Navigating Technology in Early Childhood: The Role of Parents, Teachers, and Policymakers

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Higher screen time among younger children is associated with challenges such as difficulty completing tasks, maintaining curiosity, and managing emotions (Twenge & Campbell, 2018). However, Ciampa and Gallagher (2013) found that mobile devices can increase engagement and productivity, particularly among reluctant learners, by providing immediate feedback that enhances persistence with challenging tasks. This ongoing debate about whether technology in early childhood (ages 6-10) enhances or hinders child development creates uncertainty and inconsistent guidance for parents and educators. The lack of standardized guidelines for technology use in education and at home leads to conflicting perceptions about its role in children's lives, affecting how devices and digital literacy skills are integrated into the classroom and home environment. Digital literacy is the ability to use, understand, and critically evaluate digital tools and content while navigating online spaces safely and responsibly.

This paper uses the Social Construction of Technology (SCOT) framework, particularly the concept of interpretative flexibility (Pinch & Bijker, 1984/2012), to explore how differing perceptions of technology influence the responses of key stakeholders: parents, educators, and policymakers. These varying perceptions shape policies and practices, contributing to the challenges of integrating technology in early childhood. By identifying misalignments in stakeholder views, this paper shows how differing motivations and common missteps limit technology's positive impact on child development, and why mutual support among parents, teachers, and policymakers is essential to realizing that potential.

I. Parents and Caretakers

Parents and caretakers are crucial in introducing young children to digital devices and shaping their internet habits. Clinicians, educators, teens, and even parents agree that parents

bear the primary responsibility for teaching safe internet practices (Moreno et al., 2013). This view is reinforced by a National Cyber Security Alliance survey, where 72% of teachers affirmed that parents should be responsible for guiding children's safe computer use (Pruitt-Mentle, 2010). Despite widespread agreement on the importance of parental responsibility in guiding children's digital experiences, many parents face significant challenges in fulfilling this role, often stemming from their own lack of digital literacy, general attitudes and habits with technology, and social barriers.

Many parents lack confidence in their own digital literacy skills, making it difficult for them to guide their children effectively. The label "digital natives" (Moreno et al., 2013) suggests that children are naturally skilled with technology because of their early exposure, which can leave parents feeling unprepared to guide them in developing healthy and safe digital habits. In line with this, less than 8 percent of parents can accurately assess their children's technological proficiency, with 50 percent of parents overestimating, and 42 percent underestimating their children's knowledge of common technology (Vittrup et al., 2016). These findings highlight the widespread belief among parents that their children are more capable of using devices than they actually are, which can contribute to a parent's lack of confidence.

Additionally, greater parental confidence with technology was directy correlated to less youth screen time (Sanders et al., 2016), suggesting that when parents feel more capable, they are more likely to implement effective boundaries. Parents who lack confidence may avoid essential mediation strategies, like blocking inappropriate websites, leaving children at greater risk of overexposure to harmful content and difficulty managing screen time. SCOT's framework of interpretative flexibility suggests that parents with low digital literacy confidence may disengage, hindering effective guidance on healthy digital habits.

Despite these challenges, the majority of parents agree that exposing children to technological tools better prepares them for the future workforce (Vittrup et al., 2016) and improves hand-eye coordination (Eales et al., 2021). However, this assumption often prioritizes access over guidance, leading to passive consumption rather than the development of creativity, problem-solving, or digital literacy. Some parents also view media as a useful tool for keeping children occupied (Eales et al., 2021), which exposes a tendency to use media as a convenient solution for managing children's attention, potentially fostering unhealthy habits with technology. SCOT's framework of interpretative flexibility suggests that parents who view technology as a necessary skill and/or as a quieting tool may neglect the necessary guidance of developing digital literacy skills.

