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The impact of digital literacy on cognitive development in early childhood

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Abstract

This study looks at how digital tools affect early childhood education, how theoretical frameworks guide digital literacy practices, and how to balance digital and traditional literacy activities. The study concludes, based on a literature review, that interactive learning experiences and digital tools such as educational apps and tablets can enhance engagement and complement traditional methods. Though, well, circumstances are such that kids will get excessively dependent on technology, which could limit their opportunities for physical play and face-to-face interaction. Theoretical frameworks, such as constructivist and sociocultural perspectives, emphasize the need to integrate digital literacy in a balanced manner that supports comprehensive development. To provide students with a well-rounded educational experience, the study emphasizes integrating digital tools with traditional literacy activities. Access issues and cultural differences are also raised, highlighting the importance of context-sensitive approaches and further research. Overall, even though digital tools can improve early childhood education, they should be used alongside more conventional methods to ensure students receive a complete education and are treated equally.

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1. Introduction

The quick development of digital tools in the 21st century has changed many phases of daily life, including education. Early childhood education has gradually integrated digital tools into learning environments as they have become more common and affordable. The capacity to utilize digital innovations to successfully and fundamentally explore, assess, and bring data has emerged as a fundamental element of current education (Erstad and Gillen, 2019). This introduction focuses on the significance of digital learning in childhood settings, examining the impact of digital tools on young learners and the repercussions for educational practices. A general shift in public perception toward a computerized mix is evident in the early reception of digital advancements in educational settings. Early adoption of digital technologies in educational settings reflects a broader societal shift toward digital integration. It is currently up to youth teachers to ensure that computerized devices improve rather than divert from customary learning. Early digital literacy, according to Marsh (2005), involves more than just using technology; it also entails understanding how digital content is produced and used. From this perspective, it is crucial to carefully incorporate digital tools into early education to ensure they benefit children's development. Digital literacy supports early childhood development, according to research.

Digital literacy supports a kind of early childhood progress status, according to research. For example, narrating exercises that consolidate advanced tools can further enhance proficiency development by offering intuitive and engaging opportunities for growth. Maureen et al. (2018) observed that digital narrating expands kids' commitment and provides numerous ways for them to communicate their thoughts,

which can be particularly useful for various kinds of students. Pereira et al. (2023) highlight the capability of cutting-edge technology to create unique learning conditions that accommodate diverse learning styles and needs. Tatminingsih (2022) analyzes how advanced literacy is coordinated in early childhood in Indonesia. The review aims to survey current practices, challenges, and opportunities in digital literacy education for young students. Explore demonstrates that while there is growing attention to the significance of advanced education, its implementation is hampered by factors such as limited access to technology, inadequate teacher preparation, and the lack of standardized rules.

Notwithstanding these difficulties, effective digital education programs have led to greater commitment and advanced skills among children. Saleha et al. (2022) in this research feature the combination of advanced devices in youth training to support profound and social development. The researcher found that consolidating digital education activities helps kids develop stronger interactive skills and a deeper understanding of themselves by providing opportunities for growth and engagement. According to Scott and Marsh (2018), digital literacies include not only technical skills but also the ability to use digital content and tools critically. They discuss the evolving role of digital tools in young children's learning environments and the potential advantages and drawbacks of incorporating them. The positive effects of digital literacy on children's social and cognitive development are important findings. However, there are also concerns about screen time and the need for balanced, developmentally appropriate use (2014). The study investigates how digital skill levels are perceived and enacted in instructional settings, stressing that the field is defined by shifting perspectives and debates. Examines how kids' communication with advanced technologies can both enable and challenge conventional notions of proficiency. Concerns about equitable access and the quality of digital experiences, as well as divergent opinions on the impact of digital tools on learning and development, are key issues. The article emphasizes the need for ongoing discussion and research to address these contentious aspects and guarantee inclusive digital literacy practices. Pynnönen (2019) examines how parents in Pakistan and Bangladesh perceive the use of digital games in early childhood education. The review examines how guards perceive the anticipated advantages and disadvantages of computerized game-based learning for young children. Discoveries reveal that while there is overall recognition of the educational benefits of digital games, such as increased engagement and learning opportunities, concerns persist regarding screen time and the appropriateness of content. To address these concerns and support the effective and balanced use of digital games in childhood settings, the paper emphasizes the need for educators and parents to be more aware of one another and to communicate with one another. This hole highlights the need for a top-to-bottom examination of how advanced proficiency is demonstrated in schools, how well current techniques work, and how distinctively country and metropolitan regions use them.

