are.

What if new information becomes available about the study?

During the course of this study, we may find more information that could be important to you. This includes information that, once learned, might cause you to change your mind about being in this study. We will notify you as soon as possible if such information becomes available.

You can get the answers to your questions, concerns, or complaints.

If you have any questions, concerns or complaints about this study, call May Alyaeesh at +▮▮▮▮▮▮▮. If you have questions about your rights, complaints, or issues as a person taking part in this study, call the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu.

Consent to Take Part in Research

I freely give my consent to take part in this study. I understand that by signing this form I am agreeing to take part in research. I have received a copy of this form to take with me.

_____   _____
Signature of Person Taking Part in Study   Date

_____
Printed Name of Person Taking Part in Study

Statement of Person Obtaining Informed Consent and Research Authorization

I have carefully explained to the person taking part in the study what he or she can expect from their participation. I confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in their primary language. This research subject has provided legally effective informed consent.

_____   _____
Signature of Person Obtaining Informed Consent   Date

_____
Printed Name of Person Obtaining Informed Consent

Appendix C: Consent Form (Arabic Version)

UNIVERSITY OF
SOUTH FLORIDA
USF RESEARCH & INNOVATION

الموافقة المسبقة على المشاركة في البحوث التي تنطوي على الحد الأدنى من المخاطر

معلومات يجب مراعاتها قبل المشاركة في هذه الدراسة البحثية

العنوان: معتقدات وممارسات المعلمين السعوديين قبل الخدمة فيما يتعلق بالتكنولوجيا الرقمية في تعليم السنوات الأولى:
دراسة حالة نوعية

دراسة #

STUDY003615

نظرة عامة: يُطلب منك المشاركة في دراسة بحثية. يجب أن تساعدك المعلومات الواردة في هذا المستند على تحديد ما إذا كنت ترغب في المشاركة. توفر الأقسام الموجودة في هذه النظرة العامة المعلومات الأساسية حول الدراسة. يتم توفير معلومات أكثر تفصيلاً في باقي المستند.

طاقم الدراسة: تقود هذه الدراسة مي البعيثي الحاصلة على درجة الدكتوراه. طالبة في تعليم الطفولة المبكرة في جامعة جنوب فلوريدا. يسمى هذا الشخص الباحث الرئيسي. يتم توجيهها في هذا البحث من قبل الدكتورة إيلين بيرسون، أستاذة الطفولة المبكرة بجامعة جنوب فلوريدا. يجوز لموظفي البحث المعتمدين الآخرين التصرف نيابة عن الباحث الرئيسي.

تفاصيل الدراسة: أجريت هذه الدراسة في جامعة ▮▮▮▮▮▮▮▮▮▮ بالمملكة العربية السعودية. الغرض من الدراسة هو فهم وشرح معتقدات المعلمين السعوديين قبل الخدمة وممارساتهم فيما يتعلق بالتكنولوجيا الرقمية في التعليم في السنوات الأولى. سيقوم الباحث بجمع البيانات من خلال المقابلات (اثنين إلى أربعة لكل مشارك)، والملاحظات الصفية (من اثنين إلى ستة لكل مشارك)، والوثائق (على سبيل المثال، خطط الدروس)، دفتر الباحث. الوقت المقدر لكل مقابلة ومراقبة هو ٣٠-٦٠ دقيقة. سيتم تسجيل المقابلات صوتيًا، وسيتم أخذ إذن المشارك بالتسجيل قبل بدء المقابلة. سيتم إجراء المقابلات عبر الإنترنت أو وجهاً لوجه في مكان ووقت مناسبين لكل مشارك، وسيتم جمع الوثائق مرة واحدة في الأسبوع.

الموضوعات: يُطلب منك المشاركة لأنك مسجل في برنامج تعليم الطفولة المبكرة في جامعة ▮▮▮▮▮▮▮▮▮، في المستوى الأول، وتعمل حاليًا في تدريبك النهائي.

المشاركة الطوعية: مشاركتك تطوعية. لا يتعين عليك المشاركة ويمكنك إيقاف مشاركتك في أي وقت. لن تكون هناك عقوبات أو خسارة في المزايا أو الفرص إذا لم تشارك أو قررت التوقف بمجرد أن تبدأ. لن يؤثر قرارك بالمشاركة أو عدم المشاركة على حالة الطالب، أو درجة التربية العملية، أو التوصيات، أو الوصول إلى الدورات التدريبية أو فرص التدريب المستقبلية.

