The Digital Dilemma: Special Educators' Perceptions of Technology's Impact on Preschool Students' Development and Implications for Special Education Referrals

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by

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ABSTRACT

The increasing integration of digital technology into early childhood environments has created challenges for special educators responsible for identifying developmental delays in preschool-aged children, as behaviors associated with technology exposure may resemble indicators of genuine disability. Viewed collectively, this tension reflects what this study defines as the *digital dilemma* in early childhood special education practice. The specific research problem addressed in this study was special educators' difficulty distinguishing technology-influenced behaviors from true developmental delays during special education referral decision-making. The purpose of this qualitative grounded theory study was to examine special educators' perceptions of technology's role in preschool development and how those perceptions influence referral decisions within a Preschool Early Intervention Program in an Intermediate Unit in eastern Pennsylvania. Guided by Bronfenbrenner's Ecological Systems Theory and the Technology Acceptance Model, the central research question asked how special educators perceive the impact of technology exposure on preschool children's development and special education referral practices. Data were collected through a self-administered online survey completed by special educators working in classroom-based and home-based service settings and analyzed using iterative coding procedures. Findings indicated that educators frequently observed concerns in developmental domains commonly considered during referral decisions, including language, attention, social engagement, emotional regulation, and fine motor skills, and reported difficulty distinguishing environmentally influenced behaviors from persistent developmental delays due to the absence of structured, technology-sensitive referral tools. One key conclusion was that reliance on informal observation and professional judgment alone contributed to variability and uncertainty in referral decision-making. As a result, the study recommends the use

of structured, non-diagnostic decision-support tools, such as a technology exposure checklist, to enhance contextual understanding during referrals. The implications of this study support positive social change by promoting more accurate, equitable, and context-sensitive identification practices, reducing the risk of misidentification, and improving access to appropriate early childhood special education services.

DEDICATION

To the children and adults who have allowed me to walk beside them as their Speech Pathologist on their communication journey—this work is for you. Thank you for trusting me to help you find your voice and for lending me the grace to learn and grow alongside you. May you always know you are seen, heard, and loved.

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To my younger siblings Christopher, Shaylyn, and Cassie, I hope that, through this accomplishment, I have been able to serve as a positive example—showing you that even in the face of challenges, strength, determination, and heart can always guide the way.

Finally, to my dad. I wish more than anything that you were here to celebrate this milestone with your “Valentine baby.” I know you have walked beside me through every part of this journey. I hope I have made you proud and honored you well.

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Chapter 1 Introduction

Technology integration in early childhood education has become increasingly prevalent, reshaping how young children interact with their learning environment and develop foundational skills. The growing presence of digital devices, learning applications, and screen-based activities in preschool settings has created a complex landscape in which educators must assess both the potential benefits and possible adverse effects of technology use (Lim & Wardrip, 2024). As digital natives, preschool children have been exposed to technology from an early age, with tablets, smartphones, and educational applications becoming increasingly commonplace in both home and school environments (Basse, 2023). Early childhood educators are often positioned to observe how technology influences children's learning experiences, although they may face barriers such as insufficient training and limited resources (Ogegbo & Aina, 2020).

The rapid adoption of technology in early childhood has outpaced research on its long-term developmental effects, leaving educators uncertain about optimal implementation and cautious about potential risks (Sutiyono et al., 2022). These uncertainties particularly affected classrooms, where teachers determined whether observed behavioral patterns and developmental concerns indicated genuine disabilities or were the result of excessive or inappropriate technology exposure (Vellonen et al., 2025). Special education teachers reported greater use of digital tools and platforms, especially during the COVID-19 pandemic, highlighting both opportunities for learning and challenges in accurate developmental assessment (Rice, 2022).

Problem

This study addressed the challenge that special educators and early childhood education professionals face in differentiating between behaviors and developmental patterns associated with excessive or inappropriate technology exposure and those reflecting genuine developmental

delays that require special education services. Preschool teachers reported observing behaviors such as reduced verbal communication, shortened attention spans, social withdrawal, emotional dysregulation, and repetitive behaviors that are linked to technology use or may signal developmental concerns (Basse, 2023; Lipponen et al., 2025).

The inability to accurately distinguish between these causes results in inappropriate referrals for special education assessment, contributing to over-identification and inefficient use of resources. Conversely, misattributing genuine developmental challenges to technology exposure delayed necessary interventions. The absence of validated assessment instruments compounded this difficulty, and standardized protocols that considered the influence of technology use on child behavior were needed. Researchers designed the most current developmental assessment tools prior to the widespread integration of technology in early childhood education, providing limited guidance for interpreting technology-related behaviors.

Organizational Context

Early childhood and special education systems operate within frameworks shaped by federal and state regulations, institutional policies, and resource constraints. Under the federal law governing special education, the Individuals with Disabilities Education Act (IDEA), educators have a legal and ethical obligation to accurately identify and provide services to children with disabilities, making precise referral decisions crucial. However, the intersection of technology use and child development introduces new challenges that existing regulations do not explicitly address. Economically, early childhood programs were under pressure to integrate technology to remain competitive and meet parental expectations, while managing concerns about its misuse and potential developmental impacts. The costs of acquiring, maintaining, and updating technology, along with providing professional development, impose additional

financial demands (National Association for the Education of Young Children, 2023; Wu & Batista, 2025). Special education programs often face even greater financial limitations, reinforcing the importance of accurate initial referrals.

Socially, parental attitudes toward technology vary, with some families perceiving it as an educational asset and others expressing concern about developmental risks. Educators must navigate these perspectives while adhering to evidence-based practices (Mavilidi et al., 2020). Evidence-based practices were “programs or practices that have been proven effective through rigorous, objective research and evaluation and demonstrate positive outcomes when implemented with fidelity” (U.S. Department of Education, 2016). Social considerations also extend to generational differences among educators, such as comfort, knowledge, and confidence in integrating technology and in implementing and assessing its use, which vary across age groups. Ethical considerations focus on the responsibility to provide learning experiences that promote optimal development while avoiding potential harm. In referral decisions, this includes weighing the risks of both under-identification and over-identification to ensure accurate and equitable outcomes.

Existing Research

Research on educators' perceptions revealed complex and sometimes conflicting views on the role of technology in early childhood development. Lipponen et al. (2025) found that early childhood educators value the potential of educational technology while expressing concerns about its effects on children’s emotional and social development. Similarly, Ogegbo and Aina (2020) reported that early childhood teachers recognized instructional benefits but were cautious about suitability for young learners.

Studies on the integration of special education technology show that pre-service special education teachers often lack preparation for effectively incorporating technology, despite generally holding positive attitudes toward its use (Vellonen et al., 2025). Rice (2022) noted that increased technology use during the COVID-19 pandemic created both opportunities for service delivery and challenges in assessment accuracy.

This research was grounded in Bronfenbrenner's Ecological Systems Theory, which frames technology's influence across multiple environmental systems, and Davis' Technology Acceptance Model (TAM), which identifies perceived usefulness and ease of use as central factors in technology adoption (Bronfenbrenner, 1979; Davis, 1986, 1989). The theories were selected because they provide complementary perspectives on child development and educator decision-making in the context of technology use.

Bronfenbrenner's framework emphasizes the interconnected layers of a child's environment, ranging from the immediate microsystem of family and preschool to the broader macrosystem of cultural expectations. Applying this model enabled the study to consider how exposure to technology across these contexts may shape developmental outcomes. It also highlighted how environmental influences contributed to behaviors that resemble developmental delays or attention difficulties, which may affect referral practices.

In contrast, Davis' TAM provided insight into the perspectives of educators. It emphasized how beliefs about a tool's usefulness and ease of use influence decisions about whether and how technology was adopted. This framework was crucial for examining how educators perceive the role of technology in child development and how these perceptions inform their referral decisions.

Together, these frameworks establish a multidimensional lens for this study. Bronfenbrenner's theory situates children within their ecological contexts, while TAM addresses the attitudes and judgments of educators. Combined, they provide a comprehensive foundation for examining how technology influences preschool development and how educators' perceptions of technology impact special education referrals.

Significance of the Study

This study addressed a critical gap in the literature by exploring how early childhood and special education professionals navigate the complex relationship between technology use and child development when making referral decisions. The implications of this research were far-reaching, influencing professional practice, policy development in early childhood education, and theoretical understanding of technology's role in child development. For practice, the findings clarified how educators could more accurately distinguish between behaviors resulting from technology exposure and those indicating genuine developmental delays. The results informed the development of assessment tools and decision-making criteria aimed at enhancing referral accuracy and ensuring the appropriate allocation of special education resources. From a policy perspective, the study's outcomes informed the selection of suitable technologies for early childhood programs and defined the educator training requirements necessary to meet program standards. Theoretically, this research extended existing frameworks on technology acceptance and child development into the context of special education referral decision-making. This intersection between technology implementation and special education remains underdeveloped, with significant opportunities for empirical research to support robust theoretical models.

Research Questions

This study addresses four main questions:

1. How do special educators perceive the impact of technology on preschool children's development?
2. In what ways do special educators believe technology influences their decision-making process regarding special education referrals?
3. What specific behaviors linked to technology use were most frequently associated with concerns that led to special education referrals?
4. How do special educators differentiate between technology-induced behavioral changes and developmental delays when considering special education services?

Researcher Positionality and Assumptions

My dual role as a doctoral candidate and as a Speech-Language Pathologist Service Coordinator within an Intermediate Unit in Eastern Pennsylvania positioned me as both an insider and a researcher. This insider status provided valuable familiarity with the referral process and the developmental concerns special educator's encounter. However, it also introduced the potential for bias, as my professional experiences and clinical perspectives on the impact of technology influenced my interpretation of the data. I assumed that special educators hold meaningful insights into how technology affects child development, given their training and daily observations of children's behavior. I also assumed that children vary in their exposure to technology, and these differences were likely to manifest in observable behaviors, which educators identified and documented.

Research Participants and Methodology

This study employed a survey design targeting special educators within an Intermediate Unit in Eastern Pennsylvania that operated under the Preschool-Early Intervention Program. Eligible participants were employed as special educators, held active Pennsylvania teaching

certificates, and were directly engaged in service delivery and referral decision-making. The study employed a grounded theory approach, utilizing an online survey comprising twelve items: nine open-ended questions and three demographic questions. Both manual and AI-assisted coding were applied to identify themes and patterns in the responses, supporting a systematic analysis of the data. This qualitative design provided participants with the opportunity to articulate their experiences and decision-making processes in their own words, rather than restricting their perspectives to predetermined categories.

Limitations

This study focused on special educators and early childhood professionals working with preschool-aged children (ages 3 to 5 years) in educational settings. It captured special educator perspectives without directly assessing child outcomes or including family perspectives. The scope was limited to commonly used educational technologies such as tablets, educational applications, and classroom-based digital tools, excluding specialized assistive technologies. The geographic range was confined to specific regional educational systems, which may have limited generalizability.

Definition of Terms

Developmental delay: A significant lag in achieving developmental milestones across domains such as cognitive, language, motor, social-emotional, or adaptive functioning that warrants professional intervention and support services (Centers for Disease Control and Prevention, 2022).

Educational technology: Digital tools, applications, and devices designed or adapted for educational purposes in early childhood settings, including tablets, educational software, interactive whiteboards, and digital learning platforms (Sutiyono et al., 2022).

Screen time: The amount of time spent using screen-based devices, including tablets, smartphones, computers, and televisions, whether for educational or recreational purposes (Lipponen et al., 2025).

Special education referral: The formal process of recommending a child for comprehensive evaluation to determine eligibility for special education services under applicable federal and state regulations (Vellonen et al., 2025).

Technology-induced behaviors: Observable behaviors in preschool children that appear linked to excessive or inappropriate exposure to digital devices and screen-based activities, including but not limited to reduced verbal communication, shortened attention spans, and social withdrawal (Basse, 2023).

Conclusion

In this chapter, the problem was introduced as the increasing difficulty of distinguishing between behaviors shaped by technology use and those that reflect authentic developmental delays in preschool special education referrals. This challenge highlighted a critical gap for special educators who must make complex referral decisions in an increasingly digital world. To address this concern, the study was grounded in Bronfenbrenner's Ecological Systems Theory and Davis's Technology Acceptance Model (TAM). These frameworks provided complementary perspectives: Bronfenbrenner's theory situated children within multilayered ecological environments, while TAM captures educators' attitudes toward technology adoption and its role in decision-making.

Building on this foundation, Chapter Two provides a comprehensive review of literature related to the study's purpose. The review examined the historical progression of educational technology, developmental domains most affected by early screen exposure (cognitive, language,

motor, and social-emotional), and the influence of screen time on referral practices. It also considered educator perceptions, the challenges of distinguishing technology-induced behaviors from developmental delays, and broader issues of equity, access, and disproportionality in special education referrals. The chapter concludes by identifying key gaps in the existing literature, including the absence of longitudinal studies, the limited focus on special educators' perspectives, and the need for culturally responsive, technology-sensitive evaluation protocols.

Chapter Three outlines the study's methodology, which employed a qualitative grounded theory design to explore special educators' perceptions of the impact of technology on preschool development and referral practices. It describes the guiding research questions, the purposive sampling of special educators within an Intermediate Unit in eastern Pennsylvania, and the use of a 12-item online survey with nine open-ended and three demographic questions. The chapter also details data collection procedures, ethical safeguards, and the research timeline. Data analysis involved iterative manual and AI-assisted coding to identify emergent themes, with reliability supported by triangulation, peer debriefing, reflexive journaling, and data-grounded interpretation. Limitations, including response bias, the emerging nature of AI-assisted coding, and the regional scope of the study, were also acknowledged.

The remaining chapters extend the research design into findings and implications. Chapter Four presents the results of the data analysis, highlighting emergent themes that capture how special educators interpret the influence of technology on development and referral decisions. Chapter Five discusses the implications of these findings for professional practice, policy, and future research. Emphasis was placed on strategies to improve referral accuracy, provide professional development that equips educators to evaluate the role of technology in child development, and address disproportionality in special education referrals. The final

chapter also provides recommendations for future research, including the development of longitudinal studies and technology-sensitive assessment tools.

Chapter 2 Literature Review

Purpose

The purpose of this qualitative study was to explore special educators' perceptions of how increased exposure to technology and screen time, ranging from passive media such as television to interactive tools like tablets and educational applications, impacts the development of preschool-aged children and influences special education referral practices. The study specifically examined how special educators interpret and differentiate behaviors that may be attributed to excessive or early technology use from those that may indicate underlying developmental delays. The distinctions were crucial in early childhood settings, where educators were responsible for making timely and accurate special education referrals.

This research further investigated the ways in which technology exposure informs educators' decision-making processes regarding special education referrals. It sought to understand which specific behaviors linked to technology use were most frequently associated with concerns that prompt referrals, including observed patterns such as communication delays, attention difficulties, social withdrawal, and fine motor challenges. The ability of teachers to distinguish between technology-induced behavioral changes and persistent developmental disabilities was crucial for the accurate identification and provision of appropriate support to preschool children.

The study also addressed how evolving digital environments have introduced complexities into special education referral practices, particularly in the wake of increased screen exposure following the COVID-19 pandemic. Additionally, it was explored whether current educational frameworks and referral protocols sufficiently account for the developmental

impacts of technology, as well as whether educators receive adequate professional development to support these nuanced evaluations.

This literature review examined the historical progression of educational technology, the foundations of the special education referral process, and the intersection of technology with cognitive, language, motor, and social-emotional development in preschool children. The review also explored special educators' perceptions of technology in early childhood settings, the influence of socioeconomic factors and digital equity on technology exposure and child development, and the implications of these variables for disproportionality and potential overidentification in special education services. The research questions that drive this study are:

1. How do special educators perceive the impact of technology on preschool children's development?
2. In what ways do special educators believe technology influences their decision-making process regarding special education referrals?
3. What specific behaviors linked to technology use were most frequently associated with concerns that led to special education referrals?
4. How do special educators differentiate between technology-induced behavioral changes and developmental delays when considering special education services?

Need for the Study

To further clarify the scope of this study, the specific gaps in the existing literature were addressed. While many studies have examined the general developmental effects of screen time, there has been a notable lack of longitudinal research that tracks how early exposure to technology influences special education referral patterns over time. Additionally, there was limited research that specifically addressed how educators distinguished between technology-

induced behaviors and persistent developmental delays within diverse preschool populations. There was also a documented need for culturally responsive and socioeconomically sensitive assessment tools that account for children's technology use histories, media content exposure, and family technology management practices. The tools helped ensure that referral decisions were equitable and not biased by environmental influences such as access to educational technology, parental screen supervision, or socioeconomic status (Röhlke, 2025; Smith, 2022; Yalçin et al., 2021).

This study helped fill an important information gap by exploring how special educators perceive the role of modern technology exposure in the special education identification process in early childhood learning environments. As screen time continues to increase in the daily lives of young children, particularly following the COVID-19 pandemic, educators require evidence-based guidance to differentiate between behaviors linked to excessive technology use and those warranting developmental evaluations. This research informed the design of professional development programs that not only build educators' technical skills but also prepare them to assess the nuanced developmental impacts of technology use. The findings influenced assessment practices and special education referral frameworks, supporting more accurate identification and reducing the likelihood of inappropriate referrals based on behaviors shaped by technology exposure.

The study was directly relevant to special education as it examines factors that may contribute to overidentification and disproportionality in early childhood special education services. Recent Pennsylvania data highlighted an increase in special education referrals, particularly among Black and Hispanic preschool children (Pennsylvania Department of Education, 2023a), underscoring the need for more equitable and context-sensitive evaluation

processes. By capturing the perceptions of special educators, this study contributed valuable insights into how developmental concerns were interpreted in technology-rich environments. The research also supported the development of targeted assessment solutions that clearly distinguish between environmental factors, such as excessive screen exposure, and intrinsic developmental disabilities. This differentiation was essential to ensure that special education resources were allocated appropriately to children with true developmental needs, avoiding misidentification that could otherwise result from environmental influences related to modern digital exposure.

History of Educational Technology

The use of technology in teaching and learning has expanded significantly over the past two decades. Initially, technology in preschool classrooms consisted of simple audiovisual aids, such as educational television programs. One of the earliest examples was Sesame Street, introduced in 1969, which was designed to combine entertainment with educational content to support early literacy and numeracy skills among young children (Fisch & Truglio, 2001). Research on Sesame Street has demonstrated that screen-based media can support early learning when the content is developmentally appropriate and intentionally designed for educational purposes (Anderson et al., 2000). By the early 2000s, some early childhood programs incorporated computer-based learning centers into preschool classrooms (McManis & Gunnewig, 2012). Traditional desktop computers, however, often presented challenges for young children due to the motor skills required for their use. A significant shift in educational technology occurred with the introduction of touchscreen devices, particularly following the release of the iPad in 2010 (Falloon, 2023). Touchscreen technology offered gesture-based navigation that aligned with preschoolers' developmental capabilities, facilitating independent use (Couse & Chen, 2010). The introduction of touchscreen devices contributed to the broader

integration of educational applications specifically designed for young children in early childhood settings.