2. Literature review

The integration of computerized encounters into youth training tends to a fundamental change in educational practices, reflecting greater cultural acceptance of digitalization. Drawing on diverse sources, this survey examines the multi-layered nature of advanced education in youth settings to highlight current practices, theoretical frameworks, and challenges related to the use of digital media by young students. Digital literacy in early childhood encompasses a range of skills beyond technical experience. Marsh (2005): Beyond just using technology, digital literacy also includes knowing how digital content is made. According to Erstad and Gillen (2019), digital literacy practices must be contextualized within children's extensive media experiences. They emphasize the importance of situating digital literacy within theoretical frameworks that account for the intricate connections between children's media interactions and their developmental paths. Maureen et al. (2018) provide empirical evidence for incorporating digital tools into early childhood education through storytelling activities. Their research demonstrates that by increasing engagement and providing a variety of expression options, digital storytelling can facilitate both traditional and digital literacy skills. The results of Pereira et al. (2023) emphasize the importance of qualified educators using digital tools to support literacy development. Their exploration demonstrates that computerized devices can be utilized to make dynamic, intelligent learning conditions that accommodate a variety of learning styles and needs. However, there are numerous obstacles to overcome when incorporating advanced technology into youth education. In Indonesia, Tatminingsih (2022) examines explicit issues, including deficiencies in teacher professional development and limited access to digital resources. Saleha et al. (2022) look into how digital literacy can help young children develop their social and emotional skills. The review shows that coordinating computerized devices into youth education can

improve social connections, personal development, and overall engagement in learning. To adequately reinforce children's social and emotional development, the authors emphasize the need to use digital resources in a balanced, developmentally appropriate manner and to provide adequate teacher training.Su and Yang (2024)look into how digital literacy can help young children develop their social and emotional skills. The review finds that coordinating digital tools in youth education can foster friendly collaborations, close-to-home mindfulness, and overall commitment to learning. To adequately reinforce children's social and emotional development, the authors emphasize the need to use digital resources in a balanced, developmentally appropriate manner and to provide adequate teacher training. Mashura (2022) explores that while computerized proficiency is increasingly recognized as fundamental for contemporary education, its implementation varies widely across schools. Key difficulties include insufficient resources, inadequate teacher preparation, and outdated curricula. The article underscores the significance of fostering an organized approach to digital literacy that incorporates comprehensive teacher support and resource allocation to ensure effective learning outcomes for students. According to Scott and Marsh (2018), interactive and engaging learning experiences enabled by digital literacies can significantly improve children's cognitive and social development. In any case, they also note concerns related to screen time and the need for developmentally appropriate practices. This study highlights the importance of an effective methodology that supports youngsters' overall development while preparing them for a digital future.The author examines various hypothetical perspectives on digital education, including sociocultural and biological approaches. They discuss how these hypotheses can be applied to examine and improve digital literacy practices in youth settings. Erstad and Gillen highlight the powerful collaboration among kids, advanced technologies, and educational settings, suggesting that digital proficiency is not just about acquiring technical skills but also about developing critical thinking and socio-emotional skills. This study emphasizes the need for frameworks that address the complexity of digital literacy and support efficient practice in early education settings.Advanced encounters that are formatively appropriate and in accordance with youngsters' mental and emotional stages are fundamental, as this thought illustrates. The significance of ongoing professional development and support is underscored by the fact that educators' instructional strategies can significantly impact the success of digital literacy practices. Supporting social and emotional development through digital literacy is a growing area of interest. In their 2022 research, Saleha et al. investigate how youth settings can benefit from digital tools to foster social-emotional skills. According to their research, digital literacy practices can enhance children's social interactions, emotional regulation, and self-expression. However, they also caution about potential side effects, such as the need for equal access to digital resources and the risk of excessive screen time. There is a notable lack of in-depth, descriptive research on digital literacy in early childhood studies in Pakistan, despite the growing recognition of its significance. Rather than providing a thorough outline of how computerized proficiency is intertwined with different educational contexts, existing studies often focus on specific tools or parental perspectives. This hole highlights the need for top-to-bottom investigations into how advanced education is implemented in schools, how well existing methodologies work, and how computerized proficiency practices differ across developed and underdeveloped areas.