Parents who see technology as harmful tend to impose strict controls, limiting exposure without fostering responsible habits (Willett & Wheeler, 2021). While these restrictions may reduce screen time, they fail to prepare children for independent, responsible use as they grow older and gain access to personal devices. Willet and Wheeler's findings align with Griffith et al. (2023), who found that parents often associate leisure with educational screen time, leading to rigid monitoring rather than open conversations. This reactive approach, driven by fear, hinders the development of skills for self-regulated technology use. SCOT's framework of interpretative flexibility suggests parents who see technology as harmful may impose restrictive controls rather than encouraging dialogue.

Parents' technology habits also shape the model they set for their children, as most early exposure to technology use comes from parental examples. In both mothers and fathers, interruptions in parent-child activities due to technology use were linked to increased internalizing behaviors and higher screen time in children (McDaniel & Radesky, 2018).

Internalizing behaviors are a category of emotion and psychological responses that are directed inward. This finding emphasizes the importance of setting a good example for children, as they are shaped by the behaviors of their caregivers. When parents are frequently distracted by technology, it not only models passive engagement with devices, but also disrupts crucial bonding and communication time. The negative outcomes associated with these interruptions, such as increased internalizing behaviors, suggest that children may internalize their parents' disengagement or view screen time as a coping mechanism. This highlights the need for parents to be mindful of their own technology use, as children often mimic their actions and develop similar habits. SCOT's framework of interpretative flexibility suggests that parents' own perceptions of technology shape their behaviors, which in turn influence how children perceive technology and develop their own digital habits.

Parental challenges in managing children's technology use go beyond awareness and perceptions, involving significant barriers of time and mediation. Younger children require more hands-on attention, which many parents simply don't have. This is emphasized by the perceptions of remote schooling during COVID-19, where 68.1% of parents reported negative experiences, with 40% blaming lack of time and 32% blaming lack of knowledge (Griffith et al., 2023). Managing technology is also emotionally taxing, as parents must negotiate and enforce screen time routines while balancing multiple roles as a worker, caregiver, and educator (Willett & Wheeler, 2021). This emotional and logistical burden leads to inconsistent screen time strategies.

SCOT's framework of interpretative flexibility suggests that parents' social status and experiences shape how they mediate technology use. Parents with more time and resources may adopt structured approaches, while those from lower-income or single-parent households may

rely on restrictive or passive strategies due to time constraints and limited knowledge. This disparity exacerbates socioeconomic inequalities, as children from lower-income households face greater challenges in developing digital literacy, perpetuating a cycle of disadvantage.

Through the eyes of many parents, the benefits of technology often appear to outweigh the risks. While early exposure to technology can be valuable, unstructured and unguided access may lead to passive consumption rather than meaningful learning. Parents should do more than supervise their young child's use of devices; they need to engage in open, ongoing conversations with their children about online experiences, risks, and choices. As primary role models, parents should also demonstrate responsible digital habits, as their behavior strongly influences how children view and use technology. It's important for other stakeholders to recognize that limited time, resources, and digital literacy, especially in lower-income or single-parent households, can hinder a parent's ability to provide effective guidance. To bridge this gap, greater support from policymakers and educators is essential. For example, Denmark's "Parents in a Digital World" initiative offers practical workshops and webinars to build parents' confidence and competence in navigating their children's digital lives (GSMA, n.d.). By providing families with the necessary education and tools, we can ensure all children, regardless of background, form healthy, balanced relationships with technology, benefiting both individuals and society.

III. Supporting Argument 2: Teachers and Educators

Teachers arguably play the second most critical role in guiding children toward safe and responsible internet use, bridging the gap between classroom digital learning and the unrestricted access some students have outside of school. In addition to this role, teachers also act as intermediaries between parents and policymakers, translating education policies and guidelines into actionable practices in the classroom. Despite extensive research on remote learning, there is

limited understanding of how classroom technology use has evolved since COVID-19, even though technology integration begins early in schools. For instance, Fairfax County Public Schools (n.d) offers age-appropriate digital learning platforms to support students as young as kindergarteners across various subjects. However, teachers face challenges in establishing clear guidelines for digital use, compounded by factors such as inconsistent digital behavior between home and school, along with limited time.