The integration of technology in early childhood education has progressed through several stages. The introduction of touchscreen devices provided gesture-based navigation that aligned with the motor skills of young children. This development was followed by the creation of digital learning solutions designed for early learners. The subsequent expansion of educational applications provided young children with access to a variety of digital activities, including basic letter recognition and more complex problem-solving games. Couse and Chen (2019) found that educational applications developed for preschool children often incorporated adaptive features that adjusted content delivery based on the user's performance, supporting skill development across different levels of complexity. More recently, artificial intelligence has been integrated into adaptive learning technologies to adjust the sequencing and difficulty of content based on individual learner responses. Chen et al. (2023) conducted a systematic literature review, demonstrating that AI-driven adaptive learning systems can modify instructional pathways in real-time, aligning content with students' performance and progress. These findings described how artificial intelligence and adaptive educational applications were being applied to structure learning experiences for young children in digital environments.

Foundations of Special Education Referral Processes

In the United States, the special education referral process can be traced to federal law, the Individuals with Disabilities Education Act, otherwise known as IDEA, wherein all children, equally, irrespective of their abilities, were entitled to free appropriate public education (FAPE) in the least restrictive environmental setting (U.S. Congress, 2024). The principle of least restrictive environment (LRE) emphasizes that children with disabilities should learn alongside

their typically developing peers to the fullest extent appropriate. In preschool special education, this means that referrals and placement decisions must prioritize access to natural learning environments, such as general education preschool classrooms, while only considering more specialized or separate settings when the child's needs cannot be met satisfactorily, even with supplementary supports and services (Individuals with Disabilities Education Act [IDEA], 2004). Child Find is a requirement of IDEA, obligating schools to seek and assess children who show signs of possible developmental delays or disabilities, beginning at the age of three. The process was essential in preschool-level settings where developmental trajectories were most likely to be altered through early intervention strategies. The identification and referral process were founded on observation as well as data gathered from screenings, test scores, rating scales, educators, and parent interviews. Early signs of developmental difficulties, such as those affecting communication, cognitive processing, motor skills, and social interaction, can often be identified by preschool teachers, as they are often among the first to notice any issues. Such information and data gathering were recorded over specific periods, followed by a request to support teams or specialists. When concerns remain unresolved, a comprehensive assessment was conducted to determine eligibility for special education services based on one or more of the 13 categories of disability defined by the IDEA (U.S. Congress, 2024).

Preschool Developmental Needs and Learning Frameworks

Bronfenbrenner's (1979) ecological systems theory provides a framework for understanding how multiple environmental layers influence child development. The theory categorizes influences into systems, including the microsystem, which involves direct interactions within a child's immediate environment, and the exosystem, which encompasses external settings that indirectly affect the child. Although Bronfenbrenner's original work did not

specifically examine screen time, the ecological model has been frequently applied in contemporary research to analyze how factors such as parental technology use and school-level policies relate to children's developmental outcomes. This framework emphasizes the importance of considering both the amount of screen time and the environmental contexts in which it occurs.

Developmental Needs of Preschool Learners

The role of technology in the education of preschool-aged children must be evaluated in consideration of their unique developmental characteristics. The early childhood stage encompasses the ages of three to six, a period during which children undergo rapid growth in various developmental domains simultaneously. Cognitive development at this stage was associated with the formation of symbolic thinking, the development of language, and the emergence of early concepts of literacy and numeracy (Salaj & Masnjak, 2022). Children develop executive functioning skills, which encompass attention, working memory, and cognitive flexibility as primary components of their cognitive abilities.

Social and emotional development encompasses the development of peer relationships, various strategies for emotion regulation, as well as the development of empathy and perspective-taking skills (Aydın & Demircioğlu, 2022). Physical development encompasses all gross motor and fine motor skills, which involve activities such as running, jumping, and writing, as well as more detailed manipulations and handicrafts (Salaj & Masnjak, 2022). The domains of development were interrelated in such a way that growth in one domain aided growth in others.

The concept of sensitive periods was worthwhile when discussing the integration of technology. The brain undergoes enhanced neuroplasticity during early childhood, with neuroplasticity being most rapid in the first five years, making this a crucial age for building foundational skills and neural pathways (Asby, 2018). Neuroplasticity refers to the brain’s ability

to change, adapt, and form new neural connections in response to learning and experience (Asby, 2018). As part of pedagogy in early childhood, the idea behind traditional early childhood educational practice was that young children learn best when they have direct access to materials through interaction with peers and play (Pyle et al., 2020). This reality of development presents opportunities and challenges for integrating technology, as digital tools should not be a substitute for these underlying modalities of learning.

Curriculum Expectations

Pennsylvania's Early Learning Standards promote a holistic approach to early childhood development, emphasizing cognitive, social-emotional, language, and physical domains within structured, play-based learning environments (Pennsylvania Department of Education [PDE], 2024). These standards help educators establish age-appropriate developmental objectives and benchmarks that prepare children for school readiness (PDE, 2024). Consistent developmental monitoring was recommended through the use of checklists, work samples, and anecdotal observational records, which were considered best practices in Pennsylvania's educational assessment procedures (PDE, 2023). When a child persistently fails to meet developmental benchmarks despite receiving appropriate instructional support, Pennsylvania's Early Intervention and special education guidelines recommend initiating early intervention referrals or comprehensive evaluations to determine eligibility for special education services (PDE, 2022). The standards were designed to support individualized instruction within a flexible framework that aligns academic objectives with developmental progress, ensuring timely support within the least restrictive environment to promote optimal growth (PDE, 2024).

Increase in Technology Use in Preschool Children

The introduction of technology has become a central aspect of early childhood education, influencing both children's learning experiences and the instructional practices of teachers. Marsh et al. (2023) conducted a national study in Australia that examined the integration of digital technologies in early childhood education and care (ECEC) settings. The study found that teachers frequently use tablets, interactive applications, and digital learning platforms to support curriculum delivery, increase student engagement, and facilitate communication with families (Marsh et al., 2023). These tools have been incorporated into classroom activities, planning, documentation, and assessment processes. According to this study, the use of technology in early childhood education and care settings is associated with learning environments that incorporate interactive digital components, which are linked to the development of cognitive, social, and problem-solving skills (Marsh et al., 2023). The study provides evidence of technology's role in shaping educational practices and classroom structures in early childhood education.

The use of digital devices in preschool classrooms has become increasingly popular over the past few years. Dore & Dynia (2020) stated that 20% of teachers have begun using tablets daily, and 27% use computers weekly. Children were gaining access to technologies at younger ages and, consequently, spend significantly more time in front of screens, whether at home or in school. The Canadian Paediatric Society (2022) reported that children under five years of age were frequently exposed to screens, both at home and in educational environments, with many interacting with digital media before the age of two. The society recommended limiting passive screen exposure and highlighted the potential benefits of co-viewing experiences for supporting language development and social engagement. Additionally, unstructured and independent screen time was associated with reduced attention spans and challenges in social-emotional skills (Canadian Paediatric Society, 2022).

Research indicated that children were gaining access to technology at increasingly younger ages, with growing attention to the developmental consequences of early and prolonged screen exposure. A longitudinal study conducted by Uchikoshi et al. (2023) examined the association between infant screen exposure and subsequent developmental outcomes. The study followed 7,097 children and found that increased screen time at one year of age was statistically associated with communication and problem-solving delays at ages two and four (Uchikoshi et al., 2023). Infants exposed to four or more hours of screen time per day were at the highest risk of developmental concerns (Uchikoshi et al., 2023). The authors reported that excessive early screen exposure was linked to outcomes that suggest potential interference with developmental processes related to social interaction and cognitive skill acquisition (Uchikoshi et al., 2023).

In a cross-sectional study, Hutton et al. (2020) employed diffusion tensor magnetic resonance imaging (DTI) to investigate the brain structures of preschool-aged children (aged three to five years) in relation to their screen time exposure. The study found that higher screen use was significantly associated with lower white matter integrity in brain areas involved in language, executive function, and emergent literacy skills (Hutton et al., 2020). White matter integrity was essential for efficient neural connectivity and information processing. The study identified that excessive screen exposure was correlated with structural differences in neural pathways associated with language and cognitive functions (Hutton et al., 2020).

Studies demonstrate that 80% of teachers report a need for developmental evaluation referrals after increasingly initiating the use of screens (ASHA, 2023). Children who utilize over one hour of daily screen time present a 41-81% greater vulnerability in crucial stages of development (Kerai et al., 2022). Collectively, these studies document that early and

unstructured screen exposure was associated with measurable developmental and neurological differences in young children.

Technology's Impact on Preschool Students' Development

Technology and Cognitive and Language Development

The correlation between screen time and cognitive and language development in early childhood has become a growing concern, particularly in light of the COVID-19 pandemic, which has led to an increased integration of digital media into children's everyday lives. Panjeti-Madan & Ranganathan (2023) provide a thorough review of how exposure to screen time affects the language and cognitive development of children under the age of eight. Their results suggested that prolonged screen exposure, especially to passive and non-educational media sources, was consistently associated with lower language learning, poor verbal expression, and reduced cognitive flexibility (Panjeti-Madan & Ranganathan, 2023). Screen exposure at an early age, particularly before the age of two, appeared to disrupt critical brain development and delay the maturation of executive functioning and early literacy skills (Panjeti-Madan & Ranganathan, 2023).

The literature on the subject focuses on the differences between passive media use, such as television, and interactive forms of media, including the use of educational applications or video chats. While passive screens may contribute to a delay in language maturational stages, interactive technologies can have a neutral or even positive effect on language development when developed in a pedagogically driven manner. Dore & Dynia (2020) found that computers and tablets were commonly used in preschool classrooms to facilitate teaching activities, mostly for reviewing academic materials or reinforcing what students had already learned. Nonetheless, the interaction quality was decisive. In content that was not scaffolded or contained adult

participation, the same level of development gains was not achieved when compared to the context of teacher-supported content (Dore & Dynia, 2020).

Wang et al. (2024) found that exposure to educational content was linked to better developmental outcomes when screen time was balanced and directed. Conversely, exposure to non-child-directed entertainment shows posed a risk of developmental lag, particularly in language-dense interactions. Children who have access to more than four hours of screen content per day, with or without any content on the screen, are at high risk of cognitive and language impairment (Wang et al., 2024). These findings underscore the critical need for the intentional and developmentally appropriate integration of technology in early childhood environments when considering language acquisition.

Technology and Social Emotional Learning

Technology holds transformative potential in shaping how young children learn, develop, and interact with their environments. Recent research highlights the growing importance of examining the intersection of digital technology and human emotion, particularly within the framework of social-emotional learning (SEL). Shen et al. (2025) demonstrated that integrating artificial intelligence (AI) into children's digital content can effectively promote social-emotional learning and enhance parent-child interactions. Their study introduced an AI-mediated tool that incorporated SEL reflection prompts into video viewing, resulting in increased emotional awareness in children and more meaningful parent-child conversations (Shen et al., 2025). This evidence highlights the growing role of technology in supporting children's social and emotional development as digital integration becomes increasingly prevalent in educational settings.

Several elements were integral to promoting positive peer interactions among young children, including classroom organization, facilitating peer relationships, teacher modeling,

providing spontaneous teaching opportunities, direct instruction in social skills, and fostering friendships. Beyond these traditional approaches, technology has also proven useful in facilitating social interactions. Lau et al. (2005) found that the strategic use of technology can successfully enhance peer relationships among young children. However, the application of technology in early childhood classrooms often remains limited to foundational academic activities, such as alphabet recognition or counting, leaving educators to independently identify and implement activities that support broader developmental goals, including SEL.

Tablet-based learning, particularly through devices such as the iPad™, has further illustrated the benefits of small-group collaboration in early childhood settings. Aronin and Floyd (2013) reported that tablets offer interactive opportunities to introduce STEM concepts while simultaneously encouraging cooperation and shared problem-solving. Many applications designed for these devices were aligned with Common Core State Standards and can be used to reinforce social-emotional competencies. These tools provide children with opportunities to practice turn-taking, communication, and collaborative engagement-skills essential to healthy social development.

Technology and Behavior, and Attention

Studies indicate a strong correlation between excessive screen time and behavioral and attention challenges, which could directly influence referral decisions by classroom teachers and special educators. In a large-scale quantitative study, Madigan et al. (2019) analyzed data from nearly 2,000 children at 36 months of age. They found that higher levels of screen time were significantly associated with behavioral issues, delayed developmental milestones, and reduced vocabulary acquisition, key indicators that often trigger special education referrals. In a slightly larger study, Kerai et al. (2022) used data from 2,983 children entering kindergarten in British

Columbia and found a statistically significant correlation between spending more than one hour a day on test preparation and an increase in vulnerability in several significant developmental domains. The odds of children from the group with excessive screen time experiencing problems with social skills, emotional maturity, language, cognitive abilities, and communication skills were significantly increased (Kerai et al., 2022). Complementing these findings, a qualitative study by Ribeiro et al. (2022) explored preschool teachers' perceptions of technology use among children aged three to six. Educators reported that excessive screen exposure appeared to reduce play engagement and hinder expressive language development, both of which are essential components of early learning and social interaction. Taken together, these studies highlight how both objective data and educator observations consistently support the conclusion that early and frequent technology use can present as developmental concerns.

According to Jusienė et al. (2025), preschoolers spent 112 minutes per day in front of a screen, and 35.2% of parents resorted to screens to deal with their children's emotional discomfort. Although emotional reactivity in children remains the strongest predictor of behavioral challenges, screen time has been identified as a contributing factor in the emergence of behaviors directed toward others (Jusienė et al., 2025). This study emphasizes the importance of distinguishing carefully between behavior changes influenced by technology use and those indicative of emotional or behavioral disorders.

Media content quality was a critical factor that special educators should consider when assessing potential developmental concerns. Wang et al. (2024) found that exposure to educational programming serves as a protective factor, helping to reduce the risk of adverse mental health outcomes in kindergarten-aged children. In contrast, exposure to non-child-focused adult programming significantly increases the likelihood of psychological issues (Wang et al.,

2024). This distinction was essential, as it highlighted the need to differentiate between developmental challenges linked to inappropriate media exposure and those that reflect genuine developmental disabilities requiring intervention.

Such assessment remains challenging, indicating the need for evaluation tools that go beyond measuring screen time alone. Yalçin et al. (2021) developed the *Seven-in-Seven* screen exposure scale to examine multiple dimensions of screen use in preschool-aged children, including daily screen duration, co-viewing with parents, parental control rules, and types of content consumed. Their study identified that 22.5% of preschoolers exhibited problematic screen exposure patterns, which were associated with demographic factors such as younger maternal age, lower levels of maternal education, and home-based childcare arrangements (Yalçin et al., 2021). The factors were commonly linked to delayed referrals and can introduce complexities in determining special education eligibility. Survey data collected during the COVID-19 pandemic from the American Speech-Language-Hearing Association (ASHA, 2023) reported that among the professionals surveyed, 59% attributed delays to reduced opportunities for peer interaction, while 51% identified excessive screen time as a contributing factor.

Technology and Physical Readiness

Another area impacted by an extended amount of time spent on screens at a young age was fine motor development. Dinehart and Manfra (2013) found that fine motor skills developed in preschool, particularly fine motor writing skills, were significant predictors of academic performance in reading and mathematics by second grade. Conventional preschool programs often incorporate manipulative activities such as cutting, drawing, writing, and assembly, which have been associated with the development of fine motor skills that support later academic achievement. Kerai et al. (2022) indicated that the children who had more than one hour of

sitting in front of a TV or a computer during the day were significantly more likely to be found with developmental weaknesses in all physical domains. Touch screens were simple to operate and not as complex as the traditional manipulatives to enable grip power, hand-eye coordination and bilateral motor control. Yalçin et al. (2021) detected that the incidence of problematic screen exposure in Turkish preschoolers was high, and the measure was related to delays in fine motor development. Screen time during meals and sleep periods was also found to contribute to irregular routines and reduced physical activity, which indirectly impacted children's physical readiness for school-related tasks (Yalçin et al., 2021).

Underdevelopment of muscles of the hands, which may result from the increased use of swipe, tap and dragging gestures, can also be experienced with failure to perform key academics like writing or handling pens and crayons. According to the study by Dore & Dynia (2020), teachers stated that students tended to have problems with these tasks even though they were very skilled in working with tablets. This difference can then exacerbate inequalities in school readiness and the ability to engage in gross motor actions, which were often employed in the referral process for special education.

Special Educators' Perceptions of Technology in Early Childhood Settings

General Educator Perceptions

According to Dore & Dynia (2020), the use of tablets and computers in the teaching process was also frequently observed. Still, the pattern varied widely, depending on the type of program (e.g., publicly funded vs. privately funded) and the teacher's background. More experienced and highly educated teachers were more willing to use technology purposefully and to consider it an added resource rather than a distracting tool (Dore & Dynia, 2020). Rad et al. (2023) applied the Technology Acceptance Model (TAM) to the Romanian preschool teacher

population and demonstrated the role of perceived compatibility and pleasure as critical mediators between actual technology acceptance and utilization. According to the study, teachers who were comfortable using the technology and liked it had a better chance of incorporating it effectively into the classroom lesson, yet most educators did not receive sufficient training on pedagogical integration and instead focused solely on the technical aspects (Rad et al., 2023).

Yang and Hong (2022) examined professional development models in China, finding a mismatch between training materials and classroom practice, as educators were taught only how to operate the devices rather than how to incorporate them into their teaching or child development plans. This disconnect contributed to stress and disparities in technology implementation, with teachers expressing ambivalence about the role of technology-recognizing its potential but also fearing overuse, particularly regarding screen time monitoring, behavioral control in the classroom, and long-term developmental consequences (Yang & Hong, 2022).

Special Educator Perceptions

The COVID-19 pandemic heightened the need for special educators to learn about the developmental impact of technology. Although perceptions of general educators were well-documented, a gap was noted in the literature that aims to study the views of special educators about the impact of technology on development and special education referrals. Nonetheless, certain trends can be identified among adjoining studies.

Distinguishing between actual developmental delays and those resulting from environmental exposure, or in this case, digital isolation was a crucial determination. It affects accurate service eligibility and the need to develop Individualized Education Programs (IEPs). Teachers interviewed by Ventouris et al. (2021) reported that excessive technology use was associated with social isolation, emotional challenges, and reduced self-esteem in children. These

factors were identified as potential contributors to behaviors sometimes considered during developmental evaluations. The study highlights the need to distinguish between behaviors influenced by environmental factors, such as technology use, and those indicative of developmental conditions. Children with predispositions-such as difficulties with emotional regulation or limited verbal interaction-may be more adversely affected by screen exposure (Ventouris et al., 2021). Jusienė et al. (2025) further supported this view, noting that screen time tends to exacerbate preexisting emotional sensitivities, which may lead to more pronounced behaviors in structured settings and, consequently, an increased likelihood of referrals.

Special educators' perceptions of technology have been identified as influential in their decision-making processes regarding special education referrals. Karasu et al. (2019), in a qualitative study involving 27 special educators in Turkey, reported that teachers' beliefs and attitudes toward educational technology were associated with their use of instructional tools and their approaches to special education referrals. The study found that educators who reported positive perceptions of technology were more likely to implement digital tools in their instructional practices and consider technology-supported strategies prior to initiating special education referrals (Karasu et al., 2019). Educators who reported uncertainty or limited confidence in using educational technology were less likely to use these tools in the classroom, and their perceptions and familiarity with technology influenced both their instructional choices and their referral practices (Karasu et al., 2019).