3. Method

This study relied on a systematic literature review (SLR) as its methodology, aiming to provide a clear, replicable framework for analyzing the impact of digital literacy on early childhood development. A systematic search has been performed in 5 major scholarly databases, namely Google Scholar, Emerald, Taylor and Francis, JSTOR, and ScienceDirect, in order to identify the relevant scholarly work. The search strategy was based on the Boolean operators and the combination of core terms, including digital literacy, digital competence, and technology and child development, with population-specific terms, such as early years learning and young child. The initial identification phase yielded 53 results. A screening process in stages was required to narrow this pool; therefore, the inclusion and exclusion criteria were stringent, and only empirical research papers on digital competence in early education were included. In the initial step, 23 articles were excluded based on title and abstract criteria for irrelevance. This was followed by a comprehensive text-based eligibility screening, which excluded 15 additional studies, of which 7 were found to be specifically irrelevant to the intersection of digital tools and early childhood. The result of this stringent filtering process was a final selection of 30 high-quality articles. The chosen research was then subjected to a thematic analysis, which sought to understand the impact of digital tools on cognitive maturation, the theoretical foundations (constructivist and sociocultural perspectives) guiding such

practices, and the pedagogical balance between digital and traditional literacy practices that needs to be established.

4. Objectives

1) to examine the impact of the use of digital tools on cognitive development and engagement during early childhood education,
2) to explore the theoretical frameworks (sociocultural and constructivist) that are used in digital literacy practices and promote cognitive development,
3) to determine ways to balance digital and traditional literacy activities to achieve balanced development.

5. Results and Discussion

5.1 Results

Effect of the Digital Tools on the Cognitive Development

Digital tools are interactive agents that are dramatically transforming the learning environment among young learners. Multisensory environments facilitated through educational applications and tablets enhance executive function skills, including working memory, attention control, and inhibitory control, as explained by Marsh (2006) and Pereira et al. (2023). The tools provide dynamic feedback, enabling children to participate in more complex problem-solving and symbolic representation as main milestones in cognitive maturation. Nevertheless, the results provide a crucial caveat: screen time can become excessive, leading to cognitive overload and diminishing spatial cognition traditionally acquired through physical play (Palaiologou, 2016). Therefore, the influence on education is beneficial only when exploration is active and supported by digital tools, not as a replacement for it.

Theoretical Frameworks that guide Cognitive Practices

Two main conceptual lenses that strongly inform the digital literacy practices are:

1) **Sociocultural Perspective**
   According to this perspective, cognitive development is a collaborative process. Digital scaffolding occurs through the use of digital tools when a child communicates with peers and adults through media, thereby internalizing social and cognitive norms (Scott and Marsh, 2018).
2) **Constructivist Approach**
   This approach, based on the research by Erstad and Gillen (2019), states that children develop their own perceptions of the world through manipulations of the digital interface. Such interactive use facilitates metacognition and critical thinking because, in educational software, children need to make rational decisions. These models offer assurance that digital literacy will be incorporated into broader literacy, acknowledging the cognitive advantages as well as the possible disadvantages of the media.