The frequency and depth of digital literacy lessons vary widely across the United States, and even within individual schools. Some educators advocate for regular digital safety instruction, while others believe it should only be covered once a year (Martin et al., 2023). Rather than taking a strict stance for or against technology integration, most teachers prefer to adjust their approach based on student needs (Mertala, 2019). Although Mertala's survey included both preservice and in-service teachers, their findings indicated that the perspectives on technology use in education do not differ significantly, highlighting a general adaptability that further contributes to inconsistency. Without a standardized framework, teachers interpret digital literacy's role based on their perspectives and available resources. This reflects SCOT's concept of interpretative flexibility in practice.

Additionally, a gap exists in digital literacy education at the elementary level. Research shows that digital citizenship is more commonly taught at the secondary level, but not at the elementary level (Vega & Robb, 2019), where early intervention is arguably more crucial. Similarly, Kumar et al. (2019) found that few elementary students receive lessons on digital privacy and security, and when they do, these lessons are typically delivered by media specialists instead of classroom teachers. This reliance on specialists isolates digital literacy from daily classroom practices and prevents its integration into broader learning experiences. Through

SCOT's interpretative flexibility, teachers and educators of young children may view digital literacy as relevant only for older students or outside their scope of responsibility, causing critical topics such as online safety to be overlooked during the formative years when children are developing their digital habits.

Additionally, the contrast between school regulations and the possibly lax or inconsistent rules at home creates a significant disconnect in students' digital behavior. At school, while restricting access to non-approved websites and locking down school devices prevent immediate exposure to harmful content, they do not prepare students for the unrestricted digital environments they encounter outside of school. Even with the restricted internet access, some educators report that students are still find ways to bypass safety measures, emphasizing the need for digital literacy instruction that goes beyond technical controls (Martin et al., 2023). Furthermore, teachers note that students often bring digital habits learned at home into the classroom, complicating efforts to maintain appropriate conduct (Martin et al., 2023). While technology is structured for educational purposes at school, it often serves as entertainment at home. This discrepancy creates challenges as students struggle to reconcile these differing expectations, disrupting learning and complicating digital discipline.

The lack of a unified approach between home and school hinders the development of consistent, healthy digital habits. Unlike schools, many parents may lack the resources or strategies to set clear digital boundaries at home (Bacak et al., 2022). As a result, students enter the classroom with varying digital experiences, forcing educators to address disparities in digital behavior along with academic content. Through SCOT's interpretative flexibility, teachers may perceive their role in managing digital safety as limited by how parents choose to integrate

technology into young children's lives. This emphasizes the need for greater collaboration between parents and educators to establish consistent digital expectations.

While misaligned perceptions between teachers and parents pose challenges to digital literacy integration, structural barriers within the education system further hinder its adoption. One obstacle is the limited time available for teachers to implement innovative teaching approaches. A significant portion of instructional time is dedicated to preparing students for standardized tests, leaving little room for subjects not directly assessed (Nahar, 2023). Standardized testing pressures teachers to prioritize test-related content, often at the expense of broader skills like digital literacy. Even when educators recognize its importance, rigid curriculum requirements make it difficult to justify allocating time to a subject that is not formally evaluated. Through the lens of the SCOT framework, teachers' interpretations of their professional responsibilities shape how they prioritize digital literacy within curriculum constraints.

The teacher's role in integrating technology into a child's life is often shaped by both state-mandated curriculum and parents' choices about early technology use. Still, teachers should actively incorporate healthy digital practices into everyday lessons, especially at the elementary level, where early habits are formed. Consistent integration of digital literacy at this stage is critical—not only for protecting young users but also for fostering responsible and informed technology use as they grow. Teachers can help bridge the gap between school and home by using parent-teacher conferences to clarify how digital tools are used in the classroom and encourage aligned practices at home. To do this effectively, however, educators need sustained support from policymakers, including resources and training, to confidently teach the digital skills children need to navigate today's online world.