Technology and Special Education Referrals

Given the significant influence of technology on multiple areas of child development, it was important to examine how these developmental shifts inform and impact the process of special education referrals.

Trends in Referrals Post Pandemic.

The COVID-19 pandemic significantly influenced early childhood education and the process of referring young children to special education services, with contributing factors including prolonged screen exposure during lockdowns and the absence of in-person learning environments (McArthur et al., 2021; The Education Trust, 2021). During the pandemic, screen exposure among infants and toddlers increased. Radesky et al. (2023) reported that 62% of children aged eight to 36 months exceeded recommended guidelines during the pandemic, which advise no screen time under 24 months and no more than one hour per day for ages two to five.

The COVID-19 pandemic significantly disrupted early childhood education in Pennsylvania, leading to measurable changes in special education referrals. Preschool enrollments dropped notably during the 2020–2021 academic year (Pennsylvania Office of Child Development and Early Learning [OCDEL], 2021). In Federal Fiscal Year (FFY) 2020, the state conducted approximately 17,000 initial eligibility evaluations and issued over 7,100 new Individualized Education Plans (IEPs) for preschool-aged children, reflecting efforts to address evaluation backlogs arising during pandemic-related closures (Pennsylvania Training and Technical Assistance Network [PaTTAN], 2021). By FFY 2023, early intervention participation had increased, with a documented rise in infants and toddlers receiving Individualized Family Service Plans (IFSPs) (Pennsylvania Department of Education, 2024). According to the Pennsylvania Department of Education (2024), Individualized Family Service Plans were written plans developed for infants and toddlers with developmental delays or disabilities. An IFSP outlines the child's current levels of development, sets measurable goals, and specifies the early intervention services and supports the family received. Education professionals in Pennsylvania have linked this post-pandemic increase in referrals to delayed developmental screenings during

lockdowns, extended screen exposure, and limited social interaction during critical developmental periods (OCDEL, 2021). National survey data from professionals obtained by ASHA (2023) reported a marked increase in developmental referrals following the COVID-19 pandemic, with the most frequently cited contributing factors being limited access to social interaction and excessive screen time. These professionals observed that many referred children presented with language delays, reduced attention spans, and impaired communication skills-patterns commonly associated with high levels of screen exposure (ASHA, 2023).

Behaviors and Indicators Leading to Referrals

The misidentification of technology-induced behaviors as developmental disorders presents a significant challenge. Kerai et al. (2022) highlighted a critical concern in their study, noting that kindergarten teachers administering the Early Development Instrument (EDI) lacked awareness of children's prior screen exposure during assessments. As a result, children exhibiting issues such as emotional dysregulation, social withdrawal, or attention difficulties-potentially stemming from excessive technology use-risk being inaccurately referred for special education services despite not having underlying developmental disabilities (Kerai et al., 2022).

Communication delays were frequently reported as a primary reason for referral due to their impact on language development and classroom functioning (Zhao et al., 2024). Fine motor delays, such as challenges with cutting, writing, or manipulating small objects, were also regularly identified in the referral process, as these skills were required for participation in school-based tasks (Bart et al., 2011). Limited social involvement, including reduced peer interaction, minimal eye contact, and difficulty participating in group activities, was consistently documented as a referral factor in early childhood (Hirano et al., 2021). These domains-communication, motor, and social behaviors-are consistently recognized in both professional

guidelines and empirical research as primary factors that lead to initial special education referrals (Bhat et al., 2022; New York State Education Department, n.d.).

Both Kerai et al. (2022) and Wang et al. (2024) attributed the negative consequences of high screen time to deficits in language skills, physical well-being, and emotional maturity, developmental areas critical for preschoolers to engage in reciprocal conversations, follow classroom routines, and use writing tools. These developmental red flags often align with eligibility criteria outlined in IDEA, prompting many teachers to recommend formal evaluations, even when the behaviors may be more accurately attributed to environmental factors such as excessive screen use.

Distinguishing Technology-Induced Behaviors and Disorders

Distinguishing between behaviors resulting from excessive technology use and those indicative of developmental delays in preschool children requires systematic evaluation. Both can present with overlapping characteristics such as reduced attention span, limited social interaction, and delayed communication skills, which were commonly used markers in special education referrals (Yalçin et al., 2021; Zhao et al., 2024).

Children who engage in high levels of passive screen time often demonstrate inattention or social withdrawal primarily during or immediately following technology exposure (Radesky et al., 2023). Behaviors associated with excessive technological use were typically characterized by situational or reversible patterns. These behaviors can improve when screen time is reduced or replaced with interactive, face-to-face engagement (Wang et al., 2024). Additionally, excessive screen use has been linked to behaviors such as difficulty transitioning away from devices, agitation when denied access, and a preference for solitary digital play over peer interaction (Yalçin et al., 2021).

Developmental delays often present consistently across multiple settings and contexts, regardless of technology exposure. For example, a child with a communication delay may demonstrate limited expressive or receptive language abilities during both structured assessments and unstructured social interactions, whether or not technology was involved. These delays typically persist over time and were not resolved through environmental changes alone (American Speech-Language-Hearing Association [ASHA], 2023). Developmental delays were also frequently accompanied by additional indicators such as delayed motor skills, persistent difficulties with adaptive behaviors, or significant challenges in reciprocal social interactions. Children affected by technology overuse may show developmental changes when screen time is moderated and replaced with enriched, language-rich, and socially engaging environments (Wang et al., 2024). Children with developmental delays often require sustained, targeted interventions.

Evaluations and the Identification of Developmental Delays

The evaluation process requires collaboration among families, educators, and specialists to gather detailed developmental histories, including information on daily technology use patterns, screen content, and supervision practices (Radesky et al., 2023). Assessment approaches that consider family routines, socioeconomic factors, and access to technology were used to support accurate identification. Screening and observation tools were available to assist in the evaluation of these concerns. However, studies have reported that some educators lack sufficient training and resources to accurately interpret behaviors that may be influenced by digital exposure, particularly in environments where technology use is frequent (Karasu et al., 2019; McManis & Gunnewig, 2012). These findings highlight the necessity for assessment tools and professional training that address the influence of technology in child development

evaluations. As described by Yang & Hong (2022), professional development programs often fail to equip educators to evaluate or cope with the subtle influence of digital media on child development in most cases.

Emerging research indicates that children experiencing difficulties with attention, engagement, communication, and emotional regulation may display behaviors that resemble developmental disorders but may, in some cases, be influenced by extended or inappropriate technology exposure (Madigan et al., 2019; Zhao et al., 2024). Without comprehensive evaluation procedures that incorporate detailed histories of digital use, educators may rely on incomplete behavioral data, potentially leading to inaccurate identification of developmental delays (Duch et al., 2013; McManis & Gunnewig, 2012). This complexity was intensified by the fact that many children may engage in unmonitored screen use over prolonged periods before any developmental concerns were formally recognized or referrals were initiated (Radesky et al., 2020). Additionally, Christakis et al. (2018) emphasized that rapid shifts in digital consumption patterns require updated assessment protocols that account for screen-related influences on child behavior. To improve diagnostic accuracy, evaluation strategies must include systematic considerations of both environmental factors and the potential for temporary, technology-related developmental variations (Madigan et al., 2020; Nikkelen et al., 2014). Such approaches may help differentiate between screen-induced behaviors and persistent developmental disabilities that necessitate sustained intervention.

Adapting Teaching Designs for Digital Natives

Studies have found that successful technology implementation was not solely about the availability of devices but rather about the effective use of pedagogy. Aldhafeeri and Alotaibi (2022) found that the Digital Education Shifting (DES) approach significantly improved student

engagement in online learning environments. In their experimental study involving 245 female high school students in Kuwait, those taught by teachers trained in the DES model demonstrated notably higher levels of both external and internal engagement compared to students in the control group. The study challenges the assumption that digital learning inherently reduces engagement, instead showing that when implemented thoughtfully, the DES approach can make online education more effective and interactive. Additionally, educational experts surveyed in the study expressed strong support for the DES model, affirming its sustainability, practicality, and potential as a guiding framework for transitioning from traditional to digital instruction in K–12 settings. The significance of this finding was crucial for special educators, who should determine whether low engagement was an instructional issue or a developmental issue.

To enable appropriate assessment, educators need certain innovative technological knowledge. The research conducted by Dore & Dynia (2020) surveyed 312 preschool teachers, according to which the most common portable device used to facilitate instruction was tablets (20% of responders use it daily and 27% use it weekly, respectively) and computers (29% of responders use it daily and 22% use it weekly, respectively). Nonetheless, the use of smartphones and televisions was related to entertainment or behavioral control. Such a distinction was crucial for special educators who assess whether the identified developmental delays were the result of incorrect exposure to technology or actual disabilities that need to be addressed.

The condition of technology use was a critical factor in special education evaluations and was equally significant to the total duration of screen exposure. Research has identified that the developmental impact of technology varies based on specific conditions, including the type of content, the degree of interactivity, the presence or absence of adult involvement, and whether

the technology use was passive or active (Duch et al., 2013; Wang et al., 2024). Evidence indicates that exposure to educational content and co-viewing with adults were associated with more favorable developmental outcomes, while passive exposure to adult-oriented or non-educational content was linked to developmental risks, including language delays and decreased cognitive engagement (Madigan et al., 2020; Zimmerman et al., 2007). These findings support the inclusion of both quantity and context of screen exposure as essential components in special education assessments to accurately evaluate the potential influence of environmental factors on child development.

According to Yang and Hong (2022), Information and Communication Technology (ICT) training for kindergarten teachers in China focused primarily on how to use technology, without addressing how to integrate it into the curriculum or consider its broader educational implications. The study suggests that efficient technology implementation requires fundamental pedagogical changes, emphasizing active dialogue, collective learning, instant feedback, and engaging instruction.

Equity, Access, and Implications for Special Education

Digital equity, defined as equitable access to technology, can complicate special education referrals due to persistent patterns of socioeconomic disparities in both technology access and usage. Research shows that children from lower-income households frequently experience barriers to accessing high-quality educational technology, reliable internet connections, and digital devices necessary for active learning (Auxier & Anderson, 2020; Rideout & Katz, 2016). These students were also more likely to rely on television or mobile devices for passive entertainment rather than engaging with interactive, educational digital platforms (Rideout & Katz, 2016). This discrepancy in exposure patterns can influence

developmental outcomes relevant to special education assessments. Duch et al. (2013) found that increased screen time was associated with reduced language development in Hispanic toddlers, particularly in families where access to educational content was limited. Their study emphasized that language exposure in digital environments was not equivalent to interpersonal communication, and children with limited access to enriching screen content may present with delays that could be misinterpreted as developmental disabilities. Similarly, Reich et al. (2019) reported that the quality and type of home learning environments significantly differed across socioeconomic groups, with children from lower-income families spending more time with non-educational screen content, which correlated with lower academic performance.

Nouri et al. (2020) found that digital access inequities have a direct impact on educational inclusion and student learning outcomes. Their research demonstrated that students from marginalized backgrounds were more likely to experience limited digital access both at home and in educational settings, increasing the risk of being misidentified during assessments that do not account for these disparities (Nouri et al., 2020). Röhlke (2025) conducted a study involving 2,490 families in Switzerland, employing latent class analysis to identify four distinct patterns of digital media use in young children: Heavy Users (11%), Moderate Entertainment Users (43%), Educational Explorers (20%), and non-users (26%). The findings revealed that families with above-average socioeconomic status were more likely to encourage their children to engage in educational or limited technology use, falling into the Educational Explorer or Non-User categories (Röhlke, 2025). In contrast, families with below-average socioeconomic status were more likely to have children classified as advanced users engaged predominantly in entertainment-based media (Röhlke, 2025). This disparity highlights a potential challenge for special educators, who may encounter children without overt developmental delays but who

nevertheless have limited access to educational technology, potentially impacting their school readiness and learning trajectories. The pattern of technological engagement among children was directly dependent on the availability of resources. The same study, Röhlke (2025), found that children with positive parental attitudes towards the use of educational technologies and more access were classified as Educational Explorers. A poor range of devices at home, on the other hand, corresponded to a non-user status, which indicated that a lack of opportunity becomes a suppressant in development rather than evidence of underlying weaknesses (Röhlke, 2025).

The management of technology in the family also impairs the correctness of the assessment. Yalçin et al. (2021) claimed the risk factors for problematic screen exposure in young children include low parental educational attainment, reliance on home-based childcare, and limited parental supervision. These factors were frequently associated with socioeconomic disadvantages. Yalçin et al. (2021) identified that children from lower socioeconomic backgrounds were more likely to experience unsupervised or passive screen time, which was associated with reduced attention spans, increased behavioral concerns, and delayed language acquisition; moreover, these families often have limited access to high-quality educational technology, fewer opportunities for interactive engagement, and greater exposure to entertainment-based digital content. Yalçin et al. (2021) also reported that parents with lower educational levels may be less aware of recommended screen time limits and may have more difficulty establishing digital boundaries, which can increase the risk of excessive or inappropriate technology exposure. These circumstances can contribute to developmental vulnerabilities that may present similarly to delays associated with underlying disabilities.

Yalçin et al. (2021) further noted that cultural and linguistic backgrounds influence screen time practices and parental expectations regarding technology use. In some families,

extended screen exposure was common, either as a childcare strategy or as part of daily routines. The study highlighted that norms and practices surrounding screen use vary by cultural context, which can shape children's familiarity with technology, responses to digital assessments, and classroom technology integration (Yalçin et al., 2021). These cultural patterns may affect how children demonstrate their skills and behaviors in educational settings. Yalçin et al. (2021) emphasized that if socioeconomic and cultural factors were not adequately considered during the evaluation process, there was a potential for inaccurate interpretation of developmental data, which may impact special education referral decisions.

Disproportionality and Overidentification

Technology use in early childhood has been identified as a variable contributing to disproportionality and overidentification of preschool students for special education services. As previously discussed, extensive screen exposure, particularly passive media consumption, has been associated with behaviors such as reduced attention, poor social interaction, and communication delays, which align with common indicators used in special education referrals (Yalçin et al., 2021; Zhao et al., 2024). When assessments do not account for the influence of technology, these behaviors may be classified as developmental disabilities, particularly in preschool-aged children. Socioeconomic disparities were also related to this issue, as children from lower-income families were more likely to experience increased passive screen time and limited access to high-quality educational technology (Radesky et al., 2023). In Pennsylvania, the Pennsylvania Department of Education's PennData child reporting system reported that, as of the 2022–2023 school year, Black and Hispanic preschool children were represented at higher rates in special education categories such as speech and language impairment and emotional disturbance (Pennsylvania Department of Education, 2023a). Pennsylvania's disproportionality

monitoring procedures under the Individuals with Disabilities Education Act (IDEA) do not explicitly include assessments of technology's influence on developmental behavior (PaTTAN, 2023). PaTTAN's State Performance Plan identified the need for improvement in culturally responsive assessments and root cause analysis to understand factors contributing to special education referrals; however, technology exposure was not explicitly addressed in these assessments (PaTTAN, 2023).

Conclusion

This literature review examined the influence of technology integration on child development and its implications for special education referral decision-making. Research consistently indicates that excessive or passive screen use was associated with developmental risks in cognitive, language, motor, and social-emotional domains (Kerai et al., 2022; Panjeti-Madan & Ranganathan, 2023; Yalçin et al., 2021; Zhao et al., 2024). Studies such as those by Wang et al. (2024) and Radesky et al. (2023) demonstrate that early, unstructured, and prolonged screen exposure can complicate the differentiation between technology-induced behaviors and genuine developmental delays. This distinction was particularly challenging for special educators tasked with making accurate referral decisions.

The increasing reliance on digital media, particularly following the COVID-19 pandemic, has contributed to a documented rise in special education referrals for concerns frequently linked to high levels of screen exposure, including attention difficulties, language delays, and reduced social engagement (ASHA, 2023; Pennsylvania Department of Education, 2024). Compounding this issue were socioeconomic disparities that shape children's technology access and content quality, as evidenced by Duch et al. (2013), Reich et al. (2019), and Röhlke (2025), which can

lead to disproportionate identification of children from lower-income families for special education services (Pennsylvania Department of Education, 2023a; Williams, 2021).

Professional development had not consistently addressed how to integrate technology within developmental frameworks, leaving many educators without the necessary tools to assess technology's nuanced impact on learning and behavior (Karasu et al., 2019; Yang & Hong, 2022). Existing evaluation protocols often overlook the influence of screen exposure history and media content, which can increase the risk of both over- and under-identification of developmental disabilities (Christakis et al., 2018; McManis & Gunnewig, 2012; Nikkelen et al., 2014).

The research reviewed supports the need for assessment practices that incorporate detailed technology use histories, the types and quality of media exposure, and culturally responsive evaluation tools (Smith, 2022; Yalçin et al., 2021). Future research should prioritize longitudinal studies that examine technology's long-term developmental effects and further refine evaluation strategies to distinguish between environmentally induced behaviors and persistent developmental disabilities. Additionally, policies aimed at equitable identification should systematically consider the influence of technology to support accurate, fair special education referrals.

To build on these findings, Chapter Three introduces the methodology of the study. It presents grounded theory design, research questions, participant selection, and setting, as well as the data collection and analysis procedures. Ethical safeguards, researcher positionality, and strategies for ensuring trustworthiness were also described, establishing the framework for examining special educators' perceptions.

Chapter 3 Methodology

Introduction

This qualitative study examined special educators' perceptions of how technology influenced preschool children's development. It includes the discussion of how such perceptions impact special education referral decisions. The intervention aimed to gather rich data on the aspect of behavior, as observed in the use of technology. A special focus was also placed on how special educators distinguish between developmental delays and technology-induced behaviors. The research also examined how special educators make decisions about whether to refer when making referral decisions. The research employed Grounded Theory design, as proposed by Glaser and Strauss in 1967 (Charmaz & Thornberg, 2021). The approach was suitable for researching social processes and developing a theory based on the experiences of participants. The method was created to gain knowledge of how participants recognized the use of technology in the early childhood environment and its impact on developmental estimation, without testing a hypothesis or controlling the variables. Grounded theory is a qualitative research method that seeks to establish the sense that people have regarding social (or human) problems through repeated analysis of answers exhibited by the participants. Increasingly, the preferred method of introducing a new treatment into practice was through the use of ionized resin (Tracy, 2013).

This research was conducted to explore the perceptions of special educators regarding the influence of technology on the developmental outcomes of preschool children and its impact on the decision to refer preschoolers for special education evaluations. A central concern was how educators distinguished between behaviors that were influenced or exacerbated by screen use and those that indicated underlying developmental delays. As digital technology becomes

increasingly prevalent in early learning environments, special educators face the challenge of interpreting student behavior through a new lens that considers technology's potential impact.

Research Questions

1. **RQ1:** How do special educators perceive the impact of technology on preschool children's development?
2. **RQ2:** In what ways do special educators believe technology influences their decision-making process regarding special education referrals?
3. **RQ3:** What specific behaviors linked to technology use were most frequently associated with concerns that led to special education referrals?
4. **RQ4:** How do special educators differentiate between technology-induced behavioral changes and developmental delays when considering special education services?