Digital and Traditional Balancing to Whole Growth

One of the main conclusions of this review is that harmony is the precondition of healthy cognitive development. Although digital tools help increase visual-spatial processing and information synthesis, fine motor coordination, and deep focus, these skills must be promoted through traditional techniques such as tactile play and paper-based storytelling (Maureen et al., 2018). These media are used in conjunction with effective pedagogical planning, such as using a digital application to identify plant species and then engaging in traditional outdoor gardening (Razfar and Yang, 2010). Such a moderating approach reduces the risk of inactivity and provides the child with a holistic learning experience that meets their physical, social, and cognitive needs.

5.2 Discussion

The results of this system review confirm the multifaceted and multidimensional nature of the connection between early childhood education and digital integration in terms of its contribution to cognitive development. The evidence shows that the digital tools are not simply support tools but ones at the center of the development of executive processes. It is important to note that interactive digital experiences help develop higher-order thinking by providing immediate feedback, which is essential for building metacognition and self-regulation among young learners (Piris Pereira et al., 2023). The conscious use of tablets and education software, in contrast to passive media, enables children to make hypotheses

testable in real-time, hence enhancing their capacity to process complex symbolic representations faster. This aligns with Marsh's (2006) observation that digital tools offer dynamic opportunities for growth, yet this cognitive advantage depends on the quality of adult-mediated interaction to avoid passive consumption, as Palaiologou (2016) cautions. Digital literacy should be integrated into practice using the theoretical frameworks discussed in this paper. As explained by Scott and Marsh (2018), sociocultural theory can be a crucial perspective on how digital tools can facilitate social-cognitive development when children engage in digital tasks and internalize social norms and team-based problem-solving solutions. At the same time, the constructivist model Erstad and Gillen (2019) use confirms the effectiveness of digital play in enabling children to actively develop knowledge. The theories imply that digital literacy is a complex mental activity that, in its application, bridges the gap between abstraction and concrete cognition. Kontovourki et al. (2017) also maintain that these conceptual understandings are required to identify the advantages and disadvantages of digital media for overall literacy practices.

One point that should be discussed critically is the need for cognitive harmony and a balance between digital and traditional literacy. Although digital tools are most effective for visual-spatial processing and information synthesis, fine motor coordination and extended attention cannot be achieved without traditional tools, such as tactile activities and physical storytelling (Maureen et al., 2018; Saleha et al., 2022). In the case of independent use of digital tools, the risk of cognitive overload or sedentary behavior is a concern. Hence, only a balanced approach to pedagogy, as proposed by Razfar and Yang (2010), in which technology shifts physical interaction but does not substitute for it, can provide the child with a balanced learning experience that covers all aspects of their needs in physical, social, and cognitive ways.

Lastly, the discussion emphasizes that there is no universal model for implementing digital literacy. The differences in access to technology, in the culture of screen use, and in educational practices at the local level require flexible approaches. To have an opportunity to positively influence the cognitive development of learners in a wide variety of contexts, digital literacy programs should also be formulated to meet the requirements of the learners and be focused on the unique socio-economic and cultural backgrounds of specific learners, as it has been shown by Tatminingsih (2022) and Pynnönen (2019). This highlights the importance of tailoring digital literacy initiatives to the specific conditions of different learning environments to maximize cognitive performance and ensure equal access to 21st-century skills.

6. Implications of the Study

This research has important implications for different stakeholders in the early childhood education sector. The level of educational policy requires the rapid development of standardized, developmentally appropriate guidelines for digital integration. The policies also need to shift the focus beyond hardware supply to creating pedagogical systems that emphasize cognitive achievement rather than mindless screen time. Concerning pedagogical practice, teachers must use a balanced curriculum model. This incorporates strategic planning of activities, with digital tools used to explore and synthesize with traditional physical activities, which are maintained to encourage motor skills and social-emotional control.

