



Rethinking Digital Learning Readiness through Smart TV Utilization in Early Childhood Education

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ABSTRACT

The integration of digital technology has become an important strategy for enhancing learning quality in Early Childhood Education (ECE). This study aimed to analyze the utilization of Smart TV as a learning medium and identify the factors influencing its implementation in an early childhood education setting. The research employed a qualitative descriptive approach conducted at TK Negeri Pembina Lumbung, Indonesia. Data were collected through observations, semi-structured interviews, and documentation, and analyzed using the Miles and Huberman interactive model. The findings revealed that Smart TV was effectively utilized to support thematic learning, educational videos, coding activities, and school communication programs. Teachers demonstrated adequate readiness and competence in operating the technology and integrating digital resources into learning activities. Children responded positively through increased engagement, participation, and learning motivation. However, the primary challenge was not teacher competence, as commonly reported in previous studies, but infrastructural limitations, particularly unstable internet connectivity and electricity interruptions. These findings suggest that successful digital learning implementation depends not only on technological devices and teacher readiness but also on reliable supporting infrastructure. The study contributes to the discourse on educational digital transformation by highlighting infrastructure readiness as a critical determinant of sustainable technology integration in early childhood education.

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1. INTRODUCTION

The rapid advancement of digital technology has significantly transformed educational practices worldwide, including in Early Childhood Education (ECE). The integration of digital technology into educational settings is increasingly viewed as an essential strategy for fostering innovative, interactive, and learner-centered learning environments that support twenty-first-century competencies. Digital technologies enable educators to provide multimodal learning experiences through visual, auditory, and interactive content, thereby enhancing children's engagement and participation in learning activities (Jumiati *et al.*, 2022). In early childhood contexts, the use of digital media is considered particularly relevant because young children tend to learn through concrete, visual, and experiential activities that stimulate various aspects of development simultaneously (Nasution *et al.*, 2022).

The growing emphasis on digital transformation in education has encouraged governments worldwide to invest in technology-based learning infrastructure. In Indonesia, educational digitalization has become a national priority, reflected in various initiatives aimed at improving access to digital learning resources and strengthening technology integration in schools. One of these initiatives is the provision of Smart TVs or Interactive Flat Panels (IFPs) as educational media in schools. These technologies offer opportunities for teachers to access online learning resources, present multimedia content, facilitate interactive learning activities, and create more engaging classroom environments (Layara *et al.*, 2025; Septiyaningtiyas *et al.*, 2025).

Within early childhood education settings, Smart TVs possess considerable pedagogical potential. The technology supports the presentation of learning materials through animations, educational videos, interactive games, and digital storytelling activities that correspond to children's developmental characteristics. Previous studies have reported that interactive digital media can increase children's learning motivation, attention span, participation, and learning enjoyment (Sulistiyawan, 2025). Moreover, Smart TVs provide teachers with greater flexibility in adapting learning materials according to children's needs and interests while simultaneously supporting the implementation of innovative learning approaches.

Despite these potential benefits, the successful integration of educational technology depends not only on the availability of digital devices but also on various supporting factors. Previous studies have predominantly focused on the effectiveness of digital learning media, media development processes, or the impact of technology on children's learning outcomes (Jumiati *et al.*, 2022; Nasution *et al.*, 2022). Other studies have examined the role of teacher competence and technological readiness in implementing digital learning (Purnama *et al.*, 2025; Umara *et al.*, 2025). These studies generally suggest that teachers' technological skills are among the primary determinants of successful technology integration in educational settings.

However, findings from preliminary observations conducted at TK Negeri Pembina Lumbung indicate a different phenomenon. Teachers demonstrated adequate readiness and competence in operating Smart TVs and utilizing digital learning resources. They were able to access online educational content, integrate digital materials into classroom activities, and manage children's participation effectively during technology-assisted learning sessions. Contrary to assumptions commonly found in the literature, teacher competence did not emerge as the primary challenge in implementing Smart TV-based learning.

Instead, the major obstacles identified were related to infrastructural limitations, particularly unstable internet connectivity and unexpected electricity interruptions. These

challenges frequently disrupted learning activities and reduced the effectiveness of Smart TV utilization in classrooms. Such findings suggest that educational technology implementation cannot be fully understood solely through the lens of teacher readiness. Rather, broader contextual factors, including infrastructure availability and technological support systems, play a critical role in determining the sustainability and effectiveness of digital learning initiatives.