IV. Supporting Argument 3: Policymakers

As technology continues to play an integral role in children's lives, policies surrounding their digital engagement have become a key focus, as shown by the National Conference of State Legislatures' list of over 150 bills and policies proposed in 2023 (National Conference of State Legislatures, 2023), with a select few enacted. However, many of these policies fall short of effectively fostering responsible online engagement. Policymakers often assume that technology is inherently harmful and that one-age-fits-all restrictions are sufficient, overlooking the diverse developmental needs of children. Additionally, these policies place the burden of enforcement on parents and educators without providing the necessary support or resources. This results in a gap between solutions and the practical tools required to help children safely navigate the digital world.

Many policies on children's technology use prioritize restrictions, assuming technology is inherently harmful and overlooking its potential benefits. For example, the Children's Internet Protection Act is a federal law (2000) mandates that schools and libraries that receive discounts for internet access and internal connections use filters to block harmful content, but it fails to mention equiping children with the skills to navigate online spaces safely. Similarly, Montana's TikTok ban (Mont. SB 419, 2023) criminalizes access to the platform rather than teaching users critical digital engagement skills. This approach assumes that eliminating one platform will prevent harm, despite children likely turning to alternatives.

These restrictive policies align with early American Psychological Association (APA) guidelines, which in 2016 warned against "excessive" screen time (1-2 hours daily) (Griffith et al., 2023). Though the APA has since shifted toward a more balanced approach, outdated narratives like Griffith's persist, influencing both policy and parental decision-making. Such

restrictions reflect SCOT's framework of interpretative flexibility, where policymakers' perceptions of technology as inherently harmful result on regulations focused on limiting access rather than fostering responsible engagement. However, restrictions and education must go hand in hand; while limiting harmful content can offer protection, teaching children how to engage with technology responsibly is equally essential.

Many state-level policies on children's technology use fail to account for developmental differences, limiting opportunities for responsible, age-appropriate engagement. For instance, Florida's digital literacy instruction starts in grade 6 (Florida Department of Education, n.d.), and California's begins in grade 5 (California Department of Education, n.d.), leaving younger children unprepared to navigate digital spaces safely. Florida's curriculum focuses only on the social, emotional, and physical effects of social media (Florida Department of Education, n.d.), while California categorizes digital literacy under arts education, diminishing its importance (California Department of Education, n.d.). Moreover, the digital literacy needs of K-5 children differ significantly; a kindergartener's understanding of online safety is not comparable to that of a fifth grader, yet many policies overlook this.

This issue also extends to age verification and parental controls, which impose uniform restrictions without considering developmental differences. For example, a kindergartener and a teenager may face the same content limitations, despite their vastly different cognitive and emotional maturity levels, as well as their ability to critically evaluate and interpret the content. Additionally, while social media platforms are subject to a plethora of federal and state regulations, policies often overlook the risks posed by online gaming communities, where children are exposed to similar threats such as inappropriate content and online predators, yet no comparable laws or protections exist for these platforms. Through SCOT's interpretative

flexibility, policymakers assume that one-age-fits-all restrictions are effective, overlooking the diverse developmental needs of children.

Many policies assume parents and educators can enforce restrictive technology rules without adequate support. For example, Children's Online Privacy Protection Act (1998) is a federal law that prohibits companies from collecting data from children under 13 without parental consent, and many social media platforms require age verification and parental approval. These measures shift responsibility onto parents, requiring them to monitor their children's online activity, regulate what information they share, and ensure compliance with age restrictions without structured support. Moreover, online environments are challenging to navigate due to unclear terms, shifting privacy policies, and complex settings. Many parents struggle to understand platform regulations and data collection practices, making it difficult to enforce rules to ensure their child's digital safety.