Also, teacher professional development programs should be modernized to keep up with basic technical literacy. Teachers need special training in digitally scaffolding to actively mediate the interaction between a child and technology, thereby maximizing cognitive engagement. The digital divide challenge is also an important implication of equity and access, in that the absence of equal access to quality digital resources and professional facilitators may continue to leave children in underdeveloped or rural regions lagging in cognitive preparedness in the 21st century. Lastly, as a form of parental guidance, the study suggests the need for effective school-home communication. The parents ought to be informed about the difference between passive consumption and active digital learning, so that the use of technology at home can effectively support the child's continued cognitive development.

7. Conclusion

The paper examines how digital literacy has transformed its role in early childhood, with particular reference to cognitive development. The results show that the deliberate use of digital devices, such as interactive applications and tablets, is a stimulus for the executive functions and increases a child's problem-solving abilities and symbolic representation. Based on sociocultural and constructivist theories, this study concludes that the notion of digital literacy is not only a technical skill but a complex cognitive ability that

supports knowledge building and scaffolding of social cognition. Nevertheless, the main finding of this study is that cognitive advantages can only be achieved in a state of balance between digital and traditional activities. Although technology can provide multisensory stimulation, it cannot substitute for the motor and social development offered by physical play and tactile literacy activities. Hence, there is a need for a balanced, context-based approach to avoid cognitive overload and to provide digital tools that augment, rather than supplant, holistic educational experiences.

Conflict of Interest

The authors declare no conflict of interest.

References

Erstad, O., & Gillen, J. (2019). Theorizing digital literacy practices in early childhood. In *The Routledge handbook of digital literacies in early childhood* (pp. 31–44). Routledge. https://doi.org/10.4324/9780203730638-3

Erstad, O., Flewitt, R., Kümmerling-Meibauer, B., & Pereira, Í. S. P. (2019). Introduction: The emerging field of digital literacies in early childhood. In *The Routledge handbook of digital literacies in early childhood* (pp. 1–16). Routledge. https://doi.org/10.4324/9780203730638-1

Green, L. (2014). Children's digital literacies: A contested space. *Fusion Journal*, (5), 1–15.

Hassan, A. A. U., Fazal, M., & Sheikh, M. A. (2024). Digital learning of children through YouTube: Perception of young parents in Lahore. *Online Media and Society*, 5(1), 25–35.

Hatzigianni, M., & Kalaitzidis, I. (2018). Early childhood educators' attitudes and beliefs about the use of computers. *International Journal of Early Years Education*, 26(2), 151–167. https://doi.org/10.1080/09669760.2018.1444584

Herdzina, J., & Lauricella, A. R. (2020). *Media literacy in early childhood report*. Erikson Institute.

Kontkanen, S., Pöntinen, S., Kewalramani, S., Veresov, N., & Havu-Nuutinen, S. (2023). Children's digital competence in early childhood education: A comparative analysis of curricula. *Eurasia Journal of Mathematics, Science and Technology Education*, 19(1), em2215. https://doi.org/10.29333/ejmste/12711

Kontovourki, S., et al. (2017). *Digital literacy in the early years: Practices in formal settings, teacher education, and the role of informal learning spaces*. COST Action IS1410.

Kucirkova, N. (2017). *Digital personalization in early childhood*. Bloomsbury Academic. https://doi.org/10.5040/9781474251785

Livingstone, S. (2012). Critical reflections on the benefits of ICT in education. *Oxford Review of Education*, 38(1), 9–24. https://doi.org/10.1080/03054985.2011.577938

Marsh, J. (Ed.). (2005). *Popular culture, new media and digital literacy in early childhood*. Psychology Press. https://doi.org/10.4324/9780203028360

Marsh, J. (2006). Emergent media literacy: Digital animation in early childhood. *Language and Education*, 20(6), 493–506. https://doi.org/10.2167/le660.0

Masoumi, D., & Bourbour, M. (2023). Adequate digital competence in early childhood education. *Ubiquity Proceedings*, 3(1). https://doi.org/10.5334/uproc.54

Masyhura, N. (2022). Implementation of digital literacy in elementary schools. *Journal of Education*, 1(2), 45–58.