This situation reveals an important research gap. Although numerous studies have investigated digital learning media in early childhood education, limited research has specifically explored the implementation of Smart TVs within authentic preschool settings while simultaneously examining the influence of supporting infrastructure on their utilization. Existing studies tend to emphasize pedagogical benefits and teacher-related factors, whereas infrastructural readiness remains underexplored, particularly in Indonesian early childhood education institutions.

Therefore, this study is significant because it seeks to provide empirical evidence regarding the actual implementation of Smart TV-based learning in early childhood education and to identify infrastructural challenges affecting its sustainability. The novelty of this research lies in its focus on infrastructure as a critical determinant of digital learning success, rather than solely emphasizing teacher competence. By highlighting the relationship between technology utilization and infrastructural readiness, this study contributes to the growing discourse on digital transformation in education and offers practical recommendations for policymakers, school administrators, and educators seeking to optimize technology integration in early childhood education. Accordingly, this study aims to analyze the utilization of Smart TV as a learning medium in early childhood education and to identify the infrastructural constraints influencing its implementation at TK Negeri Pembina Lumbung.

2. METHODS

This study employed a qualitative approach using a descriptive research design. A qualitative descriptive method was selected because the study aimed to explore and provide an in-depth understanding of the actual implementation of Smart TV as a learning medium and the infrastructural challenges affecting its utilization in Early Childhood Education (ECE). This approach enables researchers to investigate participants' experiences and contextual realities within natural educational settings without manipulating research variables.

The research was conducted at TK Negeri Pembina Lumbung, Indonesia, on June 3, 2026. The research site was selected purposively because the school had received Smart TV facilities and had actively integrated them into learning activities. The participant of this study was the principal of TK Negeri Pembina Lumbung, who was selected as the key informant due to her comprehensive knowledge regarding school policies, technology integration practices, teacher readiness, and infrastructural conditions related to Smart TV implementation.

Data were collected through observations, semi-structured interviews, and documentation. Classroom observations were conducted to examine the actual use of Smart TVs during teaching and learning activities. Semi-structured interviews were carried out using an interview guide designed to explore information regarding the forms of Smart TV utilization, teacher readiness in using digital learning media, children's responses during technology-assisted learning, and challenges encountered during implementation. Documentation was used to support the findings obtained from observations and interviews, including field notes, photographs, and institutional records related to Smart TV utilization.

In qualitative research, the researcher served as the primary instrument (human instrument) and was supported by observation sheets, interview protocols, and documentation guidelines. These instruments facilitated systematic data collection while ensuring that the information obtained was relevant to the research objectives.

The collected data were analyzed using the interactive model proposed by Miles and Huberman, which consists of three stages: data reduction, data display, and conclusion drawing/verification (Sari & Karma, 2022). Data reduction involved selecting, focusing, and simplifying information obtained from observations and interviews. Data display was conducted by organizing the data into a systematic form to facilitate interpretation. Finally, conclusions were drawn through an iterative process of examining patterns, relationships, and meanings emerging from the data.

To enhance the trustworthiness of the findings, this study employed methodological triangulation by comparing data obtained from observations, interviews, and documentation. This process was intended to ensure data credibility, consistency, and validity, thereby strengthening the accuracy of the research findings.

3. RESULTS AND DISCUSSION

3.1. Smart TV Utilization in Early Childhood Learning

The findings revealed that Smart TV has been routinely integrated into various educational activities at TK Negeri Pembina Lumbung. The device is not only utilized during classroom learning sessions but is also employed in extracurricular activities and communication activities involving parents. During classroom instruction, Smart TV is frequently used to display educational videos, thematic learning materials, digital storytelling content, and coding-based learning activities designed to stimulate children's cognitive development. The integration of Smart TV into daily learning practices indicates that digital technology has become an important component of educational delivery within the institution.