الفوائد والتعويضات والمخاطر: لا نعرف ما إذا كنت ستحصل على أي فائدة من مشاركتك. لا يوجد أي تكلفة للمشاركة. لن يتم تعويضك عن مشاركتك. يعتبر هذا البحث الحد الأدنى من المخاطر. يعني الحد الأدنى من المخاطر أن مخاطر الدراسة هي نفس المخاطر التي تواجهها في الحياة اليومية. بسبب جائحة الفيروس التاجي، هناك خطر انتقال الفيروس التاجي الجديد من هذه الإجراءات. بينما سيتم اتخاذ الاحتياطات، لا يمكنني ضمان عدم تعرض المشارك للفيروس.

السرية: حتى إذا نشرنا نتائج هذه الدراسة، فسنحافظ على خصوصية وسرية معلومات دراستك. يجب على أي شخص لديه سلطة الاطلاع على سجلاتك الحفاظ على سريتها.

لماذا يطلب منك المشاركة؟

الغرض من الدراسة هو فهم وشرح معتقدات المعلمين السعوديين قبل الخدمة وممارساتهم فيما يتعلق بالتكنولوجيا الرقمية في التعليم في السنوات الأولى. يُطلب منك المشاركة لأنك (أ) مسجل في برنامج تعليم الطفولة المبكرة في جامعة ▮▮▮▮▮▮▮▮، (ب) في المستوى الثامن، و (ج) تعمل حاليًا في تدريبك النهائي.

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إجراءات الدراسة:

إذا شاركت في هذه الدراسة، فأنت تدرك ما يلي:

* ستشارك في اثنين إلى أربع مقابلات. سيتم إجراء المقابلات من قبل الباحث عبر الإنترنت أو وجهاً لوجه بناء على تفضيل المشارك والباحث. سيتم تسجيل المقابلات بالصوت لأغراض التحليل، وسيتم أخذ إذنك بالتسجيل قبل بدء المقابلة. ستكون المقابلات شبه منظمة، والوقت المقدر لكل مقابلة هو ٣٠-٦٠ دقيقة. ستتضمن المقابلات أسئلة مفتوحة مرتبطة بخبرات التدريس للمشاركين خلال فترة تدريبهم النهائية، ووجهات نظرهم حول استخدام التكنولوجيا، والملاحظات ذات الصلة من الملاحظات الميدانية، وقد تتضمن بعض أسئلة المتابعة بناء على إجابات المشاركين والتي تهدف إلى توضيح و / أو توسيع الإجابة.

* سيلاحظك الباحث اثنين إلى ست مرات في حجرة الدراسة أثناء دمج التكنولوجيا في التدريس والتعلم. الوقت المقدر لكل ملاحظة هو ٣٠-٦٠ دقيقة. سوف يدون الباحث ملاحظات ميدانية أثناء الملاحظة.

* سيجمع الباحث نسخة من مستندات التدريس الخاصة بك (على سبيل المثال، خطط الدروس).

* مدة الدراسة تقريبا ٨ أسابيع. أسبوع الى أسبوعين سيكون لجمع البيانات من مشارك واحد. لضمان سرية البيانات وإخفاء هويتها، سأقصر الوصول إلى المعلومات المتعلقة بك واستخدام أسماء مستعارة لجميع المشاركين في سجلات البيانات وعند كتابة هذه الدراسة. سيتم تخزين جميع البيانات على جهاز كمبيوتر محمي بكلمة مرور.

* يمكن استخدام نتائج الدراسة لأغراض تعليمية. علاوة على ذلك، يمكن تقديم نتائج الدراسة في مؤتمر محلي أو دولي.

إجمالي عدد المشاركين:

سيشارك حوالي ٣-٥ أفراد في هذه الدراسة في جامعة ██████████████ في المنطقة الشرقية من المملكة العربية السعودية.

البدائل / المشاركة الطوعية / الانسحاب

ليس عليك المشاركة في هذه الدراسة البحثية. يجب أن تشارك في هذه الدراسة فقط إذا كنت ترغب في التطوع. يجب ألا تشعر بوجود أي ضغوط للمشاركة في الدراسة. أنت حر في المشاركة في هذا البحث أو الانسحاب في أي وقت. لن تكون هناك عقوبة أو خسارة في المزايا التي يحق لك الحصول عليها إذا توقفت عن المشاركة في هذه الدراسة. لن يؤثر قرار المشاركة أو عدم المشاركة على حالة الطالب أو تقدير الدورة.