Maureen, I. Y., Van der Meij, H., & De Jong, T. (2018). Supporting literacy and digital literacy development in early childhood education using storytelling activities. *International Journal of Early Childhood*, 50(3), 371–389. https://doi.org/10.1007/s13158-018-0232-9

Meng, Q., Yan, Z., Abbas, J., Shankar, A., & Subramanian, M. (2023). Human–computer interaction and digital literacy promote educational learning in pre-school children. *International Journal of Human–Computer Interaction*, 1–15. https://doi.org/10.1080/10447318.2023.2184656

Nascimbeni, F., & Vosloo, S. (2019). *Digital literacy for children: Exploring definitions and frameworks*. UNICEF.

Palaiologou, I. (2016). Children under five and digital technologies: Implications for early years pedagogy. *European Early Childhood Education Research Journal*, 24(1), 5–24. https://doi.org/10.1080/1350293X.2014.929876

Pires Pereira, Í. S., Parente, M. C. C., & da Silva, M. C. V. (2023). Digital literacy in early childhood education: What can we learn from innovative practitioners? *International Journal of Early Years Education*, 31(1), 287–301. https://doi.org/10.1080/09669760.2020.1848523

Plowman, L., & McPake, J. (2013). Seven myths about young children and technology. *Childhood Education*, 89(1), 27–33. https://doi.org/10.1080/00094056.2013.757195

Poveda, D. (2019). Researching digital literacy practices in early childhood: Challenges, complexities and imperatives. In *The Routledge handbook of digital literacies in early childhood* (pp. 45–63). Routledge. https://doi.org/10.4324/9780203730638-4

Pynnönen, L. (2019). Digital game-based learning for early childhood: Guardians' attitudes in Pakistan and Bangladesh. *European Conference on Games Based Learning*, 917–XXI. https://doi.org/10.34190/GBL.19.161

Razfar, A., & Yang, E. (2010). Digital, hybrid, multilingual literacy practices in early childhood. *Language Arts*, 88(2), 114–124.

Saleha, L., Baharun, H., & Utami, W. T. (2022). Implementation of digital literacy to develop social emotional skills in early childhood. *Indonesian Journal of Early Childhood Educational Research*, 1(1), 1–10. https://doi.org/10.51912/ijecer.v1i1.3

Scott, F., & Marsh, J. (2018). Digital literacies in early childhood. In *Oxford Research Encyclopedia of Education*. https://doi.org/10.1093/acrefore/9780190264093.013.104

Stephen, C., & Plowman, L. (2014). *Digital play in the early years*. Routledge. https://doi.org/10.4324/9781315814599

Su, J., & Yang, W. (2024). Digital competence in early childhood education: A systematic review. *Education and Information Technologies*, 29(4), 4885–4933. https://doi.org/10.1007/s10639-023-11818-w

Suwarto, D. H., Setiawan, B., & Machmiyah, S. (2022). Developing digital literacy practices in Yogyakarta elementary schools. *Electronic Journal of E-Learning*, 20(2), 101–111. https://doi.org/10.34190/ejel.20.2.2215

Tatminingsih, S. (2022). Implementation of digital literacy in Indonesia early childhood education. *International Journal of Emerging Issues in Early Childhood Education*, 4(1), 12–22. https://doi.org/10.31098/ijeiece.v4i1.879

Yelland, N. (2011). *Reconceptualising play and learning in the 21st century*. McGraw-Hill Education