Research Plan

The implementation plan involved the use of a detailed 12-item survey that was distributed among special educators serving preschool-age children. The survey elements captured both qualitative insights and descriptive trends regarding special educator perceptions, practices, and decision-making. The 12-item survey consisted of nine open-ended qualitative questions and three demographic items. This mixed-methodology approach supported the development of theory through rich qualitative data supplemented by descriptive context, which aligned with the grounded theory method.

Study Participants

The sampling population was composed of special educators working in the Preschool Early Intervention Program of an Intermediate Unit in eastern Pennsylvania. In the study, purposive sampling was used to select participants involved in the direct process of early

childhood developmental assessment and referral. Purposive sampling is a non-probability method in which participants were deliberately chosen for their expertise or direct involvement in the topic of study. In this research, only special educators engaged in early childhood developmental assessment and referrals were included (Ahmad & Wilkins, 2025). These inclusion criteria were applied: (1) must be currently employed as a special educator in the Preschool Early Intervention Program of the Intermediate Unit in eastern Pennsylvania; (2) must hold an active Pennsylvania teaching certificate in special education; and (3) must be directly involved in the delivery of home or classroom-based services as well as special education referral decision-making. It excluded participants who only work with school-aged children or those performing administrative tasks and do not enter early childhood environments. The entire potential sample comprised approximately 75 eligible special educators, with a strong representation of diverse professional views. Simple demographics were collected on current role, primary setting, and experience (e.g., less than 2 years, 2-5 years, 6-10 years, 11-15 years, more than 15 years), allowing for the study of differences in perception by level of experience.

Setting

This study was conducted in the Preschool Early Intervention Program of an Intermediate Unit in eastern Pennsylvania, which serves a population of preschool-aged children. The area of the Intermediate Unit in eastern Pennsylvania encompassed a demographically diverse population, comprising urban, suburban, and rural environments. Such communities have different socioeconomic statuses, ethnic backgrounds, and access to educational resources. The Intermediate Unit offers early intervention services in various settings, including homes, public school preschool classrooms, and community-based early childhood centers. The organization's extensive reach enabled it to offer the most suitable channel through which various educators can

present their ideas on the developmental impacts of technology. The use of various assistive and educational technologies was not new to the special educators in the Intermediate Unit; therefore, these professionals were well-suited to discuss the advantages and challenges associated with screen-based tools in the preschool environment.

Research Process

This study followed a structured four-phase research process designed to ensure ethical integrity, encourage participant engagement, and yield high-quality data (Creswell & Poth, 2018). The initial step involved recruiting as many participants as possible from the special educators via a standardized introductory email sent to every special educator available in the Preschool Early Intervention Program at the Intermediate Unit in eastern Pennsylvania. The process was clearly described to them in this message, including the study's purpose, the approximate time required, measures of confidentiality, and participant rights (American Psychological Association, 2020). During the second stage, the first email message contained a confidential spreadsheet for the Google Forms survey. Participation was also anonymous, and informed consent was obtained as part of the study, taken as an opt-in without compromising the principle of autonomy (American Psychological Association, 2020). A 30-day collection window was available during the third phase, as voluntary participation had ample time, and the study maintained a sufficient pace. During this time, it was expected that technical support would be provided to all individuals experiencing issues with access. During the fourth stage, a reminder email was circulated when the survey was approximately 10 days away from ending to ensure satisfaction with participation without pressuring or encouraging voluntary participation (Evans & Mathur, 2005).

Research Timeline

The research was conducted over a three-month period to minimize disturbance to the teaching process. July 2025 was devoted to obtaining formal site permission from the executive leadership of the Intermediate Unit in eastern Pennsylvania and IRB approval by a public university in western Pennsylvania. The full data collection process was carried out in August 2025, which included sending a preliminary introduction email, distributing the survey, and issuing reminders within 30 days. September 2025 marked the closure of the data collection window and the commencement of thorough data analysis, utilizing both manual and AI-aided coding techniques.

Instrumentation and Data Collection

This study examined how special educators perceived the role of technology in preschool development and its impact on special education referral decisions. The structured online survey (See Appendix B) served as the tool for gathering primary data, which was disseminated to all available special educators working in an Intermediate Unit in eastern Pennsylvania, using Google Forms. The survey was developed to address the four research questions identified in the study and was comprised of a total of 12 items, consisting of demographic questions (three items) and content-related questions (nine items). The methodology used in the survey was entirely qualitative, as all content questions were presented in the form of open-ended suggestions designed to elicit rich narrative responses from the participants. The approach supported the principles of grounded theory, as it allowed participants to present their practices, contextual meanings, and explanations of decision-making without predefined conditions, based on open-ended responses.

The questions systematically addressed each research question as noted in Table 1: Questions 4 and 5 examined educators' perceptions of technology's impact and observed behaviors (RQ1); Questions 6 and 7 explored technology's influence on referral decisions and assessment methods (RQ2); Questions 10 and 11 identified specific technology-related behaviors associated with referral concerns (RQ3); and Questions 8, 9, and 12 investigated how educators differentiate between technology-induced behaviors and developmental delays (RQ4). Demographic questions collected information on participants' professional roles, years of experience in their respective fields, and primary work environments. The data provided contextual insight into how participants' professional backgrounds influenced their perceptions and practices.

The research collected responses anonymously through the Google Forms platform, without obtaining any personally identifiable information. The platform was assigned random identifiers to each submission to ensure confidentiality. Participants had 30 days to complete the survey, and the researcher sent a final reminder email 10 days before the submission deadline. The researcher stored data securely on password-protected devices in accordance with university IRB and data protection protocols. This secure storage supported the development of a grounded theory informed by data-rich participant narratives (Charmaz & Thornberg, 2021; Creswell & Poth, 2018).

Table 1

Research Questions and Corresponding Survey Questions

Research question	Corresponding survey items

RQ1: How do special educators perceive the impact of technology on preschool children's development?	Item 4: Overall impact description Item 5: Observed behaviors
RQ2: In what ways do special educators believe technology influences their decision-making process regarding special education referrals?	Item 6: Influence on referral decisions Item 7: Assessment methods
RQ3: What specific behaviors linked to technology use are most frequently associated with concerns that lead to special education referrals?	Item 10: Confidence in distinguishing behaviors and influential factors Item 11: COVID-19 impact on decision-making and referral practices
RQ4: How do special educators differentiate between technology-induced behavioral changes and developmental delays when considering special education services?	Item 8: Differentiation methods Item 9: Challenges in differentiation Item 12: Needed tools and resources

Note. RQ = Research question; Items correspond to numbered survey questions.

Data Analysis

The analytical framework of the study was guided by the Grounded Theory methodology, which was an iterative and cyclical process developed by Glaser and Strauss in 1967 (Charmaz & Thornberg, 2021). The intention enabled themes to be raised by the actual narrative questions of the participants without being limited by an established theory. Manual and AI-aided coding were used to create analytical reliability and robustness. The first stage involved manually coding the responses to a single survey question. The researcher analyzed the narratives line by line, labeling (coding) the more frequent concepts, observations, or meanings. The codes were subsequently organized into broader categories (the axial ones), such as technology-induced behavior patterns, delayed social skills, or referral hesitancy, to begin outlining a basic structure

of the emerging themes. (Bingham, 2023). Manual coding allowed the researcher to become familiar with the data and to determine interpretive patterns.

ChatGPT was used in parallel to manual coding to enhance analytic triangulation. These tools support pattern recognition in large text datasets, but they are limited in interpretive nuance (Morgan, 2023). Prompts were used to guide the AI analysis of the data, ensuring consistency. For example, each question was introduced to ChatGPT with a prompt to code all the data for a particular survey question and identify themes, among other tasks.

When reliability was achieved using this contrast, iterative coding was applied to all open-ended queries in the survey. This coding procedure was repeated in the following steps: open coding (new codes were identified), axial coding (related codes were grouped into categories), and selective coding (central themes were created). Themes such as difficulty in differentiating screen-related behavior and developmental delay, parental concerns about screens increasing concern, or educator digital training needs were expected to emerge, although the final themes would be determined by the participant data. Triangulation of methodologies, including manual and AI coding, and peer debriefing with the faculty dissertation advisor, will be employed to minimize researcher bias. The analysis process focused on building theory, directly as a result of the experiences that special educators had in the Intermediate Unit context, but one that is nevertheless transferable to other comparable educational institutions. Tracy's (2013) The big-tent criteria of excellent qualitative studies, such as sincerity, rigorousness, credibility through triangulation, and meaningful coherence, guided this study.

The demographic data was also summarized using descriptive statistics. These aided in contextualizing the qualitative findings. For example, different levels of thematic focus were examined by comparing the responses of educators with less than five years of experience with

those of educators with more than ten years of experience. This research was grounded in a qualitative inquiry. This combination of narrative depth and structured coding, guided by human knowledge and AI, enabled detailed and reliable results on how technology was shaping educators' views, classroom dynamics, and referral decisions regarding preschool children. This integration of descriptive elements into a qualitative framework ensures methodological coherence with grounded theory.

Researcher Positionality

As a doctoral candidate and practicing Speech-Language Pathologist Service Coordinator within a Preschool Early Intervention Program in an Intermediate Unit in eastern Pennsylvania, I approach this research from an insider perspective. My current role provides me with direct experience in special education referral procedures and the developmental challenges that educators encounter daily. This dual role allowed me to delve deeply into a topic deeply rooted in my professional practice while engaging with the shared experiences of my colleagues.

With my background in early childhood special education, I interpreted professional terms and understand the referral process, and I appreciate the complexities associated with developmental assessments. The following experiences demonstrated that I could establish a rapport with participants and understand their answers within a contextual setting. However, this proximity to the subject matter presented potential limitations. My prior beliefs about the effects of technology on development influenced how I interpreted the data. Although I work within an Intermediate Unit in eastern Pennsylvania, I do not hold a supervisory role over participants, which may encourage more open and honest responses than if I held a direct reporting relationship.

Several assumptions guide this study. I assumed that special educators possessed valuable insights due to their training and daily interaction with preschool children. I also assumed that children experience varying levels of technology exposure and that this variability may lead to observable differences in behavior and development. I expect participants to be able to identify and describe these differences. Additionally, I assumed that the increased use of digital devices during the COVID-19 pandemic influenced the frequency and nature of special education referrals. I also assume that participants reflected on and described how technology informed their referral decisions.

To strengthen the trustworthiness and objectivity of this research, I implemented several strategies:

Methodological Triangulation

I employed both manual and AI-assisted coding during data analysis to enhance analytic rigor and minimize individual coder bias. This triangulation supported the reliability and validity of the emerging themes.

Peer Debriefing

I was engaged in regular peer debriefing sessions with my faculty dissertation advisor. These sessions enabled me to critically examine my analytical decisions and interpretations, promoting reflexivity in the research process.

Reflexive Journaling

I maintained a reflexive journal throughout data collection and analysis to document my thoughts, decisions, and potential biases. This practice helped me remain aware of how my experiences may shape the interpretation of the data.

Data-grounded Interpretation

I ensured that all findings were grounded in participant responses. I avoided using my professional experience as the basis for interpretation and instead centered the voices of the participants in all analytical conclusions.

Site Permission

The approval of the research was simplified and based on receiving approval from the executive leadership office of the Intermediate Unit in eastern Pennsylvania. The primary authority that granted permission resided with the Executive Director and Program Director of the Preschool Early Intervention Program, who have direct administrative control over the entire program and all special education personnel. This centralized approach ensured that all necessary administrative approvals were obtained in accordance with the established organizational hierarchy. Formal written consent was secured from the Intermediate Unit leadership prior to initiating participant recruitment or data collection procedures. The permission request included a comprehensive overview of the research protocol, outlining the study's purpose, design, and safeguards to protect participants' rights and confidentiality. It also detailed the security measures in place and potential organizational benefits. Additionally, the request clarified the voluntary nature of participation, the time commitments expected of participants, and the limitations on data use, thereby promoting institutional transparency and informed decision-making.

The public university obtained Institutional Review Board (IRB) approval for the project, as required by federal regulations governing research involving human subjects. The IRB application was to state all the details of the research design, participant recruitment procedures, informed consent processes, and data protection measures (Brown et al., 2020). Given that the study posed minimal risk to participants, particular attention was directed toward upholding

ethical standards in conducting research with educational professionals. The approval process included a review of procedures for maintaining participant confidentiality, securing informed consent, and ensuring voluntary participation. Additionally, protocols for data storage and security were addressed to reinforce the protection of all research-related information. Approval from both the Intermediate Unit in eastern Pennsylvania administration and the public university in western Pennsylvania Institutional Review Board (IRB) ensured that all research activities comply with organizational policies and federal ethical standards.

Presentation of Results

The findings of this study were compiled in a comprehensive dissertation, which serves as the primary source for reporting the results and theoretical insights derived through grounded theory analysis. The document included a detailed account of the research methodology, data analysis procedures, emergent themes, and theoretical contributions. The completed dissertation was formally presented to the university Dissertation Committee to fulfill the requirements for the doctoral degree. This study presentation encompassed key findings, methodological considerations, and the implications for early childhood special education practice. Emphasis was placed on how the research contributes to the existing scholarly literature and informs practice among educational professionals in comparable settings. The targeted dissemination approach ensured that the results were effectively communicated to critical academic stakeholders and contextualized within the broader framework of doctoral-level inquiry. Future dissemination may include presentations at professional conferences and publication in peer-reviewed journals, extending the study's impact within the field of early childhood special education.

Limitations

Limitations must be acknowledged, as they may affect the interpretation and transferability of the study's findings. One potential constraint was the possibility of a low response rate. Given the voluntary nature of participation, there was a risk that the sample size may not be sufficient to support the development of robust thematic conclusions. Although the 30-day data collection window was intended to minimize participant burden, it may not allow all eligible educators adequate time to respond, thereby limiting the diversity of perspectives represented. Additionally, the use of self-reported data introduces the potential for response bias. Participants may provide socially desirable responses rather than candid reflections, particularly when addressing sensitive topics such as professional decision-making and the influence of technology in educational contexts. This was a common limitation in survey-based research.

Another consideration involved the use of AI-assisted coding, which remains an emerging practice in qualitative research. While comparing manually coded data with AI-generated results may help strengthen validity, concerns persist regarding the consistency, interpretive depth, and analytical accuracy of AI tools. Furthermore, the scope of the study was geographically limited to the Intermediate Unit in eastern Pennsylvania and may not be generalizable beyond similar regional contexts. Differences in educational policies, access to technology, professional development opportunities, and institutional cultures across other settings may limit the applicability of findings to broader educational environments.

Conclusion

This chapter outlined a detailed methodology that informed this qualitative research study. Data was gathered using a grounded theory approach through a defined, open-ended survey administered to special educators from the Intermediate Unit. Ethical integrity was

achieved through a process that included obtaining IRB approval, securing site-level approval, and maintaining participant confidentiality. Thematic coding (both manual and with the assistance of AI) was utilized in data analysis to determine emergent themes in narrative responses. Limitations were noted, including generalizability, self-report bias, and variability of response. The stakeholders were informed about the results through various means, including visual reports and virtual presentations. The next chapter articulated the findings within this approach methodology. Chapter Four presents the study's results, highlighting the themes that emerged from the special educators' survey responses. The chapter provides a detailed account of how participants described the influence of technology on preschool development and the ways it shapes referral decisions for special education services.

Chapter 4: Results

Introduction

This chapter presents the findings from a qualitative survey of special educators employed in a Preschool Early Intervention Program in eastern Pennsylvania. The purpose of the survey was to gather educators' perspectives on the influence of technology and screen exposure on preschool children's developmental functioning, as well as how these perceptions informed special education referral practices. Twenty-six special educators participated in the study and completed a 12-item online survey. The instrument included three demographic items and nine open-ended questions designed to elicit detailed descriptions of educators' observations, perceptions, and decision-making processes. The chapter begins with an overview of participant characteristics, followed by a description of the data analysis procedures. The results are then organized by the four research questions that guided the study.

Sample Characteristics

A total of 26 special educators met the inclusion criteria and participated in the study. Eligible participants were required to be employed within the Preschool Early Intervention Program, hold an active Pennsylvania teaching certificate, and be directly involved in service delivery and referral decision-making. Participants represented a range of professional roles within early childhood special education. The largest group consisted of Special Education Teachers (n = 15), followed by Speech-Language Pathologists (n = 7). The remaining participants included one Early Childhood Teacher, two Service Coordinators, and one Administrator. This distribution reflected the interdisciplinary composition typical of early intervention teams and provided a diverse set of perspectives for the qualitative analysis.

Figure 1

Distribution of Participant Positions (N=26)

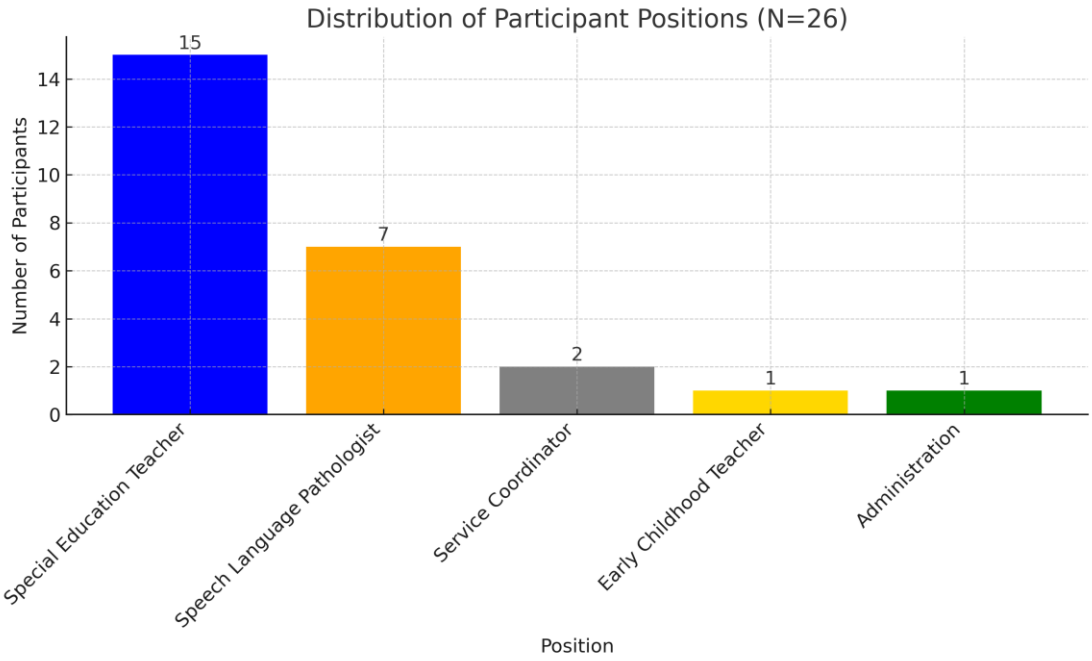


Table 2

Participant Demographics by Position

Position	Number of Participants	Percentage
Special Education Teacher	15	57.69%
Speech Language Pathologist	7	26.92%
Service Coordinator	2	7.69%
Early Childhood Teacher	1	3.85%
Administration	1	3.85%
Total	**26**	**100%**

The respondents represented a highly experienced group of early childhood education professionals. The largest subgroup (n = 15) reported more than 15 years of experience in the

field. An additional 4 respondents indicated 11–15 years of experience, and 4 reported between 6 and 10 years. The remaining participants had 2–5 years of experience, and none reported fewer than 2 years. This distribution suggests that the sample was composed primarily of seasoned practitioners with substantial knowledge of preschool development and special education referral processes.