فوائد

لن تتلقى أي فائدة (مزايا) من خلال المشاركة في هذه الدراسة البحثية.

مخاطر أو إزعاج

يعتبر هذا البحث على أنه الحد الأدنى من المخاطر. هذا يعني أن المخاطر المرتبطة بهذه الدراسة هي نفسها التي تواجهها كل يوم. لا توجد مخاطر إضافية معروفة لأولئك الذين يشاركون في هذه الدراسة. ومع ذلك، بسبب جائحة الفيروس التاجي، هناك خطر انتقال الفيروس التاجي الجديد من هذه الإجراءات. بينما سيتم اتخاذ الاحتياطات، لا يمكنني ضمان عدم تعرض المشارك للفيروس.

تعويض

لن تتلقى أي مدفوعات أو تعويضات أخرى مقابل المشاركة في هذه الدراسة.

التكاليف

المشاركة في الدراسة لن تكلفك أي شيء.

الخصوصية والسرية

سنبذل قصارى جهدنا للحفاظ على سرية وسرية سجلاتك. لا يمكننا ضمان السرية المطلقة. قد يتم الكشف عن معلوماتك الشخصية إذا اقتضى القانون ذلك. قد يحتاج بعض الأشخاص إلى الاطلاع على سجلات الدراسة الخاصة بك. هؤلاء الأفراد هم:

*فريق البحث، بما في ذلك الباحث الرئيسي ومنسق الدراسة وجميع أعضاء فريق البحث الآخرين.

*بعض الأشخاص الحكوميين والجامعيين الذين يحتاجون إلى معرفة المزيد عن الدراسة. على سبيل المثال، قد يحتاج الأفراد الذين يشرفون على هذه الدراسة إلى إلقاء نظرة على سجلاتك. يتم ذلك للتأكد من أننا نقوم بالدراسة بالطريقة الصحيحة. يحتاجون أيضًا إلى التأكد من أننا نحمي حقوقك وسلامتك.

*أي وكالة تابعة للحكومة الفيدرالية أو الحكومية أو المحلية تنظم هذا البحث. وهذا يشمل مكتب حماية البحوث البشرية

*مجلس المراجعة المؤسسية بجامعة جنوب فلوريدا والموظفون المرتبطون به الذين لديهم مسؤوليات إشرافيه لهذه الدراسة، والموظفون في جامعة جنوب فلوريدا لنزاهة البحوث والامتثال.

قد ننشر ما تعلمناه من هذه الدراسة. إذا فعلنا ذلك، فلن نقوم بتضمين اسمك. لن ننشر أي شيء من شأنه السماح للأشخاص بمعرفة هويتك.

ماذا لو توفرت معلومات جديدة عن الدراسة؟

خلال هذه الدراسة، قد نجد المزيد من المعلومات التي قد تكون مهمة بالنسبة لك. يتضمن ذلك المعلومات التي بمجرد تعلمها، قد تجعلك تغير رأيك بشأن التواجد في هذه الدراسة. سنعلمك في أقرب وقت ممكن إذا توفرت هذه المعلومات.

يمكنك الحصول على إجابات لأسئلتك أو مخاوفك أو شكواك.

إذا كان لديك أي أسئلة أو مخاوف أو شكاوى حول هذه الدراسة، فاتصل بـ مي البعيش ▇▇▇▇▇. إذا كانت لديك أسئلة حول حقوقك أو شكواك أو مشكلاتك بصفتك شخصًا مشاركًا في هذه الدراسة، فاتصل ٨١٣٩٧٤٥٦٣٨ او ارسل ايميل الى

RSCH-IRB@usf.edu

الموافقة على المشاركة في البحث

أمنح موافقتي بحرية على المشاركة في هذه الدراسة. أفهم أنه من خلال التوقيع على هذا النموذج، فأنا أوافق على المشاركة في البحث. لقد تلقيت نسخة من هذا النموذج لأخذها معي.

_____   _____
توقيع الشخص المشارك في الدراسة   التاريخ

_____
الاسم المطبوع للشخص المشارك في الدراسة

بيان الشخص الذي حصل على الموافقة المسبقة والتفويض البحثي

لقد شرحت بعناية للشخص المشارك في الدراسة ما يمكن أن يتوقعه من مشاركته. أؤكد أن موضوع البحث هذا يتحدث اللغة التي تم استخدامها لشرح هذا البحث ويتلقى نموذج موافقة مستنيرة بلغته الأساسية. قدم موضوع البحث هذا موافقة مستنيرة فعالة من الناحية القانونية.

