

# Digital Transformation in Early Childhood Education: Exploring the Role of Technology in Enhancing Learning Quality

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## ABSTRACT

Early Childhood Education (ECE) plays a crucial role in shaping children's character, personality, and foundational skills during the critical early years of development. The rapid advancement of digital technology presents both opportunities and challenges for education, particularly in implementing engaging and adaptive learning strategies tailored to children's developmental needs. This study aims to examine the urgency of early childhood education and to explore the role of digital technology in enhancing the effectiveness, innovation, and quality of learning processes.

This research employed a qualitative approach using in-depth interviews and participant observation involving 16 participants, consisting of teachers and parents from Berlianta Education Foundation, Deli Serdang. The findings indicate that the integration of digital technology supports increased creativity, improved understanding of learning materials, and greater active participation among children. However, several challenges remain, including limited digital facilities, insufficient teacher training, and the potential risk of device dependency.

The study concludes that strong collaboration among teachers, parents, and adequate institutional support is essential for creating modern, safe, and meaningful early childhood learning environments in an increasingly digital era.

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## Introduction

The National Association for the Education of Young Children defines early childhood as the developmental period spanning from birth to eight years of age. This stage represents a critical phase of rapid growth and development across cognitive, social, emotional, and physical domains. Consequently, learning experiences for young children must be designed in accordance with their developmental characteristics and learning needs. The use of the term early childhood education (ECE) in the Indonesian PAUD system reflects a growing awareness among policymakers and educational institutions of the importance of providing professional, developmentally appropriate educational services for young learners. The quality of educational experiences during early childhood plays a decisive role in shaping future learning trajectories and serves as a fundamental pillar in the development of high-quality human resources.

In the contemporary era, the rapid advancement of digital technology has significantly influenced educational practices across all levels, including early childhood education. Digital tools such as tablets, educational applications, and multimedia resources offer new opportunities to create interactive, engaging, and child-centered learning environments. Previous studies have demonstrated that the appropriate use of technology can support children's creativity, motivation, and conceptual understanding when aligned with pedagogical goals (Radich, 2013). Therefore, integrating digital technology into early childhood learning is increasingly viewed as a strategic approach to enhancing educational quality and relevance in a rapidly changing world.

However, empirical evidence from PAUD Yayasan Pendidikan Berlianta indicates that learning practices remain largely dominated by conventional methods. The utilization of digital technology in daily learning activities is still limited, primarily due to inadequate supporting facilities and infrastructure. This condition reveals a substantial gap between the recognized potential of digital technology in early childhood education and its actual implementation at the institutional level. Moreover, challenges related to limited community awareness of the importance of PAUD, as

well as concerns regarding the unsupervised use of digital devices by young children, further complicate the integration of technology into learning practices.

These conditions highlight the need for a deeper understanding of how digital technology can be effectively and responsibly integrated into early childhood education. Therefore, this study aims to examine the crucial role of early childhood education and to explore the challenges associated with digital technology integration in PAUD settings. By analyzing perspectives from teachers and parents, this research seeks to provide insights into how technology can be utilized to support more effective, innovative, and developmentally appropriate learning experiences for young children in the digital era.

## Method

This study employed a descriptive qualitative research approach aimed at obtaining an in-depth understanding of the role of early childhood education and the integration of digital technology in supporting children's development in the digital era. A qualitative design was considered appropriate as the study sought to explore participants' experiences, perceptions, and practices without manipulating variables.

The research process began with a comprehensive literature review to establish a theoretical foundation regarding early childhood education and digital technology integration. Relevant literature was collected from academic books and peer-reviewed journal articles to support the conceptual framework and data interpretation. The field study was conducted over a two-week period at Yayasan Pendidikan Berlianta, located on Jl. Kongsu, Marindal I, Patumbak District, Deli Serdang Regency, North Sumatra, Indonesia.

Participants were selected using purposive sampling based on their relevance to the research objectives. A total of eight participants were involved, consisting of one early childhood education center principal, two teachers, and five parents. These participants were chosen because of their direct involvement in early childhood learning activities and their experiences with the use of technology in educational settings.

Data collection involved both primary and secondary data sources. Primary data were obtained through in-depth interviews, participant observation, and documentation. Interviews were conducted with the principal, teachers, and parents to explore their understanding of the role of early childhood education and how digital technology integration supports children's learning and development. Observations focused on learning activities and the use of technology during instructional processes, while documentation included institutional records and materials relevant to the study. Secondary data were collected from academic journals and books to enrich data analysis and contextual interpretation.