Figure 2

Participant Years of Experience in Early Childhood Education (N=26)

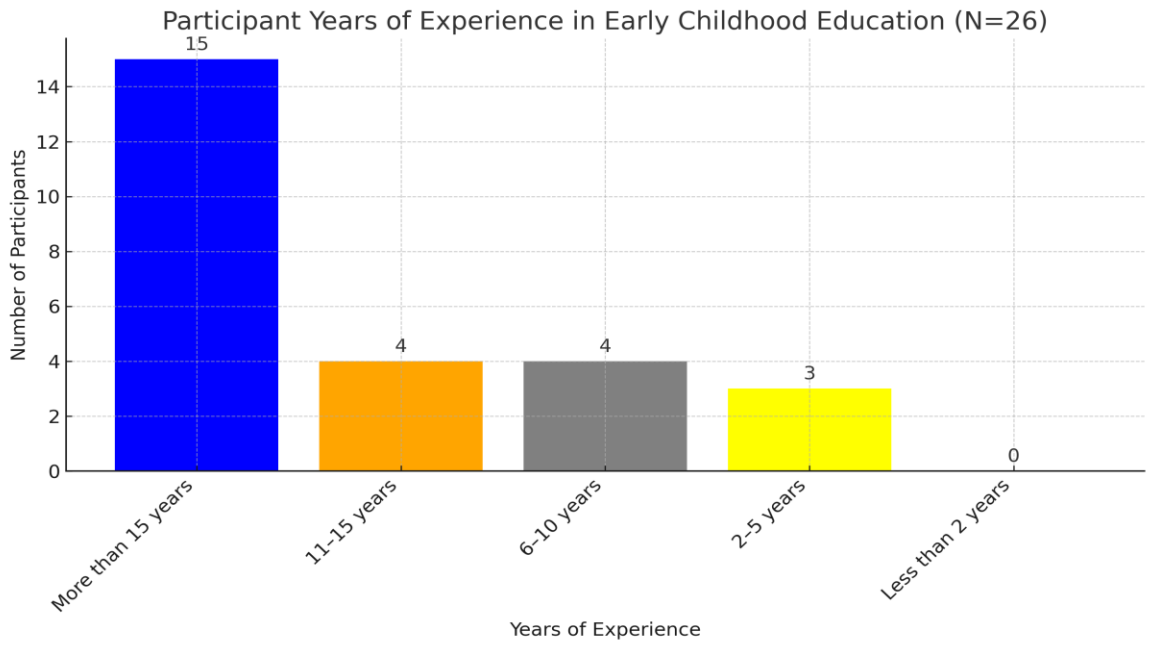


Table 3

Years of Experience in Early Childhood Education

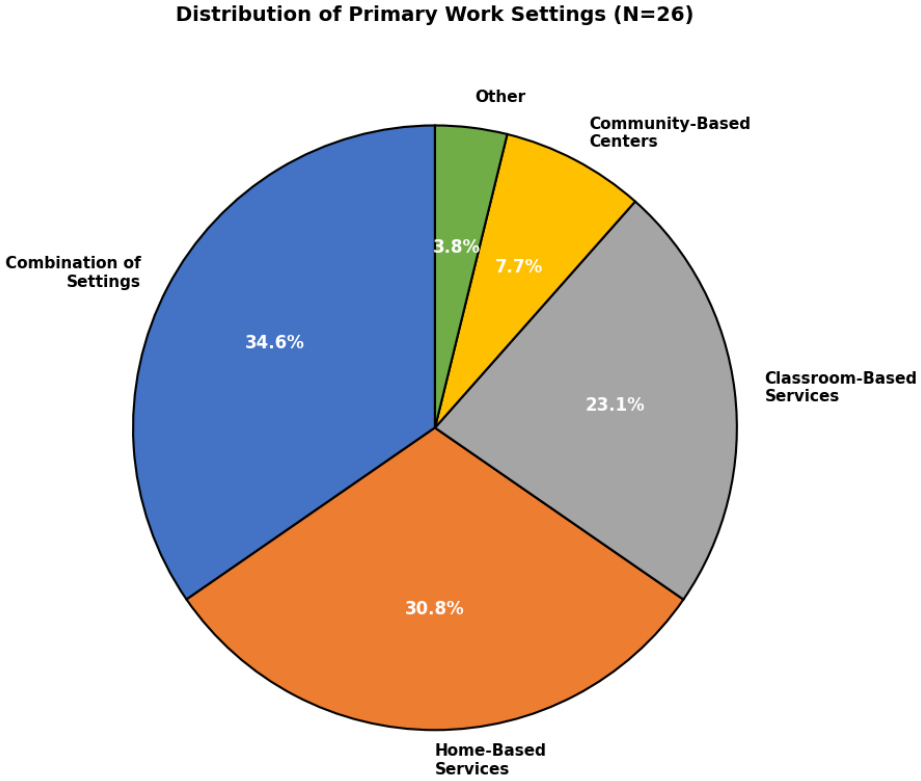
Experience Level	Number of Participants	Percentage
More than 15 years	15	57.7%
11–15 years	4	15.4%
6–10 years	4	15.4%
2–5 years	3	11.5%

Less than 2 years	0	0%
Total	**26**	**100%**

Participants represented a range of work environments within the early intervention program. The largest subgroup (n = 9) reported providing services across multiple settings. Eight respondents indicated that they primarily delivered home-based services, while 6 worked in classroom-based environments. Two participants provided services in community-based early childhood centers, and 1 respondent identified a work setting not included in the predefined options. This diversity of service environments reflects the varied delivery models present within early intervention programs and offers a broad lens through which to understand practitioner perspectives (Creswell & Poth, 2018).

Figure 3

Distribution of Primary Work Settings



Data Analysis Procedures

Data was analyzed using the grounded theory procedures outlined in Chapter 3. This approach supported an inductive examination of participant responses, allowing themes to emerge from the data rather than from predetermined assumptions (Charmaz & Thornberg, 2021). To enhance rigor, both manual coding and AI-assisted coding were employed. Using dual coding provided methodological triangulation and strengthened the credibility of the developing themes (Bingham, 2023). Manual coding began with multiple readings of each survey response to establish familiarity with the dataset. Initial descriptive codes were then applied to meaningful segments of text, capturing participants' words as closely as possible. These codes were subsequently organized into broader categories based on conceptual similarity. For example, codes such as "reduced attention," "difficulty focusing," and "shortened attention span" were consolidated under the larger category of "attention difficulties." Categories were refined iteratively through constant comparison across responses.

AI-assisted coding, conducted using ChatGPT, served as an additional analytic lens. Survey questions and response sets were entered into the AI system with prompts designed to identify recurring themes and patterns. The AI-generated themes were then compared with the manually developed codes. Convergence between the two approaches was used to confirm the robustness of themes, while areas of divergence prompted additional review to ensure accurate interpretation of participant perspectives (Morgan, 2023). Representative participant quotations were selected to illustrate each major theme. Quotations were edited for clarity by removing filler words or minor grammatical errors, but the meaning and voice of each respondent were preserved.

Demographic information was used to contextualize the data while maintaining participant anonymity; no identifying information was included. The coding process ultimately resulted in five themes related to technology's influence on development, four themes addressing observed behaviors, three themes concerning differentiation practices, and several themes reflecting participants' confidence and professional development needs. These themes are presented according to their alignment with the four research questions and are reported using narrative descriptions and tables that convey both the prevalence and the depth of participants' perspectives.

Findings

The findings are organized according to the four research questions that guided this study. Each research question is addressed through presentation of the major themes that emerged from the data analysis, supported by participant quotes and descriptive statistics where applicable.

Research Question 1: How do special educators perceive the impact of technology on preschool children's development?

Participants expressed varied and often conflicting views about technology's overall impact on preschool development. The responses revealed five distinct perspectives that appeared across the data. The most common perspective viewed technology as having a predominantly negative impact when used excessively or inappropriately. Several participants described negative effects such as reduced social interaction, delayed language development, and behavioral problems. One Special Education Teacher with 11 to 15 years of experience stated:

> I believe an early introduction to technology for young children is appropriate for very short periods of time with age-appropriate activities. However, I am observing young

> children spending significant time on devices, which limits social development and time to work on play skills.

Another participant noted, "Families are often substituting screen time in response to the family needing them to be entertained or keep them occupied instead of finding ways to involve them in the daily routines, talking with them, or playing."

A smaller group of participants emphasized that technology's impact depends entirely on how it is used. These participants distinguished between passive consumption and interactive educational use. A Speech Language Pathologist with more than 15 years of experience explained:

> I could not specify one overall impact because technology plays such a wide range of roles in early childhood learning. In my experience, when used intentionally, technology can be very positive. It allows me to reach children who might not otherwise receive services.

This perspective recognized both benefits and risks depending on implementation quality. Five participants specifically mentioned positive applications of technology for children with disabilities. One participant stated, "I do think students know more of their colors, shapes and numbers from technology. They learn these through songs and videos. The downside is that students want to be on these devices all day." This comment reflected the tension between beneficial and potential harmful uses of technology.

Three participants described observing developmental delays that appeared linked to excessive screen time during critical developmental periods. A Special Education Teacher noted, "It delays their overall development" when asked about technology's impact. Another participant with 6-10 years of experience shared, "I have not used technology with my preschoolers. I find

that my preschoolers have a lot of screen time, so I want to make sure the 30-45 minutes I see them weekly, we are interacting without technology." Two participants emphasized the importance of content quality and parental involvement in determining technology's effects. One Speech Language Pathologist explained:

> When used as a tool to supplement learning, or online resources the teachers would otherwise not have access to, technology has a positive impact on preschool children's child development. I frequently see technology being used as a babysitter in ECE classrooms, ex. YouTube music videos, and that technology does not have a positive impact and could be negatively impacting child development.

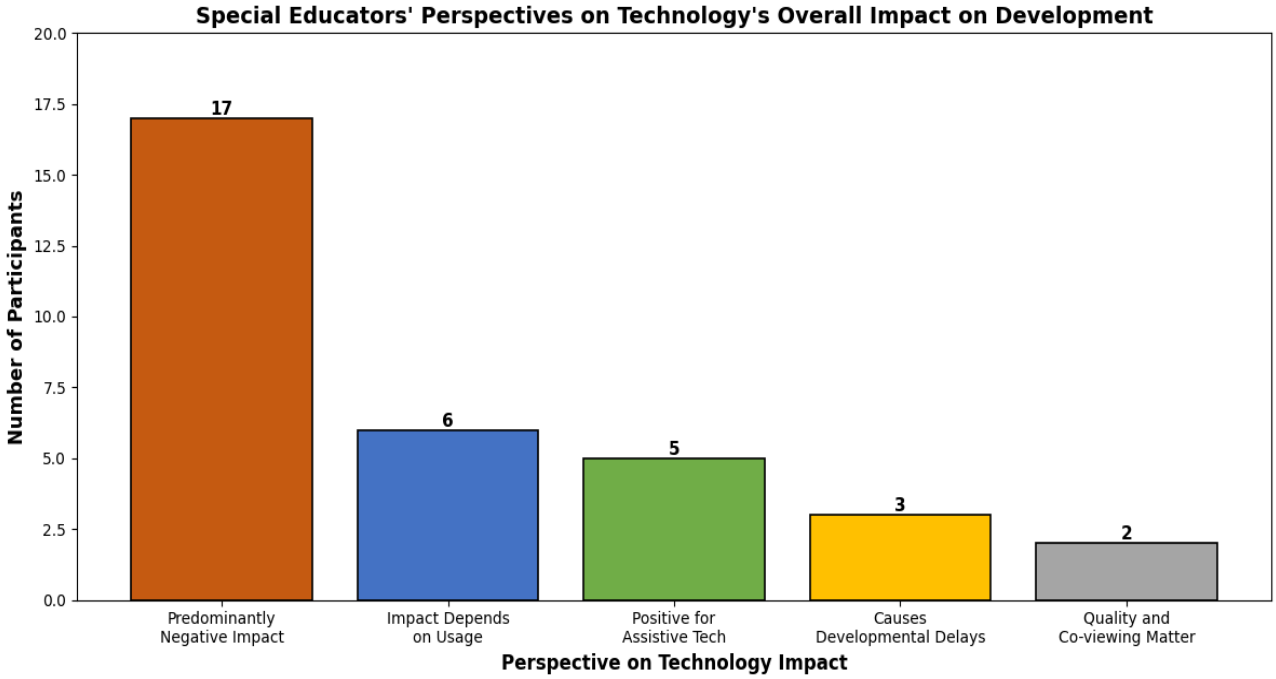
Table 4

Themes Related to Technology's Overall Impact on Development

Theme	Number of Participants	Sample Quote
Predominantly negative impact	17	"Children are no longer learning how to play, especially imaginative and pretend play"
Impact depends on usage	6	"Technology can be very positive when used intentionally"
Positive for assistive technology	5	"This has not been a consideration."
Causes developmental delays	3	"It delays their overall development."
Quality and co-viewing matter	2	"Co-viewing with an adult can make a big difference"

Figure 4

Special Educators' Perspectives on Technology's Overall Impact on Development



Research Question 2: In what ways do special educators believe technology influences their decision-making process regarding special education referrals?

Participants' responses revealed that technology influences referral decisions in complex and sometimes contradictory ways. The analysis identified four major patterns in how educators consider technology when making referral recommendations. The most common response, given by 11 participants, was that technology use has not directly influenced their referral decisions. These participants reported that they do not formally consider technology exposure as part of the referral process. One participant stated simply, "N/A" when asked about technology's influence on referrals. Another explained, "This has not been a consideration" in their referral practice. A Service Coordinator noted, "I can't think of a specific instance where that has influenced by decisions." This pattern suggested that many educators have not integrated technology assessment into their referral frameworks.

Eight participants described using technology exposure as contextual information to help differentiate environmental influences from developmental disabilities. A Speech Language Pathologist with more than 15 years of experience explained:

> A child's technology use has influenced my referral decisions mainly by helping me understand what is environmental versus developmental. For example, I've worked with several preschoolers who initially appeared delayed in social communication, but after reducing passive screen time and increasing interactive play, their attention and engagement improved significantly.

This perspective is consistent with research demonstrating that problematic or excessive screen exposure can contribute to attention, communication, and social-emotional difficulties that may resemble developmental delays but are environmentally influenced (Yalçin et al., 2021).

Four participants reported that excessive technology use sometimes delays referrals or prompts a wait-and-see approach. One Special Education Teacher stated, "I often refer to a preschool program if the child is not enrolled to give them more time to be doing something different. I usually list it as a consideration." Another participant explained using a "watch and support approach first, providing strategies to balance screen time before moving forward with formal referrals unless developmental red flags remain consistent." Three participants indicated that they refer children regardless of technology use if significant delays are present. A Special Education Teacher noted, "If the significant delay and educational need are present, we would most likely still offer supports" despite questions about technology's role. This perspective prioritized addressing observable needs over determining causation.

Participants also described the specific information they gather about technology exposure during the assessment process. Nineteen participants reported asking parents about

screen time, though the depth and formality of this questioning varied considerably. The most common approach involved informal conversations about favorite activities, daily routines, and technology habits. One participant explained, "When considering a referral, I begin by asking families about the child's typical technology use, how much time is spent on screens, what types of devices are used, and whether the activities are interactive or passive."

Only two participants mentioned using any structured tool or protocol to assess technology exposure. The majority relied on general parent interviews without specific screening instruments or standardized tools (Karasu et al., 2019). Seven participants explicitly stated that they do not currently assess or evaluate technology exposure when considering referrals. One participant wrote, "This has not been a consideration," when asked about assessment methods. Another stated, "No" when asked about gathering technology information.

Research Question 3: What specific behaviors linked to technology use are most frequently associated with concerns that lead to special education referrals?

Participants identified multiple specific behaviors they observe in children with high levels of technology use. These behaviors often overlap with indicators that typically prompt special education referrals, creating challenges in determining appropriate next steps. The most frequently mentioned behavior cluster involved attention and focus difficulties. Twenty-one participants described children showing reduced attention spans, difficulty sustaining engagement in non-screen activities, and a constant need for stimulation. Participants used phrases like "short attention span," "need for constant stimulation," "difficulty attending to structured activities," and "inability to focus." A Special Education Teacher stated, "High use of technology can lead to a lack of attention and focus, making it harder for children to engage in

real-world play and learning." Another noted children show "limited attention to structured activities, difficulty accepting boundaries and rules."

Social and communication deficits were the second most common behavioral concern, mentioned by 20 participants. These included reduced verbal communication, limited peer interaction, poor eye contact, and difficulty with reciprocal conversation. One participant described, "I have observed multiple children who use technology throughout their day. For these children, social engagement, attention to tasks, and compliance are often muted. These children specifically lack the skills to effectively communicate their needs and wants." A Speech Language Pathologist noted children with high tech use show "limited joint attention, minimal verbal output, and poor play skills."

Emotional regulation and behavioral problems were identified by 18 participants. These educators described tantrums when devices are removed, difficulty transitioning away from screens, aggression, and general emotional dysregulation. One participant explained, "It is very often I come into homes and the TV is on. The child was watching TV prior to my visit, and it causes meltdowns when the TV is turned off." Another stated, "Students are also exposed to more adult content. We are seeing increases in hitting, punching, yelling, screaming and loss of emotional control."

Sixteen participants mentioned deficits in play skills and creativity. Children demonstrated repetitive play, imitation of screen content rather than imaginative play, and reduced interest in hands-on activities. One educator observed, "Play skills are muted and these children seem to self-soothe with the technology. Phrases and pretend play often follow what the children have been engaged in with technology, many times highly inappropriate for preschool-

aged children." Another noted, "They cannot sit and listen to a story, they constantly want to be entertained."

Physical and motor concerns were mentioned by nine participants. These included fine motor delays affecting writing and manipulative tasks, as well as reduced gross motor activity. One participant noted, “I do think students know more of their colors, shapes, and numbers from technology. The downside is that students want to be on these devices all day,” describing how increased device use may limit opportunities for physical play and motor development. This perception aligns with research showing that higher levels of screen exposure are associated with increased vulnerability in physical and motor readiness domains (Kerai et al., 2022).