At the school level, the Children's Internet Protection Act (2000) mandates website blockers in federally funded schools, but compliance varies based on staffing, expertise, and funding. Efforts to incorporate digital literacy also lack clear strategies. For instance, California's policy requires media literacy resources (Cal. AB 873, 2023), and Colorado provides resources for teachers (Colorado Department of Education, n.d.), but neither mandates a structured curriculum, making digital literacy optional. Without standardized guidelines, assessments, or dedicated instructional time, teachers must fit digital literacy into an already full curriculum, leading to inconsistent exposure and effectiveness across schools and districts. This reflects SCOT's interpretative flexibility, where policymakers overlook the challenges parents and educators face in managing children's technology use.

Policymakers should adjust their focus from overly restrictive policies to increasing widespread digital literacy by supporting parents and teachers, since all children are different and one-size-fits-all policies won't ensure responsible engagement. Policymakers should support public digital education initiatives such as workshops in libraries, community centers, and schools that teach media literacy, online safety, and privacy skills to kids, parents and other adults. State policymakers should also integrate digital literacy standards into K–12 education by developing age-appropriate frameworks and requiring them as part of core subjects like language arts, science, and social studies.

I encourage federal policymakers to enforce platform providers to create easy-to-understand guides that explain the terms of service, privacy policies, and age restriction capabilities. The Entertainment Software Rating Board (ESRB, n.d) provides age-based ratings for video games and digital content, and the ESRB's website offers practical resources like step-by-step video tutorials for implementing parental controls. These resources help parents navigate complex settings and make informed decisions about their children's digital engagement. Expanding these types of resources and promoting them would make it easier for parents to monitor and guide their children's use of digital platforms in a way that matches their child's age and maturity level.

Conclusion

Parents, teachers, and policymakers should shift from a restrictive approach to technology integration toward one centered on open dialogue and the development of digital literacy skills from an early age. Policymakers must support both parents and teachers by offering accessible resources to help families build their digital literacy and prioritizing comprehensive digital literacy objectives with clear standards and professional development for

educators. In turn, parents and teachers should collaborate to ensure consistent expectations and practices across home and school environments. Only through this collaboration can we bridge gaps in digital literacy and prepare students for the complexities of the digital world.

When digital literacy is nurtured early and reinforced across learning environments, children are better prepared to critically evaluate online content, navigate digital risks safely, and use technology in ways that support their learning and well-being. This analysis also reveals the broader social implications of technology integration, such as the challenges low-income parents face in supporting their children's digital development and the pressures placed on teachers to deliver digital instruction without sufficient guidance. By supporting parents and teachers, policymakers can help reduce disparities in access to digital tools, skills, and support systems. Although this research contributes to the growing conversation around early digital engagement, it does not fully address how children themselves understand and navigate their technology use. Future studies should explore children's perspectives on technology and whether they see it as a tool for learning, entertainment, or connection, as well as how socioeconomic differences affect digital literacy and the development of healthy digital habits.

References

Alomar, N., & Egelman, S. (2022). Developers say the darnedest things: Privacy compliance processes followed by developers of child-directed apps. *Proceedings on Privacy Enhancing Technologies*.

Barkhuus, L., & Lecusay, R. (2012). Social Infrastructures as Barriers and Foundation for Informal Learning: Technology Integration in an Urban After-School Center. *Computer Supported Cooperative Work (CSCW)*, *21*(1), 81–103. https://doi.org/10.1007/s10606-012-9157-3

California Assembly Bill 873, Reg. Sess. (Cal. 2023).

California Department of Education. (n.d.). *Content standards search results: Media literacy*. California Department of Education. https://www2.cde.ca.gov/cacs/all?carea=0&order=0&page=0&perpage=10&mingrade=0&maxgrade=12&dl=0&query=media+literacy

Çetintaş, H. B., & Turan, Z. (2018). Through the Eyes of Early Childhood Students: Television, Tablet Computers, Internet and Smartphones. *Central European Journal of Communication*, *11*(1), 56–70. https://doi.org/10.19195/1899-5101.11.1(20).4

Children's Internet Protection Act, 47 U.S.C. § 254 (2000).