Data analysis was conducted using qualitative triangulation techniques to ensure the credibility and consistency of findings. Information obtained from interviews, observations, and documentation was systematically compared to identify recurring patterns and themes. The use of data triangulation strengthened the trustworthiness of the findings by minimizing bias and enhancing the validity of interpretations.

## Result and Discussion

### Results

#### 1. Understanding of Early Childhood Education

The findings indicate that both teachers and parents at Yayasan Pendidikan Berlianta demonstrate a clear understanding of the importance of early childhood education. Participants consistently referred to early childhood as a critical developmental period, aligning with the definition provided by the National Association for the Education of Young Children, which defines early childhood as the age range from birth to eight years. Teachers emphasized that early childhood education plays a fundamental role in supporting children's physical, cognitive, social, and emotional development, as well as preparing them for formal schooling.

Interviews revealed that PAUD is perceived not merely as a preparatory stage for elementary education but as a foundational process for character building, social adaptation, and early cognitive

stimulation. Both teachers and parents acknowledged that educational experiences during early childhood significantly influence children's readiness for subsequent educational levels.

## 2. Learning Practices in PAUD Yayasan Pendidikan Berlianta

The results show that learning activities at Yayasan Pendidikan Berlianta are implemented using the Merdeka Curriculum, with an emphasis on play-based learning approaches such as storytelling, games, singing, drawing, and exploration. Teachers reported that these methods are intended to create a joyful learning atmosphere and to stimulate children's creativity, social interaction, and emotional development.

Observational data supported these findings, indicating that classroom activities were largely centered on interactive and experiential learning rather than formal instruction. Teachers actively facilitated children's engagement through peer interaction and guided exploration. Despite limited resources, educators made efforts to adapt learning strategies to suit children's developmental characteristics.

## 3. Use of Digital Technology in Learning Activities

The findings indicate that the integration of digital technology into learning activities has not been fully implemented at the institution. Teachers reported that the primary constraint is the lack of supporting digital facilities, such as computers, tablets, or interactive learning media. As a result, digital technology is not routinely used during classroom instruction.

Nevertheless, teachers expressed positive perceptions regarding the potential role of digital technology in early childhood education. They stated that, if appropriately used and aligned with children's developmental stages, digital tools could support learning processes by enhancing children's interest, creativity, and understanding of learning materials. These views suggest an openness among educators toward digital integration, despite current infrastructural limitations.

## 4. Challenges in Learning Implementation

Several challenges related to learning implementation were identified through interviews and observations. Teachers highlighted limitations in digital infrastructure as a major barrier to integrating technology into learning activities. In addition, variations in children's abilities and learning readiness were reported as challenges that require differentiated instructional approaches.

Although digital technology is not widely used in the classroom, teachers emphasized the importance of cautious and supervised use to avoid potential negative effects, such as excessive screen time or dependency on digital devices. These concerns reflect educators' awareness of the need to balance technological use with traditional, play-based learning approaches.

## 5. Parental Perspectives on Early Childhood Education and Technology

Interviews with parents revealed that they strongly value early childhood education as a foundation for children's moral development, character formation, and basic academic skills. Parents reported observable positive changes in their children after attending PAUD, including improved communication skills, increased social confidence, and greater enthusiasm for learning.

Regarding technology use at home, most parents stated that digital devices are permitted under specific conditions, such as limited duration and parental supervision. Parents perceived educational applications and digital media as beneficial for introducing children to letters, numbers, shapes, and colors. However, they also emphasized the importance of monitoring device use to prevent overdependence and to ensure that children continue to develop social and interpersonal skills.

Overall, the results indicate that early childhood education at Yayasan Pendidikan Berlianta is conducted within a supportive and developmentally appropriate learning environment, despite limitations in digital infrastructure. Teachers and parents share positive perceptions of the potential benefits of digital technology for early childhood learning, while also recognizing the importance of supervision and balance. The findings highlight that meaningful integration of digital technology in PAUD requires not only adequate facilities but also collaboration between educators and parents to ensure that technology use aligns with children's developmental needs.

## Discussion

The findings of this study confirm the crucial role of early childhood education as a foundational stage for children's cognitive, social, emotional, and moral development. The shared understanding among teachers and parents regarding the importance of PAUD aligns with the definition proposed by the National Association for the Education of Young Children, which emphasizes early childhood as a critical developmental period. This perspective is also consistent with Indonesian education policy, particularly Law No. 20 of 2003 on the National Education System, which positions early childhood education as an essential preparatory stage prior to formal schooling.