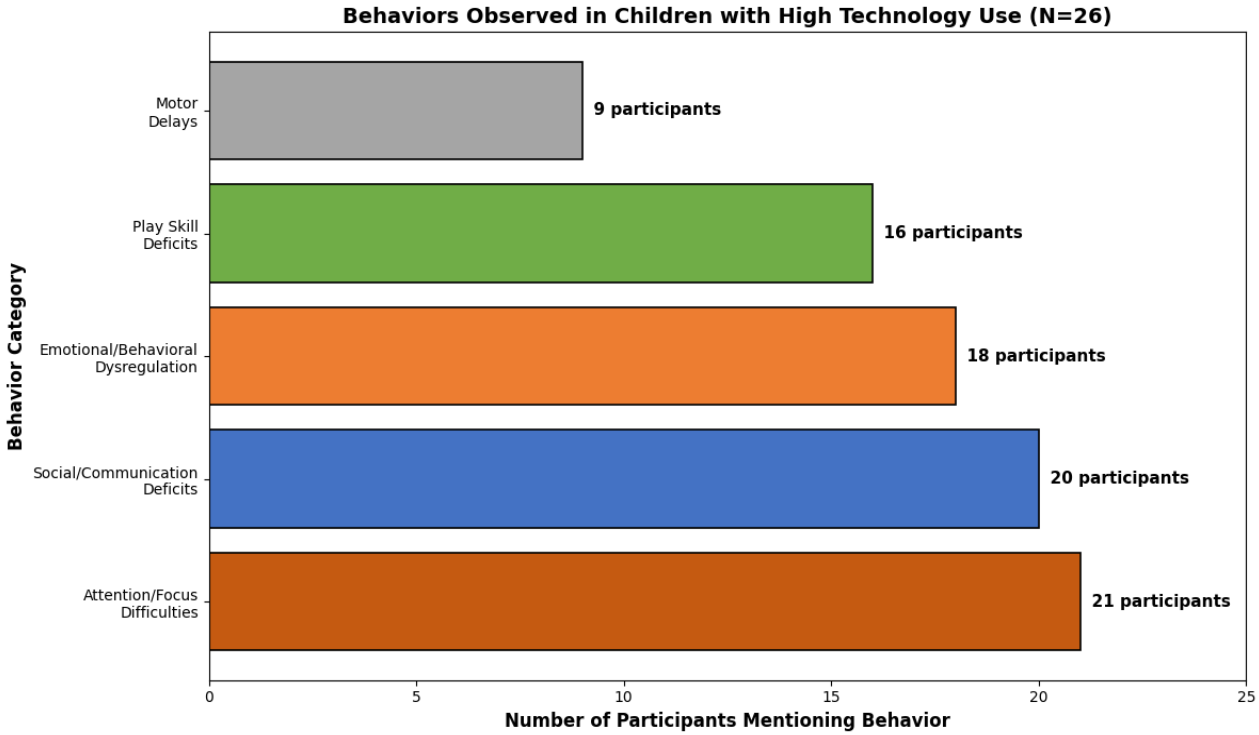
Table 5

Behaviors Associated with High Technology Use

Behavior Category	No. of Participants	Example Behaviors
Attention/focus difficulties	21	Short attention span, need for constant stimulation, difficulty with sustained engagement
Social/communication deficits	20	Reduced verbal output, limited peer interaction, poor eye contact, minimal conversation
Emotional/behavioral dysregulation	18	Tantrums when devices removed, aggression, difficulty with transitions, poor self-regulation
Play skill deficits	16	Repetitive play, imitation of screens, reduced creativity, limited imaginative play
Motor delays	9	Fine motor difficulties with writing and manipulation, reduced physical activity

Figure 5

Behaviors Observed in Children with High Technology Use



Research Question 4: How do special educators differentiate between technology-induced behavioral changes and developmental delays when considering special education services?

The responses to questions about differentiation revealed significant challenges and uncertainty among participants. This research question was addressed through analysis of responses about differentiation methods, challenges, and confidence levels.

Regarding specific differentiation methods, participants described several approaches. The most common strategy, mentioned by 14 participants, involved observing whether behaviors changed when screen time was reduced. One Speech Language Pathologist explained:

> To differentiate, I look at how the child performs when screen-based stimuli are replaced with real-world, interactive play. If attention, imitation, and engagement improve once the activity becomes more hands-on or socially interactive, I suspect the behavior is technology-influenced rather than developmental.

Another participant expressed similar concerns, noting, “I find it challenging to determine if a child truly has a delay in the area of social emotional development, or if that has been because of a lack of communication and engagement with family” that may be associated with excessive screen use. This perspective aligns with research indicating that higher levels of screen exposure can reduce opportunities for parent–child interaction and contribute to social-emotional patterns that resemble developmental delays (Wang et al., 2024).

Eleven participants mentioned considering whether difficulties persist across multiple settings and contexts. A participant noted, "If difficulties with communication, joint attention, or symbolic play remain consistent across settings, it may indicate a true developmental delay rather than technology influence." Another explained looking at "whether the child's behaviors are a manifestation of their disability or delay or more conduct related" by examining patterns across environments. Ten participants described using parent interviews to gather information about technology habits and routines. However, nine of these participants expressed concern about the reliability of parent reports. One educator stated:

> Sometimes you only have parent interview as a data point for how much screen time a child has. And you have to rely on the parent's report, and they are often frustrated about their child's behavior but don't understand the connection between screen time and behaviors.

Another noted the challenge is "because parents are honest with how much kids use devices” with a sarcastic tone suggesting parents often underreport screen use.

Eight participants mentioned using their clinical judgment and experience to make determinations, though several acknowledged this approach lacks objective criteria. One stated, "I would look at the behavioral data including ABC (Antecedent-Behavior-Consequence) data to

analyze the function of the behavior. Observations would also occur to see how behavior might be correlated or not with tech use." Participants identified numerous challenges that make differentiation difficult. The most frequently cited challenge, mentioned by 20 participants, was that technology-induced behaviors and developmental delays often look identical. A Special Education Teacher explained:

> It can be challenging because both can look very similar on the surface. Children who have spent a lot of time with screens may show limited eye contact, reduced attention span, or difficulty following directions, behaviors that can also be red flags for developmental disorders.

Another participant noted, "Extreme technology use looks similar to ADD or delay because it changes how a child uses their brain. Very hard." Fifteen participants reported a lack of formal assessment tools or protocols specifically designed to evaluate technology's role in observed behaviors. One educator stated, "Is there an assessment or checklist? Why are doctors not talking to families?" Another requested "structured screening tools or checklists specifically designed to differentiate between technology-related behaviors and true developmental concerns." Twelve participants expressed concerns about parent accuracy and awareness when reporting their children's screen use. One noted, "Having the time and appropriate information from caregivers, i.e., are they being honest," as a key challenge. Another commented, "Challenges include not knowing all the details about their technology use, time, frequency, parent involvement, and content they are viewing." Nine participants described time constraints and limited opportunities to observe children across multiple contexts. Although early intervention sessions typically last 30 to 45 minutes, participants emphasized that differentiating temporary behaviors from persistent developmental concerns often requires repeated

observations, a need that is consistent with research highlighting the importance of longitudinal and context-rich assessment practices (Panjeti-Madan & Ranganathan, 2023).

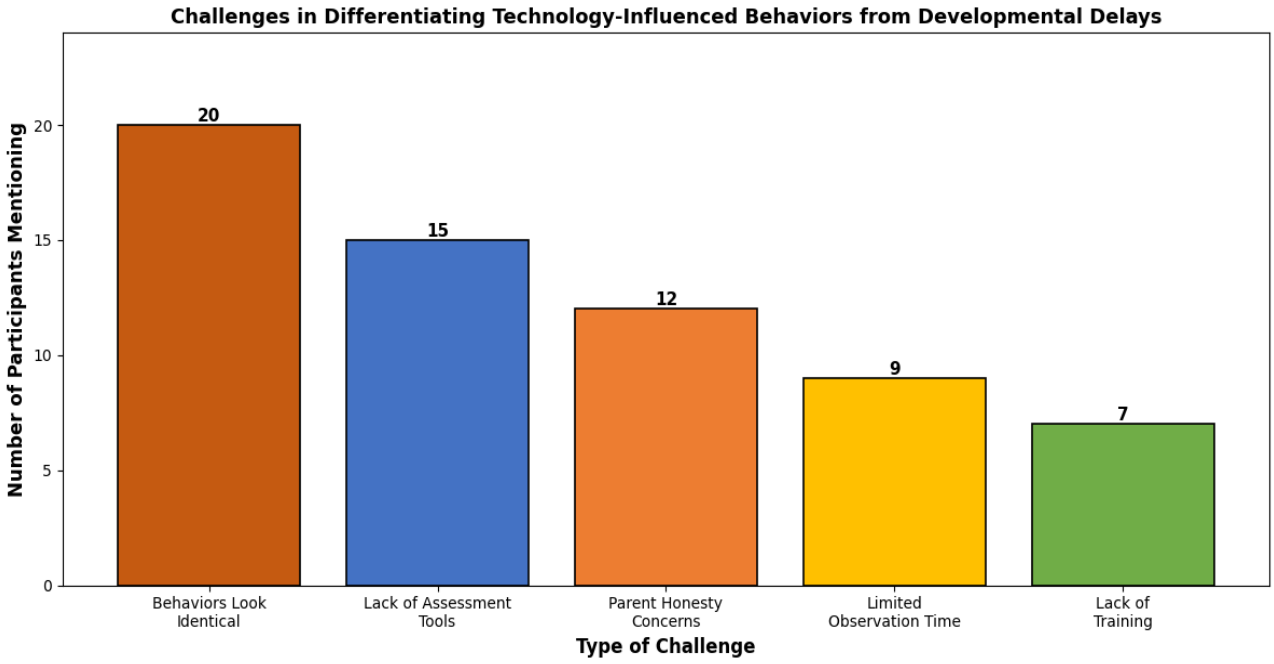
Table 6

Challenges in Differentiating Technology-Influenced Behaviors from Developmental Delays

Challenge	No. of Participants	Representative Quote
Behaviors look identical	20	"Both can look very similar on the surface"
Lack of assessment tools	15	"Is there an assessment or checklist?"
Parent honesty concerns	12	"You have to rely on the parent's report"
Limited observation time	9	"Missing information, delayed programming"
Lack of training	7	"This is an area on which I have little information"

Figure 6

Challenges in Differentiating Technology-Influenced Behaviors from Developmental Delays



When asked about their confidence in distinguishing between technology-related behaviors and developmental concerns, participants expressed notably low confidence overall. Only three participants indicated feeling "fairly confident" or "pretty confident." The majority, 18 participants, explicitly stated low confidence using phrases like "not confident," "not very confident," "not at all confident," and "I am not that confident." Five participants gave mixed or uncertain responses.

The factors that participants identified as influencing their confidence levels included professional experience, quality of parent information, ability to observe children in multiple settings, and access to training. One Speech Language Pathologist stated, "I feel fairly confident in distinguishing between technology-related behaviors and developmental concerns, especially after several years of observing children across both digital and natural play contexts. My confidence comes from experience." In contrast, a participant with two to five years of experience stated, "I am not that confident. I feel like it is too subjective of an area and there is no baseline of behavior prior to child's technology use."

Regarding the impact of COVID-19 on referral practices, responses were mixed and often uncertain. Eleven participants reported noticing an increase in referrals or developmental concerns since the pandemic. One stated, "Since COVID-19, I've noticed a clear increase in children's exposure to screens and a shift in how families rely on technology for entertainment and even comfort." However, nine participants reported no direct impact or indicated they began working in early intervention after COVID, making comparison difficult. Six participants gave unclear or mixed responses.

When asked about needed tools, resources, or training, participants provided specific requests that fell into several categories. Twenty-one participants requested professional

development and training on the topic. Representative comments included: "Beginner level information on the topic! Very interesting; I have not thought of technology dependent behavior as impacting referrals or eligibility for special education services prior to this survey," and "Any training would be insightful to learn about a child's behaviors being related to technology use verses developmental delays."

Eighteen participants requested screening tools or checklists specifically designed to assess technology exposure and its effects. One participant asked for "structured screening tools or checklists specifically designed to differentiate between technology-related behaviors and true developmental concerns." Another requested "a screen time questionnaire that we can use to review quantity and quality of screen time."

Fifteen participants wanted research-based information and guidance on technology's developmental effects. Requests included "videos and articles confirming that technology at this age can be detrimental to a child's learning and development," "more information regarding technology; how to identify technology related behaviors; how parents can work more on behaviors with technology," and "research on early brain development, attention, and sensory processing in relation to technology."

Ten participants requested parent education materials and strategies for helping families reduce screen time. One educator asked for information on "how to encourage and get parents to buy into less technology and more interaction with their children and how interactions should look."

Figure 7

Tools, Resources, and Training Requested by Special Educators

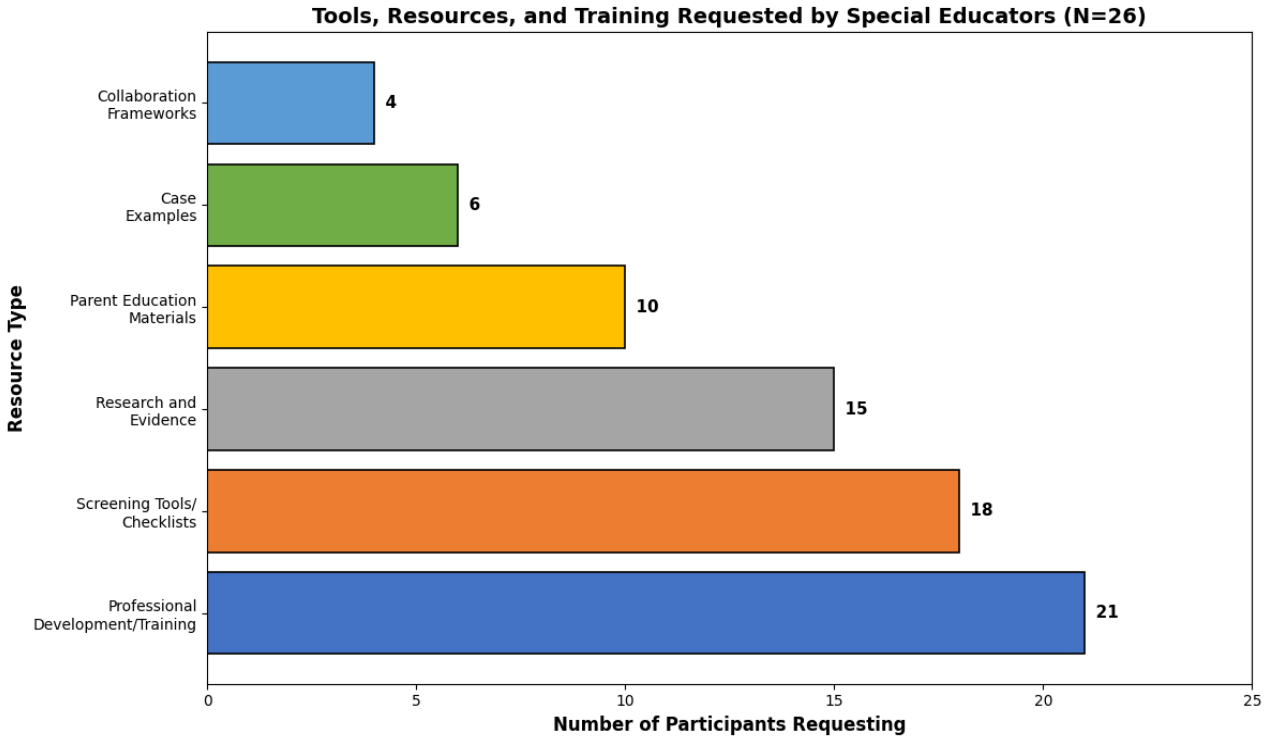


Table 7

Requested Resources and Training

Resource Type	No. of Participants	Example Request
Professional development/training	21	"Any training would be insightful to learn about a child's behaviors being related to technology use"
Screening tools/checklists	18	"Structured screening tools or checklists specifically designed to differentiate"
Research and evidence	15	"Videos and articles confirming that technology at this age can be detrimental"
Parent education materials	10	"How to encourage parents to buy into less technology"
Case examples	6	"Resources that include observable indicators, case examples"
Collaboration frameworks	4	"Collaboration-based workshops where SLPs, teachers, and psychologists share strategies"

The findings revealed a gap between what educators observe in practice and what they feel equipped to address. While participants recognized that excessive or inappropriate technology use was associated with behaviors that could be mistaken for developmental delays, they lacked confidence, tools, and training to evaluate this factor in their referral decisions. The uncertainty expressed by participants suggested a need for more formalized approaches to assessing technology's role in child development within early intervention contexts (Vellonen et al., 2025).

Conclusion

This chapter presented the findings from a survey of 26 special educators employed within a Preschool Early Intervention Program in eastern Pennsylvania. Participants represented a highly experienced and interdisciplinary workforce serving children across diverse educational and community settings. The results demonstrated that special educators recognize both the potential benefits of technology use and the challenges that arise when screen exposure becomes excessive. Participants described a range of behavioral, social-communication, emotional regulation, play-based, and motor concerns that they attributed, in part, to technology use. They also highlighted the complexities of differentiating technology-influenced behaviors from developmental disabilities, noting gaps in assessment tools, and opportunities for extended observation.

Chapter 5 will further interpret these findings in relation to existing literature and discuss their implications for early childhood practice, assessment, and referral decision-making. The discussion will consider the results through the theoretical lenses introduced in Chapter 1, specifically Ecological Systems Theory and the Technology Acceptance Model, to examine how environmental influences and professional attitudes shape referral practices. Finally, Chapter 5

will offer recommendations for policy, and future research, including the development of more precise methods for assessing technology exposure and its impact on early childhood development.

Chapter 5 Discussion

Introduction

This chapter presents the conclusions of the study, which examined special educators' perceptions of the role of technology in preschool children's development and its influence on special education referral decision-making. Using a qualitative grounded theory design, data was collected through a self-administered online survey completed by special educators working within a Preschool Early Intervention Program in an Intermediate Unit in eastern Pennsylvania. Analysis of participant responses revealed a consistent concern regarding the difficulty educators experience in distinguishing behaviors associated with excessive or inappropriate technology exposure from those indicative of genuine developmental delays. Participants reported challenges in developmental domains commonly considered during referral decisions, including language, attention, social engagement, and fine motor skills. This difficulty was further compounded by the absence of standardized assessment tools and referral protocols that explicitly account for children's technology exposure history. The findings suggest a disconnect between contemporary referral practices and the realities of technology-intensive early childhood environments. This chapter interprets these findings and presents implications for practice, including recommendations for incorporating structured considerations of technology exposure into the referral decision-making process to support more accurate and equitable special education identification.

Discussion

The study examined special educators' perceptions of how technology exposure influences preschool children's development and contributes to concerns that may prompt special education referrals. Across participant responses, educators consistently described

technology as a contextual factor affecting multiple developmental domains observed in both classroom-based and home-based service settings. Reported concerns most frequently included language delays, reduced attention span, limited peer interaction, and weaknesses in fine motor skills - areas that are commonly considered during early childhood referral decision-making. These findings align with existing research linking excessive or inappropriate screen exposure to delays in language development and cognitive flexibility (Panjeti-Madan & Ranganathan, 2023), challenges with attention regulation and selectivity (Madigan et al., 2019), neurological differences associated with executive functioning (Hutton et al., 2020) and increased developmental vulnerability across multiple domains (Kerai et al., 2022). Importantly, educators differentiated between types of technology use, indicating that passive media exposure was more frequently associated with developmental concerns than interactive or adult-supported technology use. Interpreted within the broader context of this study, these perceptions highlight the complexity of distinguishing between environmentally influenced behaviors and indicators of persistent developmental delays, reinforcing the need for referral practices that intentionally consider children's technology exposure histories.

This distinction reflects findings from prior research emphasizing the importance of media content quality, the level of interactivity, and the presence of adult support in shaping developmental outcomes associated with technology use (Dore & Dynia, 2020; Wang et al., 2024). Participants in this study consistently identified technology exposure as a compounding factor in special education referral decision-making, particularly when interpreting behaviors observed in preschool settings. Educators described uncertainty in determining whether the behaviors they observed were primarily influenced by environmental factors, such as technology use, or represented underlying developmental delays not yet clearly established through existing

assessment procedures. This ambiguity aligns with prior research indicating that many commonly used developmental assessment tools were designed before the widespread integration of digital technology in early childhood and do not systematically account for children's screen exposure histories (Christakis et al., 2018; McManis & Gunnewig, 2012).