Observation results showed that the visual and interactive features provided by Smart TV enabled teachers to present learning materials in a more attractive and understandable manner. Through the use of animations, images, and videos, abstract concepts could be transformed into concrete learning experiences suitable for young children's developmental stages. Such conditions are particularly important in early childhood education because children tend to learn effectively through direct observation, visual stimulation, and active engagement with learning materials.

These findings indicate that children tend to become more actively engaged when learning activities are supported by interactive and visually stimulating media. Digital learning environments encourage children's participation and curiosity by providing multimodal experiences that align with early childhood learning characteristics (Dwijantie *et al.*, 2025). Smart TV functions as a learning medium that facilitates such interactions by presenting multimodal information capable of stimulating children's curiosity and exploration. Through interactive digital content, children are encouraged to observe, question, and respond to learning materials, thereby promoting active learning processes rather than passive information reception.

These findings are consistent with the study conducted by Layara *et al.* (2025), which found that Smart TV and Interactive Flat Panels contribute significantly to educational digital transformation by creating more adaptive and innovative learning environments. Similarly, Jumiaty *et al.* (2022) reported that digital learning media improve children's engagement and participation by integrating visual and auditory elements into instructional activities. The current study extends these findings by demonstrating that Smart TV utilization can become

an integral component of educational activities beyond classroom instruction, including school-wide communication and extracurricular programs.

Furthermore, the findings indicate that Smart TV serves not merely as a technological device but as a pedagogical tool that supports child-centered learning. This suggests that educational institutions should consider technology integration as part of broader instructional innovation rather than simply as the adoption of digital equipment. Consequently, Smart TV implementation has the potential to contribute to the development of more engaging, flexible, and developmentally appropriate learning environments for young children.

3.2. Teacher Readiness in Utilizing Smart TV

The results demonstrated that teachers at TK Negeri Pembina Lumbung possessed adequate readiness to utilize Smart TV in learning activities. Teachers were capable of operating the device, accessing online educational resources, selecting relevant digital learning materials, and integrating these resources into classroom instruction. This readiness was supported by socialization programs organized by educational authorities and by teachers' previous experiences with digital technology.

The findings challenge a common perception within educational technology research that teachers' technological competence represents the primary obstacle to technology integration. In many developing educational contexts, limited digital literacy among teachers is often cited as a significant barrier to implementing technology-enhanced learning. However, the present study found that teachers had adapted successfully to the use of Smart TV and demonstrated confidence in utilizing its features for instructional purposes.

From the perspective of the Technological Pedagogical Content Knowledge (TPACK) framework, teachers exhibited competencies across multiple domains. They demonstrated technological knowledge through their ability to operate Smart TV features, pedagogical knowledge through their classroom management strategies, and content knowledge through the selection of developmentally appropriate learning materials. More importantly, teachers were able to integrate these domains effectively to support meaningful learning experiences for children.

The findings also suggest that institutional support plays a crucial role in developing teacher readiness. Access to training opportunities, peer collaboration, and administrative encouragement contributed to teachers' confidence in implementing digital learning activities. This finding aligns with Nur *et al.* (2023); Umara *et al.* (2025), who argued that technology integration success is strongly influenced by organizational support systems rather than solely by individual teacher competencies.

Another important finding is that teachers demonstrated flexibility in adapting instructional practices according to classroom conditions. They were able to combine digital and conventional teaching methods depending on available resources and learning objectives. Such adaptability reflects professional competence and highlights the importance of continuous professional development in supporting sustainable technology integration within early childhood education settings.

3.3. Children's Responses toward Smart TV-Based Learning

The findings indicated that children exhibited highly positive responses toward Smart TV-assisted learning activities. According to observations and interview data, children appeared more enthusiastic, attentive, and engaged when learning materials were delivered through digital media. Visual presentations, animated content, and interactive activities captured

children's interest and maintained their attention for longer periods compared with traditional instructional methods.

One factor contributing to this positive response is the compatibility between Smart TV features and the developmental characteristics of young children. At the early childhood stage, children are naturally attracted to colorful visual stimuli, movement, sound, and interactive experiences. Smart TV provides opportunities for integrating these elements into learning activities, thereby creating learning experiences that are enjoyable and meaningful. Such findings support developmental theories suggesting that young children learn most effectively through multisensory experiences.