_____

توقيع الشخص الحاصل على تاريخ الموافقة المسبقة   التاريخ

_____

الاسم المطبوع للشخص الذي حصل على الموافقة المسبقة

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Appendix D: Institutional Review Board Approval

UNIVERSITY of **SOUTH FLORIDA**

EXEMPT DETERMINATION

January 24, 2022

May Alyaeesh

████████████████

Dear Ms. Alyaeesh:

On 1/24/2022, the IRB reviewed and approved the following protocol:

Application Type:	Initial Study
IRB ID:	STUDY003615
Review Type:	Exempt 2
Title:	Saudi Pre-Service Teachers' Beliefs and Practices Regarding Digital Technology in Early Years Education: A Qualitative Case Study
Funding:	None
Protocol:	• Protocol, Version #1, Jan 21, 2022.docx;

The IRB determined that this protocol meets the criteria for exemption from IRB review.

In conducting this protocol, you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Please note, as per USF policy, once the exempt determination is made, the application is closed in BullsIRB. This does not limit your ability to conduct the research. Any proposed or anticipated change to the study design that was previously declared exempt from IRB oversight must be submitted to the IRB as a new study prior to initiation of the change. However, administrative changes, including changes in research personnel, do not warrant a modification or new application.

Ongoing IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities impact the exempt determination, please submit a new request to the IRB for a determination.

Institutional Review Boards / Research Integrity & Compliance
FWA No. 00001669
University of South Florida / 3702 Spectrum Blvd., Suite 165 / Tampa, FL 33612 / 813-974-5638

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UNIVERSITY of
SOUTH FLORIDA

Sincerely,

Various Menzel
IRB Research Compliance Administrator

Institutional Review Boards / Research Integrity & Compliance
FWA No. 00001669
University of South Florida / 3702 Spectrum Blvd., Suite 165 / Tampa, FL 33612 / 813-974-5638

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Appendix E: Saudi University IRB Approval

Kingdom of Saudi Arabia
Ministry of Education

██████████████████

Office of the Vice President for
Research & Higher Studies

المملكة العربية السعودية
وزارة التعليم

وكالة الجامعة للدراسات
العليا والبحث العلمي

اللجنة الدائمة لأخلاقيات البحث على المخلوقات الحية
Institutional Review Board
NCBE Registration No.: HAP-05-D-003

IRB Number	IRB-PGS-2022-15-059		آيربيبجس-٠٥٩-١٥-٢٠٢٢
Project Title	Saudi Pre-Service Teachers' Beliefs and Practices Regarding Digital Technology in Early Years Education: A Qualitative Case Study		
Principal Investigator	Postgraduate Student / May Alyaeesh		
College / Center	Education	Department	Kindergartens
Approval Date	06/02/2022		

The application was reviewed and approved at Imam Abdulrahman Bin Faisal University IRB through an Expedited Review on Sunday, February 6, 2022.

Approval is given for three months from the date of approval. Projects, which have not commenced within two months of the original approval, must be re-submitted to the University Institutional Review Board (IRB) Committee. If you are unable to complete your research within the validation period, you will be required to request an extension from the IRB Committee.

On completion of the research, the Principal Investigator is required to advise the Institutional Review Board if any changes are made to the protocol, a revised protocol must be submitted to the Institutional Review Board for reconsideration.

Approval is given on the understanding that the "Guidelines for Ethical Research Practice" are adhered to. Where required, a signed written consent form must be obtained from each participant in the study group.

Chairman of the Institutional Review Board

Professor ████████████████

043 1 33 105

CC. - Dean
    Deanship of Scientific Research
    - Director General
    King Fahd Hospital of the University
    - Director
    Center for Research and Medical Consultations
    - Supervisor General for Quality and Safety
    King Fahd Hospital of the University
    - Director
    Monitoring Office for Research and Research Ethics
    - Director
    Pharmacy @ KFHU

Appendix F: Institutional Review Board Certificate

CITI PROGRAM

Completion Date 21-Jan-2022
Expiration Date 20-Jan-2025
Record ID 30746860

This is to certify that:

May Alyaeesh

Has completed the following CITI Program course:

Human Research
(Curriculum Group)
Social / Behavioral Investigators and Key Personnel
(Course Learner Group)
2 - Refresher Course
(Stage)

Under requirements set by:

University of South Florida

Not valid for renewal of certification through CME.

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w41d60741-3c69-4613-8d82-4a854c6a7ce1-30746860