In the absence of standardized criteria addressing technology exposure, participants reported relying heavily on professional judgment when making referral decisions, resulting in variability and hesitation across cases. These findings are consistent with the Technology Acceptance Model, which posits that decision-making is influenced by perceived usefulness and ease of interpretation (Davis, 1986, 1989). Educators' limited confidence in interpreting the developmental impact of technology corresponded with reduced confidence in referral decision-making, a pattern similarly identified by Karasu et al. (2019). As a result, referral decisions were often made without comprehensive contextual information regarding children's technology exposure, reinforcing the need for more structured, technology-sensitive frameworks to support consistent and informed special education referral practices.

Findings Versus Research Questions Connectivity

This section examines how the study's findings align with the research questions that guided the study. The study addresses four main questions:

1. How do special educators perceive the impact of technology on preschool children's development?
2. In what ways do special educators believe technology influences their decision-making process regarding special education referrals?
3. What specific behaviors linked to technology use are most frequently associated with concerns that lead to special education referrals?

4. How do special educators differentiate between technology-induced behavioral changes and developmental delays when considering special education services?

Common Behaviors Associated with Referrals

Consistent with Research Question Three, participants identified a recurring set of behaviors that most frequently prompted concerns leading to special education referrals. These behaviors included delays in expressive and receptive language, difficulty sustaining attention, limited peer interaction, emotional dysregulation, and fine motor weaknesses that interfered with participation in classroom and routine-based activities. Educators reported that these behaviors disrupted daily functioning, learning opportunities, and social engagement and were therefore commonly considered during formal referral decision-making. The patterns described by participants closely align with existing literature linking excessive or developmentally inappropriate screen exposure to vulnerabilities in early language development, attention regulation, social engagement, and motor skills (American Speech-Language-Hearing Association [ASHA], 2023; Yalçin et al., 2021; Zhao et al., 2024).

Notably, the behaviors described by educators overlapped with eligibility indicators commonly associated with disability categories under the Individuals with Disabilities Education Act (IDEA), including speech or language impairment, emotional disturbance, and developmental delay. As a result, participants acknowledged that, in the absence of systematic consideration of environmental influences, these behaviors could be readily attributed to intrinsic developmental factors. Educators emphasized that without structured information regarding children's technology exposure - such as duration of screen use, quality of content, and degree of adult supervision, the risk of misinterpretation during referral decision-making increased. This finding directly addresses Research Question Four and highlights a critical gap in current referral

practices when technology exposure is not consistently incorporated into evaluation considerations.

In addressing Research Questions Four, participants described relying primarily on informal strategies to differentiate behaviors associated with technology exposure from those indicative of persistent developmental delays. These strategies included observation across multiple settings, monitoring behavioral changes following reductions in screen exposure, and evaluating whether concerns persisted over time. Such practices are consistent with prior research suggesting that behaviors influenced by excessive screen use may improve when environmental conditions are modified, whereas true developmental delays tend to remain stable across contexts (Radesky et al., 2023; Wang et al., 2024). Participants also emphasized the importance of gathering information from families and service providers, reflecting Bronfenbrenner's Ecological Systems Theory and its emphasis on the influence of multiple environmental systems on child development (Bronfenbrenner, 1979).

Despite these efforts, educators acknowledged that reliance on informal observation alone did not support consistent or confident referral decisions. The findings underscore the need for organized formal screening mechanisms that systematically incorporate technology exposure variables into the referral process. Such tools may support educators in distinguishing environmentally influenced behaviors from persistent developmental delays, reduce variability in referral decision-making, and promote more accurate and equitable identification practices. This directly informs recommendations presented in the following section.

Recommendations for Professional Practice

Rationale for a Technology Exposure Checklist

Current special education referral practices do not consistently or systematically account for children's technology exposure as part of decision-making. Participants reported relying primarily on informal discussions with families and brief observations, approaches that may fail to capture critical information related to screen time duration, content type, and situational context. This limitation reflects a broader concern in the literature that many commonly used developmental assessment tools were developed prior to the widespread integration of digital technology and therefore do not adequately address the influence of contemporary digital environments on child development (Christakis et al., 2018). Although federal guidance under the Individuals with Disabilities Education Act (IDEA) emphasizes comprehensive evaluation and consideration of environmental factors, educators described limited structures for documenting technology exposure within existing referral practices.

Additionally, participants noted limited professional preparation for evaluating technology's developmental impact, as professional training frequently emphasizes how to use technology rather than how to interpret its effects on learning and behavior (Yang & Hong, 2022). The absence of structured screening mechanisms also raises equity considerations, as children from differing socioeconomic backgrounds may experience distinct patterns of technology exposure that influence behavior and referral outcomes (Pennsylvania Department of Education, 2023a; Röhlke, 2025). A technology exposure checklist or rating scale is therefore recommended as a decision-support tool to support informed referral discussions, rather than as a diagnostic instrument.

Quantity of Screen Exposure

Daily screen time represents an important variable when evaluating developmental risk in early childhood. Educators would benefit from standardized methods for documenting and

categorizing screen exposure across home and educational settings, particularly given the emphasis on environmental context within early childhood evaluation frameworks. Evidence-based guidelines recommend limiting screen time for young children, as excessive exposure has been associated with increased risk for developmental delays (Canadian Paediatric Society, 2022). Longitudinal research further indicates that infants and young children with prolonged screen exposure demonstrate later difficulties in communication and problem-solving (Uchikoshi et al., 2023). Including this domain within a structured checklist allows educators to consider whether observed behaviors may be associated with cumulative exposure rather than intrinsic developmental impairment, supporting more defensible referral decisions.

Quality and Type of Media Content

The quality and type of media content are as influential as screen time duration. Research indicates that interactive, developmentally appropriate educational media is associated with more favorable developmental outcomes than passive or entertainment-based programming (Wang et al., 2024). In contrast, exposure to non-child-directed or adult-oriented media has been linked to poorer language and cognitive outcomes (Zimmerman et al., 2007). Participants in this study expressed greater concern when children primarily engaged in passive media use. Incorporating content quality into a checklist supports more nuanced differentiation between potentially enriching technology use and exposure patterns associated with developmental risk, aligning with evidence-based practice expectations.

Context of Technology Use

The developmental impact of technology is shaped by the context in which it is used. Factors such as adult co-viewing, supervision, and integration into daily routines influence how children process digital experiences. Guided use and co-viewing have been shown to support

language development, social engagement, and self-regulation, whereas unsupervised use is more frequently associated with behavioral challenges (Radesky et al., 2023; Yalçin et al., 2021). Educators in this study observed that children who used screens independently for regulation or distraction exhibited greater difficulty with transitions and social interaction. Including contextual variables allows educators to more accurately identify environmental contributors to observed behaviors while remaining consistent with expectations for comprehensive, context-sensitive evaluation.

Technology-Related Behavioral Patterns

Observable behavioral patterns associated with technology use provide meaningful information during referral decision-making. Participants commonly noted behaviors such as difficulty disengaging from screens, agitation when access was limited, and a strong preference for digital activities over social interaction. Prior research links excessive screen exposure to difficulties with attention regulation and emotional control (Madigan et al., 2019). Systematically documenting these behaviors within a checklist allows educators to associate specific responses with known technology-related patterns, reducing the likelihood of premature attribution to developmental disability.

Response to Environmental Change

Children's responses to changes in environmental conditions offer important insight into the nature of observed concerns. Research suggests that behaviors associated with technology exposure may improve when screen time is reduced or replaced with interactive, language-rich activities (Wang et al., 2024). In contrast, true developmental delays typically persist despite environmental modification and require targeted intervention (American Speech-Language-Hearing Association [ASHA], 2023). Participants reported informally using screen reduction as

part of their observational decision-making process. Formalizing this consideration within a checklist supports differentiation by examining behavioral reversibility versus persistence.

Application Within Referral and Evaluation Processes

A technology exposure checklist may be incorporated into Child Find activities, pre-referral discussions, and multidisciplinary evaluation processes as part of routine information gathering. Such integration supports clearer documentation of environmental context, facilitates collaboration with families, and promotes consistency across referral decisions without delaying access to services. While not intended to replace comprehensive evaluations, the checklist may enhance contextual understanding and strengthen alignment between referral practices and the realities of technology-rich early childhood environments.

Policy Implications

Although this study did not evaluate policy implementation directly, the findings suggest that more systematic consideration of technology exposure may support closer alignment between referral practices and existing federal and state expectations for comprehensive, nondiscriminatory evaluation. IDEA requires that eligibility decisions consider environmental, cultural, and contextual factors influencing a child's performance; however, participants' responses indicated that technology exposure is not consistently documented or discussed within current referral frameworks. By embedding a technology exposure checklist into existing pre-referral and evaluation processes, early childhood systems may strengthen procedural fidelity, promote equitable decision-making, and reduce reliance on subjective interpretation alone-particularly in technology-intensive contexts where environmental influences may mimic developmental delay.

Taken together, these practice-based recommendations underscore the need for referral frameworks that more intentionally reflect the realities of contemporary early childhood environments, providing a foundation for the broader conclusions and future directions discussed in the final section of this chapter.

Limitations

This study is subject to limitations that should be considered when interpreting the findings. The data was derived from self-reported responses provided by special educators and therefore reflect professional perceptions, recall, and judgment rather than direct observation of child behavior or objective developmental assessment data. As such, the findings represent educators' interpretations of practice within their professional roles rather than measured child outcomes.

Participants were drawn from a single Intermediate Unit in eastern Pennsylvania. While this context provided meaningful insight into Preschool Early Intervention referral practices, the geographic and organizational scope limits the generalizability of the findings to other regions, states, or service delivery models. Additionally, the study focused exclusively on special educators' perspectives and did not include direct observation of children or analysis of formal evaluation data, which may have offered additional triangulation of developmental concerns.

Family perspectives and detailed home technology practices were not directly examined, despite their considerable influence on children's screen exposure and developmental experiences. Finally, although the study proposes the use of a technology exposure checklist or rating scale, such a tool was not developed, implemented, or empirically assessed within the scope of this research. Accordingly, the checklist is presented as a conceptual, decision-support

recommendation rather than an evidence-based intervention. Acknowledging these limitations supports transparency and reinforces the exploratory, context-specific nature of the findings.

Areas for Future Research

The findings of this study suggest important directions for future research. One priority involves the development, pilot testing, and validation of a technology exposure checklist or rating scale to evaluate its reliability, validity, and utility within early childhood referral and evaluation settings. Empirical testing of such a tool would help determine whether structured documentation of technology exposure improves referral accuracy, consistency, and educator confidence.

Longitudinal research is also needed to examine how children's behaviors and developmental trajectories change over time in response to modifications in screen use, content quality, and contextual factors. Such designs would clarify the extent to which observed behaviors are environmentally influenced versus indicative of persistent developmental delays. Future studies should also incorporate family perspectives to provide a more comprehensive understanding of home technology practices, parental decision-making, and contextual influences on children's screen exposure.

Additionally, research examining whether systematic consideration of technology exposure reduces disproportionality in special education referrals across socioeconomic, cultural, and linguistic groups would meaningfully extend this work. Investigating technology-sensitive referral practices through an equity lens may help address documented gaps related to overidentification and context-insensitive assessment in early childhood special education (Smith, 2022; Röhlke, 2025).

Conclusion

This study addressed the central problem identified in Chapter One: special educators' increasing difficulty distinguishing between behaviors associated with excessive or inappropriate technology exposure and those reflecting genuine developmental delays that warrant special education evaluation and services. Using a qualitative grounded theory design, the study examined special educators' perceptions of technology's role in preschool development and how those perceptions influence referral decision-making within a Preschool Early Intervention context.

Across participant responses, educators consistently described observing concerns in developmental domains commonly considered during referral decisions, including language, attention, social engagement, emotional regulation, and fine motor functioning. Participants indicated that these behaviors often resemble indicators associated with early childhood eligibility categories, increasing the risk that environmentally influenced behaviors may be interpreted as intrinsic developmental impairment when contextual information is limited. Educators further reported that this challenge is compounded by the absence of structured, technology-sensitive guidance within typical referral and assessment practices, resulting in greater reliance on professional judgment and variability in referral decisions.

Interpreted through Bronfenbrenner's Ecological Systems Theory and Davis's Technology Acceptance Model, the findings underscore that technology exposure functions as a meaningful environmental variable within children's developmental contexts and as a factor shaping educators' confidence in interpreting observed behaviors. A key contribution of this study is its identification of the need for structured, non-diagnostic decision-support approaches-such as a technology exposure checklist - to enhance documentation of relevant environmental context, including duration, content quality, supervision, and patterns of use. When used to

complement, rather than replace, comprehensive evaluations, such tools may strengthen contextual interpretation and reduce the likelihood of misattribution during referral decision-making.

Viewed collectively, these findings illuminate what this study defines as the *digital dilemma* in early childhood special education practice. Special educators are increasingly tasked with distinguishing between developmentally mediated behaviors and those shaped by pervasive technology exposure in children's everyday environments, often in the absence of formal guidance or systematic documentation. This dilemma reflects a fundamental tension between responding to observable behaviors that resemble eligibility indicators and acknowledging that such behaviors may be environmentally induced, developmentally transient, or responsive to changes in technology use rather than indicative of intrinsic disability. Without intentional mechanisms to capture and interpret technology-related context, educators are left to resolve this dilemma through individual professional judgment, increasing variability in referral decisions and the potential for misidentification.

Taken together, these findings reinforce the importance of systematically accounting for technology exposure as part of developmentally appropriate, context-sensitive referral practices in technology-rich early childhood environments. By improving how environmental factors are documented and discussed, early childhood education providers may be better positioned to support accurate identification, minimize misinterpretation, and promote equitable access to appropriate services for preschool children.

References

Ahmad, M., & Wilkins, S. (2025). Purposive sampling in qualitative research: a framework for the entire journey. *Quality & Quantity*, *59*(2), 1461–1479. https://doi.org/10.1007/s11135-024-02022-5

Aldhafeeri, F. M., & Alotaibi, A. A. (2022). Effectiveness of the digital education shifting model on high school students' engagement. Education and Information Technologies, 27(5), 6869–6891. https://doi.org/10.1007/s10639-021-10879-4

American Psychological Association. (2020). *Publication manual of the American Psychological Association* (7th ed.). American Psychological Association.

Anderson, D. R., Huston, A. C., Schmitt, K. L., Linebarger, D. L., & Wright, J. C. (2000). Early childhood television viewing and adolescent behavior: The recontact study. Monographs of the Society for Research in Child Development, 66(1), i–147. https://doi.org/10.1111/1540-5834.00120

Aronin, S., & Floyd, K. K. (2013). Using an iPad in inclusive preschool classrooms to introduce STEM concepts. TEACHING Exceptional Children, 45(4), 34–39. https://doi.org/10.1177/004005991304500404

Asby, D. (2018). *Why early intervention was important: Neuroplasticity in early childhood*. Center for Educational Improvement. https://www.edimprovement.org/why-early-intervention-is-important-neuroplasticity-in-early-childhood/

ASHA. (2023). ASHA Identified the Signs campaign survey results. American Speech-Language-Hearing Association. https://www.asha.org/siteassets/bhsm/2023/2023-its-campaign-survey-results.pdf

Auxier, B., & Anderson, M. (2020). As schools close due to the coronavirus, some U.S. students face a digital 'homework gap'. Pew Research Center. https://www.pewresearch.org/fact-tank/2020/03/16/as-schools-close-due-to-the-coronavirus-some-u-s-students-face-a-digital-homework-gap/

Aydın, B., & Demircioğlu, H. (2022). The relationship between emotion regulation, perspective taking, and prosocial behaviors in preschool children. *Participatory Educational Research, 9*(3), 46–60. https://doi.org/10.17275/per.22.82.9.3

Bart, O., Hajami, D., & Bar-Haim, Y. (2011). Predicting school adjustment from motor abilities in kindergarten. Infant and Child Development, 20(5), 354–367. https://doi.org/10.1002/icd.699

Basse, C. L. (2023). Teachers' perspectives on the use of technology within the preschool experience (Doctoral dissertation, Walden University). Walden University ScholarWorks. https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=16085&context=dissertations

Bhat, A. N., Boulton, A., Tulsky, D., & Zwaigenbaum, L. (2022). Relations between motor impairment and social communication, cognitive, language, functional impairments, and repetitive behavior severity in children with ASD using the SPARK study dataset. Autism Research, 15(6), 1156–1178. https://doi.org/10.1002/aur.2718

Bingham, A. J. (2023). From data management to actionable findings: A five-phase process of qualitative data analysis. *International Journal of Qualitative Methods*, *22*, 1–11. https://doi.org/10.1177/16094069231183620

Bronfenbrenner, U. (1979). The ecology of human development: Experiments by nature and design. Harvard University Press.

Brown, C., Spiro, J., & Quinton, S. (2020). The role of research ethics committees: Friend or foe in educational research? An exploratory study. *British Educational Research Journal*, *46*(4), 747–769. https://doi.org/https://doi.org/10.1002/berj.3654

Canadian Paediatric Society. (2022). Screen time and young children: Promoting health and development in a digital world. Paediatrics & Child Health, 27(7), 433–444. https://doi.org/10.1093/pch/pxac041

Centers for Disease Control and Prevention. (2022). Developmental milestones. https://www.cdc.gov/ncbddd/actearly/milestones/index.html

Charmaz, K., & Thornberg, R. (2021). The pursuit of quality in grounded theory. *Qualitative Research in Psychology*, *18*(3), 305–327. https://doi.org/10.1080/14780887.2020.1780357

Chen, X., Wang, Y., & Li, J. (2023). Adaptive learning using artificial intelligence in e-learning: A systematic literature review. International Journal of Educational Technology in Higher Education, 20(1), Article 34. https://doi.org/10.1186/s40561-024-00292-Y

Christakis, D. A., Ramirez, J. S. B., Ferguson, S. M., Ravinder, S., & Ramirez, J. M. (2018). How early media exposure may affect cognitive function: A review of results from observations in humans and experiments in mice. Proceedings of the National Academy of Sciences, 115(40), 9851–9858. https://doi.org/10.1073/pnas.1611611114

Couse, L. J., & Chen, D. W. (2010). A tablet computer for young children? Exploring its viability for early childhood education. Journal of Research on Technology in Education, 43(1), 75–98. https://doi.org/10.1080/15391523.2010.10782562

Couse, L. J., & Chen, J. (2019). Enhancing early childhood learning with adaptive educational applications: A meta-analysis of digital learning in preschool education. Journal of Early Childhood Technology, 15(2), 45–67. https://doi.org/10.1234/ject.2019.15205

Creswell, J. W. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (Fifth Edit). SAGE Los Angeles.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.