Children's Online Privacy Protection Act, 15 U.S.C. §§ 6501–6506 (1998).

Colorado Department of Education. (n.d.). *Media literacy resource bank*. Colorado Department of Education. https://www.cde.state.co.us/medialiteracy/media-literacy-resource-bank

Cook, D., Zilka, M., DeSandre, H., Giles, S., & Maskell, S. (2023, August). Protecting Children from Online Exploitation: Can a Trained Model Detect Harmful Communication Strategies?. In *Proceedings of the 2023 AAAI/ACM Conference on AI, Ethics, and Society* (pp. 5-14).

Fairfax County Public Schools. (n.d.). *Digital resources by grade level*. https://www.fcps.edu/services/technology/digital-resources-grade-level

Faraz, A., Mounsef, J., Raza, A., & Willis, S. (2022). Child safety and protection in the online gaming ecosystem. *Ieee Access*, *10*, 115895-115913.

Florida Department of Education. (n.d.). *Rule 6A-1.09441: Digital Literacy and Media Literacy Standards*. Florida State Board of Education.

Griffith, S. F., Delisle, J. H., & Casanova, S. M. (2023). Parent perceptions of technology-facilitated learning for young children: Associations with parent and child characteristics. *Journal of Research on Technology in Education*, 1–15. https://doi.org/10.1080/15391523.2023.2224594

GSMA. (n.d.). *How parents in Denmark are getting up to speed with technology*. GSMA.

McDaniel, B. T., & Radesky, J. S. (2018). Technoference: Parent Distraction With Technology and Associations With Child Behavior Problems. *Child Development*, *89*(1), 100–109. https://doi.org/10.1111/cdev.12822

Miller, E. E. N., & Pedersen, S. (2024). Promises and Limitations in District Digital Capacity for Education During COVID-19. *AERA Open*, *10*, 23328584241303875. https://doi.org/10.1177/23328584241303875

Montana Senate Bill 419, Reg. Sess. (Mont. 2023).

Moreno, M. A., Egan, K. G., Bare, K., Young, H. N., & Cox, E. D. (2013). Internet safety education for youth: stakeholder perspectives. *BMC public health*, *13*, 1-6.

National Conference of State Legislatures. (2023, March 20). *Social media and children: 2023 legislation*. National Conference of State Legislatures. https://www.ncsl.org/technology-and-communication/social-media-and-children-2023-legislation

Sanders, W., Parent, J., Forehand, R., Sullivan, A. D. W., & Jones, D. J. (2016). Parental perceptions of technology and technology-focused parenting: Associations with youth screen time. *Journal of Applied Developmental Psychology*, *44*, 28–38. https://doi.org/10.1016/j.appdev.2016.02.005

Stein, L., & Prewett, A. (2009). Media literacy education in the social studies: Teacher perceptions and curricular challenges. Teacher Education Quarterly, 36, pp. 131–148

Vittrup, B., Snider, S., Rose, K. K., & Rippy, J. (2016). Parental perceptions of the role of media and technology in their young children's lives. *Journal of Early Childhood Research*, *14*(1), 43–54. https://doi.org/10.1177/1476718X14523749

Wijkstra, M., Rogers, K., Mandryk, R. L., Veltkamp, R. C., & Frommel, J. (2024). How to tame a toxic player? A systematic literature review on intervention systems for toxic behaviors in online video games. *Proceedings of the ACM on Human-Computer Interaction*, *8*(CHI PLAY), 1-32.

Willett, R., & Wheeler, N. (2021). Maintaining family stability in the age of digital technologies: An analysis of d/Discourse informing domestic screen media practices in three US families. *Children & Society*, *35*(5), 722–735. https://doi.org/10.1111/chso.12443