In addition, Smart TV facilitated greater classroom participation among children. Teachers reported that children became more willing to answer questions, share opinions, and engage in collaborative learning activities when digital content was incorporated into lessons. The technology appeared to stimulate children's curiosity and encourage active involvement throughout the learning process.

These findings corroborate previous studies conducted by Wulan *et al.* (2026) and Sulistyawan, (2025), which reported that interactive digital media can increase children's motivation, concentration, and participation during learning activities. However, the present study contributes additional insights by demonstrating that positive engagement can be achieved without fostering excessive dependency on digital devices.

Interestingly, despite children's enthusiasm for Smart TV-based learning, teachers reported that children remained capable of participating in learning activities when digital devices were unavailable. This outcome was attributed to the implementation of clear classroom rules and structured technology-use guidelines. Therefore, the findings suggest that the educational value of digital technology depends not only on the technology itself but also on the pedagogical strategies employed by teachers to manage its use effectively.

3.4. Infrastructure Challenges in Smart TV Implementation

Although Smart TV utilization generated positive educational outcomes, the study identified infrastructure-related challenges as the most significant barrier to sustainable implementation. The primary challenges included unstable internet connectivity and unexpected electricity interruptions. These issues frequently disrupted planned learning activities and limited teachers' ability to maximize the educational potential of Smart TV technology.

The dependence of Smart TV on reliable internet and electricity infrastructure illustrates the interconnected nature of educational technology systems (Umara *et al.*, 2025). While digital devices may be available within schools, their effectiveness is contingent upon the availability of supporting resources that enable continuous operation. When internet connections became unstable or electricity outages occurred, teachers were unable to access online learning resources, display multimedia content, or conduct planned digital activities.

In response to these challenges, teachers demonstrated considerable adaptability by modifying instructional strategies and utilizing alternative teaching materials. Conventional media such as printed materials, storytelling, and direct demonstrations were employed to ensure continuity of learning. Although these adaptations prevented learning disruptions, they also reduced opportunities for children to benefit fully from technology-enhanced educational experiences.

The findings highlight a critical issue frequently overlooked in discussions of educational digitalization. Many policy initiatives focus primarily on the distribution of technological devices while paying comparatively less attention to the infrastructure necessary for their

effective use. As a result, schools may possess modern educational technologies but remain unable to utilize them optimally due to inadequate supporting facilities.

This finding represents the primary novelty of the study. Unlike previous research that emphasizes teacher competence or student outcomes as key determinants of technology integration success, the present study demonstrates that infrastructural readiness constitutes an equally important factor. The findings support those of Uula & Maghfiroh (2025), who reported that the effectiveness of Smart TV implementation depends heavily on environmental and technological support systems.

Therefore, educational digitalization policies should adopt a more comprehensive approach that includes investment in internet connectivity, electricity reliability, technical maintenance, and institutional support mechanisms (Layara et al., 2025). Without such investments, the long-term sustainability of technology-enhanced learning initiatives may remain limited, particularly in rural and semi-rural educational settings. Consequently, future digital transformation efforts should prioritize not only device provision but also the development of infrastructure ecosystems capable of supporting meaningful and sustainable technology integration.

4. CONCLUSION

This study concludes that Smart TV has the potential to support meaningful digital learning experiences in early childhood education by enhancing children's engagement, participation, and learning interactions while facilitating teachers in delivering more interactive and developmentally appropriate learning activities. The findings reveal that the successful implementation of Smart TV-based learning is not primarily determined by teachers' technological readiness, as commonly emphasized in previous studies, but rather by the availability of supporting infrastructure, particularly stable internet connectivity and reliable electricity access. This finding constitutes the main contribution and novelty of the study, highlighting the need to reconceptualize digital learning readiness beyond teacher competence toward a more comprehensive perspective that includes infrastructural preparedness. Therefore, efforts to accelerate educational digitalization should not be limited to the provision of technological devices but should also prioritize strengthening infrastructure systems that ensure sustainable technology integration in schools. These findings provide practical implications for policymakers, educational administrators, and practitioners in designing more effective digital transformation strategies in early childhood education. Future studies are recommended to involve multiple educational settings and examine the relationship between infrastructural readiness and children's developmental outcomes in technology-enhanced learning environments.

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