The learning practices observed at Yayasan Pendidikan Berlianta, which emphasize play-based approaches such as storytelling, exploration, and creative activities, reflect developmentally appropriate practices in early childhood education. These practices resonate with international pedagogical frameworks that highlight the importance of experiential and child-centered learning environments in fostering holistic development (Berk, 2018). However, despite the use of appropriate pedagogical approaches, the limited integration of digital technology indicates a gap between pedagogical potential and institutional capacity.

The results demonstrate that digital technology has not yet been optimally integrated into classroom learning due to inadequate infrastructure and limited access to digital devices. This finding supports the conclusions of Bintang, Pertiwi, and Azainil (2024), who reported that infrastructural constraints remain a major barrier to digital transformation in early childhood education settings. Similarly, Inayati et al. (2025) emphasized that the successful integration of digital technology in PAUD depends heavily on the availability of facilities and the collaborative involvement of educators and parents. In the present study, although digital tools were not widely used in classroom instruction, teachers expressed positive attitudes toward technology and recognized its potential to enhance learning when used appropriately.

Teachers' perceptions regarding the potential benefits of digital technology are consistent with Radich (2013), who argued that digital media, educational applications, and multimedia resources can support children's engagement, creativity, and conceptual understanding when aligned with pedagogical objectives. The findings suggest that educators at Yayasan Pendidikan Berlianta possess an awareness of the pedagogical value of technology but are constrained by structural limitations rather than a lack of readiness or willingness to adopt innovation. This condition underscores the importance of institutional and policy-level support in enabling digital integration in early childhood education.

Parental perspectives further reinforce the importance of balanced and supervised technology use. Parents generally viewed digital devices as beneficial tools for introducing basic literacy and numeracy concepts, such as letters, numbers, shapes, and colors. However, they also emphasized the need for strict supervision to prevent excessive screen time and dependency. These concerns align with international research highlighting the dual nature of digital technology in early childhood education, which can support learning while also posing developmental risks if not appropriately regulated (Hirsh-Pasek et al., 2015). The findings indicate that parents play a critical role in mediating children's digital experiences, particularly in home learning environments.

From a policy perspective, the limited availability of digital facilities observed in this study suggests a discrepancy between national educational goals and their implementation at the institutional level. Indonesian PAUD standards emphasize the provision of safe, stimulating, and developmentally appropriate learning environments. However, the lack of digital infrastructure indicates that technological readiness has not been uniformly addressed, particularly in non-elite or community-based early childhood education institutions. This gap highlights the need for more targeted government interventions to support digital access, teacher training, and infrastructure development in PAUD settings.

Overall, this study contributes to the growing body of literature on digital transformation in early childhood education by providing empirical evidence from a local PAUD context. Consistent with Inayati et al. (2025) and Bintang et al. (2024), the findings suggest that digital transformation in PAUD cannot be achieved solely through technological provision but requires a comprehensive approach involving pedagogical readiness, parental involvement, and supportive policy frameworks. When implemented in a structured and developmentally appropriate manner, digital technology has the potential to enrich early childhood learning and support the development of foundational

cognitive skills, as also emphasized by Radich (2013)..

## Conclusion

This study concludes that early childhood education plays a fundamental role in supporting children's holistic development, particularly during the critical early years. The findings indicate that teachers and parents at Yayasan Pendidikan Berlianta share a strong awareness of the importance of PAUD as a foundation for children's cognitive, social, emotional, and moral development. Learning practices implemented through play-based and child-centered approaches are consistent with developmentally appropriate principles, even in contexts with limited resources.

However, the integration of digital technology in early childhood learning has not been optimally implemented due to inadequate digital infrastructure and limited institutional support. Despite these constraints, teachers and parents demonstrate positive perceptions of digital technology and recognize its potential to enhance creativity, learning engagement, and understanding of basic concepts when used in a structured and supervised manner. These findings highlight that the main challenges in digital transformation are structural and systemic rather than attitudinal.

Furthermore, this study underscores the importance of collaboration among teachers, parents, and policymakers in supporting the effective integration of digital technology in PAUD settings. Parental supervision and guidance are essential to ensure balanced technology use, while government support is needed to strengthen digital facilities and provide professional development for educators. Overall, meaningful digital transformation in early childhood education requires not only access to technology but also pedagogical readiness, parental involvement, and supportive policy frameworks to ensure that technology use aligns with children's developmental needs and contributes positively to learning quality in the digital era.

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