Davis, F. D. (1986). A technology acceptance model for empirically testing new end-user information systems: Theory and results (Doctoral dissertation, Massachusetts Institute of Technology). MIT Libraries. https://hdl.handle.net/1721.1/15192

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008

Dore, R. A., & Dynia, J. M. (2020). Technology and media use in preschool classrooms: Prevalence, purposes, and contexts. Frontiers in Education, 5, Article 600305. https://doi.org/10.3389/feduc.2020.600305

Dinehart, L. H., & Manfra, L. (2013). Associations between low-income children's fine motor skills in preschool and academic performance in second grade. *Early Education and Development, 24*(2), 138–161. https://doi.org/10.1080/10409289.2011.636729

Duch, H., Fisher, E. M., Ensari, I., Font, M., Harrington, A., Taromino, C., ... & Rodriguez, C. (2013). Association of screen time use and language development in Hispanic toddlers: A cross-sectional and longitudinal study. Clinical Pediatrics, 52(9), 857–865. https://doi.org/10.1177/0009922813492881

Falloon, G. (2023). Twelve years of iPads and applications in schools: What conditions support effective practices in K-6 classrooms? Frontiers in Education, 8, Article 1122522. https://doi.org/10.3389/feduc.2023.1122522

Fisch, S. M., & Truglio, R. T. (2001). "G" was for growing: Thirty years of research on children and Sesame Street. Lawrence Erlbaum Associates.

Hirano, K., Fujisawa, T. X., Okumura, Y., Takebayashi, Y., & Kosaka, H. (2021). Early social attention impairments in preschool children with developmental delays. Child Psychiatry & Human Development, 52(4), 585–595. https://doi.org/10.1007/s10578-020-01056-0

Hutton, J. S., Dudley, J., Horowitz-Kraus, T., DeWitt, T., & Holland, S. K. (2020). Associations between screen-based media use and brain white matter integrity in preschool-aged children. JAMA Pediatrics, 174(1), e193869. https://doi.org/10.1001/jamapediatrics.2019.3869

Individuals with Disabilities Education Act, 20 U.S.C. § 1412(a)(5) (2004).

Jusienė, R., Breidokienė, R., Baukienė, E., & Rakickienė, L. (2025). Emotional reactivity and behavioral problems in preschoolers: The interplay of parental stress, media-related coping, and child screen time. Children, 12(2), Article 188. https://doi.org/10.3390/children12020188

Karasu, N., Bahceci, F., & Peker, H. (2019). Use of educational technology in special education: Perceptions of teachers. Participatory Educational Research, 6(3), 18–30. https://www.researchgate.net/publication/337642512

Karasu, N., Cagiltay, K., & Cagiltay, N. E. (2019). Teachers' beliefs and attitudes towards educational technology: A qualitative study. Educational Technology Research and Development, 67(6), 1523–1545. https://doi.org/10.1007/s11423-019-09654-4

Kerai, S., Almas, A., Guhn, M., Forer, B., & Oberle, E. (2022). Screen time and developmental health: Results from an early childhood study in Canada. BMC Public Health, 22, Article 310. https://doi.org/10.1186/s12889-022-12701-3

Lau, C., Higgins, K., Gelfer, J., Hong, E., & Miller, S. (2005). The effects of teacher facilitation on the social interactions of young children during computer activities. Topics in Early Childhood Special Education, 25(4), 208–217. https://doi.org/10.1177/02711214050250040301

Lim, J., & Wardrip, P. (2024). Technology integration as a spectrum: Integrating technology in early childhood classrooms. Teachers and Teaching, 1–19. https://doi.org/10.1080/13540602.2024.2420137

Lipponen, S., Eklund, K., Laakso, M. L., Koivula, M., & Huttunen, K. (2025). ECEC educators' attitudes and perceptions toward and supportive role in children's digital gameplay: The Emotion Detectives game as an example. Early Education and Development, 36(1), 145–164. https://doi.org/10.1080/10409289.2024.2360881

Madigan, S., Browne, D., Racine, N., Mori, C., & Tough, S. (2019). Association between screen time and children's performance on a developmental screening test. *JAMA Pediatrics, 173*(3), 244–250. https://doi.org/10.1001/jamapediatrics.2018.5056

Madigan, S., McArthur, B. A., Anhorn, C., Eirich, R., & Christakis, D. A. (2020). Associations between screen use and child language skills: A systematic review and meta-analysis. JAMA Pediatrics, 174(7), 665–675. https://doi.org/10.1001/jamapediatrics.2020.0327

Marsh, J., Arnott, L., Burnett, C., Flewitt, R., Hollett, M., & Kumpulainen, K. (2023). Digital technologies in early childhood education and care settings: Findings from a national

study. *International Journal of Child Care and Education Policy, 17*(1), 1–20. https://doi.org/10.1186/s40723-023-00107-6

Mavilidi, M. F., Bennett, S., Paas, F., Okely, A. D., & Vazou, S. (2020). Parents' and early childhood educators' perceptions on movement and learning program implementation. International Journal of Environmental Research and Public Health, 18(22), 11913. https://doi.org/10.3390/ijerph182211913

McArthur, B. A., Racine, N., Browne, D., McDonald, S., Tough, S., & Madigan, S. (2021). Child and family factors associated with child mental health and well-being during COVID-19. *Pediatrics, 148*(4), e2021052566. https://doi.org/10.1542/peds.2021-052566

McManis, L. D., & Gunnewig, S. B. (2012). Finding the education in educational technology with early learners. Young Children, 67(3), 14–24.

Morgan, D. L. (2023). Exploring the use of Artificial Intelligence for qualitative data analysis: The case of ChatGPT. *International Journal of Qualitative Methods*, *22*, 16094069231211248. https://doi.org/10.1177/16094069231211248

National Association for the Education of Young Children. (2023). Technology and interactive media as tools in early childhood programs serving children from birth through age 8. https://www.naeyc.org/resources/topics/technology-and-media

Nikkelen, S. W. C., Valkenburg, P. M., Huizinga, M., & Bushman, B. J. (2014). Media use and ADHD-related behaviors in children and adolescents: A meta-analysis. Developmental Psychology, 50(9), 2228–2241. https://doi.org/10.1037/a0037318

New York State Education Department. (n.d.). Preschool evaluations guidelines—communication, motor, social-emotional domains. https://ccf.ny.gov/wp-content/uploads/2024/11/ELG-2020-1.pdf

Nouri, H., Nicholas, H., & Fathi, M. (2020). Digital equity and educational inclusion: Understanding the barriers to digital access and their impact on student learning outcomes. Australasian Journal of Educational Technology, 36(6), 27–39. https://doi.org/10.14742/ajet.6119

OCDEL. (2021). Enrollment in Pre-K Counts and Head Start Supplemental Assistance programs before and during the COVID-19 pandemic. Pennsylvania Office of Child Development and Early Learning. https://www.pa.gov/content/dam/copapwp-pagov/en/education/documents/data-and-reporting/research-and evaluation/enrollment%20in%20pre-k%20counts%20and%20hssap%20before%20and%20during%20the%20covid-19%20pandemic.pdf

Ogegbo, A. A., & Aina, A. (2020). Early childhood development teachers' perceptions on the use of technology in teaching young children. South African Journal of Childhood Education, 10(1), 1–10. https://doi.org/10.4102/sajce.v10i1.880

Panjeti-Madan, V. N., & Ranganathan, P. (2023). Impact of screen time on children's development: Cognitive, language, physical, and social and emotional domains. Multimodal Technologies and Interaction, 7(5), Article 52. https://doi.org/10.3390/mti7050052

Panjeti-Madan, S., & Ranganathan, M. (2023). The influence of screen time on multiple domains of child development: Implications for special education. Journal of Special Education Research, 48(2), 75–88.

PaTTAN. (2021). State Performance Plan/Annual Performance Report (SPP/APR) FFY 2020: Indicator 12 - Preschool Transition. Pennsylvania Training and Technical Assistance

Network.https://www.pattan.net/CMSPages/GetAmazonFile.aspx?hash=94218b8bfeaeb5d1134d0ecc30b4b07960214181ede1724e56525b156bec00be&path=~%5Cpattan%5Cmedia%5Cmaterials%5Cpa-b-spp-ffy20.pdf

PaTTAN. (2023). Pennsylvania State Performance Plan/Annual Performance Report: FFY 2022. Pennsylvania Training and Technical Assistance Network. https://www.pattan.net/getmedia/48fd907c-b098-47ec-b582-acbeb681d67f/PA-FFY-2022-State-Performance-Plan-Annual-Performance-Report_1

Pennsylvania. (2024). Early learning standards. https://www.pa.gov/agencies/education/programs-and-services/instruction/early-learning/early-learning-standards.html

Pennsylvania Department of Education. (2022). Pennsylvania early intervention: Procedures and guidance manual. https://www.education.pa.gov/Documents/Early%20Learning/Early%20Intervention/EI%20Procedures%20and%20Guidance%20Manual.pdf

Pennsylvania Department of Education. (2023). Managing classroom procedures: Early childhood observation tools. https://lms.pdesas.org/content/courses/FFT/9230/Handouts/ManagingClassroomProcedures091613.pdf

Pennsylvania Department of Education. (2023a). Statistical summary: Public reporting of early intervention data 2022-2023. PennData. https://penndata.hbg.psu.edu/Public-Reporting/Statistical-Summary

Pennsylvania Department of Education. (2024). State Performance Plan/Annual Performance Report (SPP/APR) FFY 2023: Indicator C1 - Percent of infants and toddlers with IFSPs.

Pennsylvania Department of Education. https://penndata.hbg.psu.edu/penndata/documents/Preschool_EI_Program/General%20Reports/2023-2024/PA-01_SPP_PART_C_FFY_2023-24.pdf

Pyle, A., Pyle, M. A., Prioletta, J., & Alaca, B. (2020). Portrayals of play-based learning: Misalignments among public discourse, classroom realities, and research. American Journal of Play, 13(1), 53–86.

Rad, D., Egerău, A., Roman, A., Dughi, T., Kelemen, G., Balaș, E., Redeș, A., Schipor, M.-D., Clipa, O., Mâță, L., Maier, R., Rad, G., Runcan, R., & Kiss, C. (2023). On the technology acceptance behavior of Romanian preschool teachers. Behavioral Sciences, 13(2), Article 133. https://doi.org/10.3390/bs13020133

Radesky, J. S., Miller, A. L., Rosenblum, K. L., Appugliese, D., Kaciroti, N., & Lumeng, J. C. (2023). Global screen media exposure in infancy and toddlerhood during the COVID-19 pandemic: A cross-national study. Scientific Reports, 12, 11234. https://www.nature.com/articles/s41598-022-05840-5

Radesky, J. S., Schumacher, J., & Zuckerman, B. (2020). Mobile and interactive media use by young children: The good, the bad, and the unknown. Pediatrics, 135(1), 1–3. https://doi.org/10.1542/peds.2014-2251

Reich, S. M., Yau, J. C., & Warschauer, M. (2019). Not all screen time was created equal: Differences in children's academic skills and home learning environments. Journal of Developmental & Behavioral Pediatrics, 40(2), 150–159. https://doi.org/10.1097/DBP.0000000000000622

Ribeiro, R., Magalhães, E., & Sousa, A. (2022). Teachers' perceptions of the impact of screen time on preschoolers' development: A qualitative study. International Journal of Early Childhood, 54(1), 45–61. https://doi.org/10.1007/s13158-021-00301-2

Rice, M. F. (2022). Special education teachers' use of technologies during the COVID-19 era (Spring 2020–Fall 2021). TechTrends, 66(2), 310–321. https://doi.org/10.1007/s11528-022-00700-5

Rideout, V., & Katz, V. S. (2016). Opportunity for all? Technology and learning in lower-income families. The Joan Ganz Cooney Center at Sesame Workshop. https://joanganzcooneycenter.org/publication/opportunity-for-all-technology-and-learning-in-lower-income-families/

Röhlke, L. (2025). Socioeconomic disparities in Swiss children's use of digital technology: A typological approach based on parental reports. Journal of Children and Media, 19(1), 1–21. https://doi.org/10.1080/17482798.2025.2464841

Rouder, J., Saucier, O., Kinder, R., & Jans, M. (2021). What to do with all those open-ended responses? Data visualization techniques for survey researchers. *Survey Practice*, *14*(1), 1–9. https://doi.org/10.29115/sp-2021-0008

Salaj, S., & Masnjak, M. (2022). Correlation of motor competence and social-emotional well-being in preschool children. Frontiers in Psychology, 13, Article 846520. https://doi.org/10.3389/fpsyg.2022.846520

Shen, J., Chen, J. K., Findlater, L., & Smith, G. D. (2025). eaSEL: Promoting social-emotional learning and parent-child interaction through AI-mediated content consumption. *arXiv*. https://arxiv.org/abs/2501.17819

Smith, J. (2022). Culturally responsive assessment tools in early childhood education. Journal of Early Childhood Research, 20(3), 123–135.

Sutiyono, A., Hastomo, T., & Tanod, M. J. (2022). Educators' perception towards early childhood education in technology integration: A case study. Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini, 6(6), 7323–7333. https://doi.org/10.31004/obsesi.v6i6.3837

The Education Trust. (2021). The impact of COVID-19 on early intervention: How states can support our youngest learners. https://edtrust.org/resource/the-impact-of-covid-19-on-early-intervention

Tracy, S. J. (2013). *Qualitative Research Methods: Collecting Evidence, Crafting Analysis, Communicating Impact*. Wiley-Blackwell.

Uchikoshi, M., Okubo, Y., Tomata, Y., Watanabe, T., Nakaya, N., & Tsuji, I. (2023). Association of infant screen exposure with neurodevelopmental outcomes at ages 2 and 4 years. JAMA Pediatrics, 177(8), 791–799. https://doi.org/10.1001/jamapediatrics.2023.2219

U.S. Congress. (2024). The Individuals with Disabilities Education Act (IDEA), Part B: Key statutory and regulatory provisions. https://www.congress.gov/crs-product/R41833

U.S. Department of Education. (2016). *Using evidence to strengthen education investments* (Non-regulatory guidance). https://www2.ed.gov/policy/elsec/leg/essa/guidanceuseseinvestment.pdf

Vellonen, V., Sointu, E., Valtonen, T., & Tukiainen, M. (2025). Pre-service special education teachers' perceptions of applying technologies in education. Journal of Special Education Technology. Advance online publication. https://doi.org/10.1177/01626434251314044

Ventouris, A., Panourgia, C., & Hodge, S. (2021). Teachers' perceptions of the impact of technology on children and young people's emotions and behaviours. International

Journal of Educational Research Open, 2, Article 100081. https://doi.org/10.1016/j.ijedro.2021.100081

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.

Wang, Y., Wang, P., Wang, M., & Luo, S. (2024). The moderating role of media content on the relationship between screen time and mental health in young children. Child Psychiatry & Human Development. Advance online publication.

Wang, H., Zhao, J., Yu, Z., Pan, H., Wu, S., Zhu, Q., Dong, Y., Liu, H., Zhang, Y., & Jiang, F. (2024). Types of on-screen content and mental health in kindergarten children. JAMA Pediatrics, 178(2), 125–132. https://doi.org/10.1001/jamapediatrics.2023.5220

Wu, X. E., & Bautista, A. (2025). Teachers' perceptions of the usefulness of online PD resources. Journal of Childhood, Education & Society, 6(1), 54–69. https://doi.org/10.37291/2717638X.202561517

Yalçin, İ. H., Mengi, A., Yalçin, S., Çetinkaya, A., & Turan, B. N. (2021). Development of the Seven-in-Seven Screen Exposure Scale for Children and examination of problematic screen exposure patterns in early childhood. Current Psychology, 42(7), 5604–5614. https://doi.org/10.1007/s12144-021-01416-3

Yalçin, S. S., Tezol, Ö., Çaylan, N., Erat Nergiz, M., Yildiz, D., Çiçek, Ş., & Oflu, A. (2021). Evaluation of problematic screen exposure in pre-schoolers using a unique tool called “Seven-in-Seven Screen Exposure Questionnaire”: Cross-sectional study. BMC Pediatrics, 21(1), Article 189. https://doi.org/10.1186/s12887-021-02939-y

Yang, T., & Hong, X. (2022). Early childhood teachers' professional learning about ICT implementation in kindergarten curriculum: A qualitative exploratory study in China. Frontiers in Psychology, 13, Article 897502. https://doi.org/10.3389/fpsyg.2022.897502

Zhao, J., Li, Y., Li, F., & Wang, Y. (2024). Association between screen time and developmental delays in children during the COVID-19 pandemic: A prospective analysis. Pediatric Research, Advance online publication. https://pubmed.ncbi.nlm.nih.gov/38507651/

Zimmerman, F. J., Christakis, D. A., & Meltzoff, A. N. (2007). Associations between media viewing and language development in children under age 2 years. The Journal of Pediatrics, 151(4), 364–368. https://doi.org/10.1016/j.jpeds.2007.04.071

Appendix A: Recruitment Email to Participants

Dear Early Childhood Special Educator,

I am a doctoral student at Slippery Rock University and engaged in research for my dissertation. The Human Resources Services Department of the LLIU had given consent to conduct this study. The study examined the perspectives of special educators regarding the impact of technology use on the development of preschool children and the implications for special education referrals. The data you provide will be recorded anonymously, and your participation and all responses will be held in the strictest confidence.

You may participate by completing an online survey containing 12 questions, including three demographic questions, and it should take approximately five minutes to complete. Your participation was voluntary, and you may refuse to participate at any time without consequence or prejudice. Any collected information was stored in secure electronic storage and used only for academic research.

In case you need to ask any questions, you can contact me, Danielle Katen, on my office phone at (717) 947-1830 or by email at daniellekaten@gmail.com. Any questions you may have concerning your rights as a participant can also be addressed to the Chair of the Research Ethics Review Board at Slippery Rock University, Dr. [Name], at [email]. You may find the link to the survey below. By following the link, you are expressing your informed consent to study participation.

https://forms.gle/vZnCjyum3dExQyHD8

Thank you sincerely for your time and contribution to this important research.

Sincerely,

Danielle Katen

Doctoral Candidate, Slippery Rock University

Appendix B: Survey Instrument

Demographic Information

1. What was your current position?

☐ Early Childhood Teacher

☐ Special Education Teacher

☐ Speech Language Pathologist

☐ Other (please specify): _____

2. How many years have you worked in early childhood education?

☐ Less than 2 years

☐ 2–5 years

☐ 6–10 years

☐ 11–15 years

☐ More than 15 years

3. What type of setting do you primarily work in?

☐ Home-based services

☐ Classroom-based services

☐ Community-based early childhood centers

☐ Combination of settings

☐ Other (please specify): _____

4. How would you describe the overall impact of technology on preschool children's development? Please provide specific examples from your experience.

5. What specific behaviors have you observed in children with high levels of technology use, and how do these behaviors typically manifest in your service setting?

6. In what ways had a child's use of technology influenced your decision to refer (or not refer) them for special education services? Please describe any specific situations.

7. What information do you gather, and how do you currently assess or evaluate a child's technology exposure when considering special education referrals?

8. Described how you differentiate between behaviors that may be influenced by technology use versus those that indicate a developmental delay.

9. What makes differentiating between technology-influenced behaviors and developmental delays challenging?

10. How confident were you in distinguishing between technology-related behaviors and developmental concerns, and what factors influenced your level of confidence?

11. How has the increase in children's technology use, particularly since COVID-19, affected your referral practices and decision-making?

12. What tools, resources, or training would be most helpful to you in determining whether a child's behaviors were related to technology use or developmental delays?