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Implementing Digital Media in Early Childhood Education: Teachers' Practices and Institutional Support in North Jakarta, Indonesia

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Abstract

The rapid development of digital technology in recent decades has significantly transformed early childhood education, providing opportunities to integrate digital media into learning activities. This study aims to analyze the implementation of digital media-based learning in three early childhood education institutions (PAUD Pelangi, PAUD Cempaka, and PAUD Kemuning 013) in North Jakarta, Indonesia. Using a descriptive qualitative approach, data were collected through observation, in-depth interviews, and documentation, involving three principals, six teachers, and thirty students. Data analysis followed Miles and Huberman's model, encompassing data collection, condensation, presentation, and drawing conclusions. Findings reveal that digital media is applied systematically, creatively, and interactively, supporting learning activities related to cognitive, language, socio-emotional, and motor domains. Teachers act as planners, facilitators, and content creators, while institutional support provides access to digital devices and professional development opportunities. Classroom observations and interview findings suggest that multisensory strategies and differentiated learning approaches contribute to children's engagement, participation, and motivation during learning activities. The study provides qualitative insights into digital pedagogy practices in early childhood education and offers practical recommendations for strengthening digital media integration in PAUD settings.

Keywords:
Digital Media; Early Childhood Education; PAUD; Digital Pedagogy; Teacher Competence; ICT Integration.

1. INTRODUCTION

The development of digital technology over the past few decades has brought significant changes to education worldwide. Digital transformation has not only impacted higher education and secondary schooling but has also begun to penetrate early childhood education as part of efforts to build digital literacy from the earliest stages of a child's life. Digital education has become a prominent global issue, evolving alongside the increasing use of information and communication technology in learning processes. International organizations such as UNESCO emphasize that integrating digital technology into education is a strategic measure to enhance learning quality, expand access to education, and create education systems that are more adaptive to contemporary developments. Digital education functions not merely as a learning tool but also as a means to foster interactive, collaborative, and learner-centered pedagogical experiences.

Early childhood education (PAUD) constitutes a fundamental foundation for children's cognitive, social, emotional, and character development. During this period, often referred to as the "golden age," rapid brain development occurs, necessitating appropriate and high-quality educational stimulation. Education provided during this stage significantly determines children's readiness for subsequent educational levels and establishes the basis for lifelong learning. Consequently, the quality of early childhood education heavily

depends on teachers' competence in designing interactive, enjoyable, and developmentally appropriate learning experiences.

In this context, digital media has become an important component of contemporary early childhood learning. Educational videos, animations, interactive applications, and multimedia resources can provide more engaging learning experiences and support children's active participation. Within the framework of digital pedagogy and ICT integration, technology is not merely viewed as a teaching tool but as an integral element of learning strategies that promote communication, creativity, collaboration, and digital literacy. Effective technology integration, however, requires teacher readiness, adequate infrastructure, and institutional support to ensure meaningful learning experiences.

Previous studies have reported various benefits of digital media in early childhood education. Masoumi and Bourbour (2023) found that digital technologies can support children's engagement and exploratory learning activities. Similarly, Li & Luo (2023) reported that digital learning environments strengthen teacher-child interactions and enrich learning experiences. In the Indonesian context, Daryati (2024) and Hermeianto (2023) highlighted that digital media can support children's motivation, creativity, and learning participation when appropriately integrated into classroom activities. Nevertheless, several studies have also identified implementation challenges, including limited teacher digital competence, insufficient training opportunities, inadequate technological facilities, and unequal access to digital resources (Jannah et al., 2024; Istiana & Widodo, 2023).

Although previous studies have contributed valuable insights into digital learning in early childhood education, most have focused on teachers' perceptions, digital competence, technology acceptance, or the effectiveness of particular digital learning tools. Comprehensive studies examining how digital media is actually planned, adapted, and implemented across multiple PAUD institutions within the same regional context remain limited. Furthermore, little attention has been given to the interaction between teacher practices, institutional support, media adaptation, and practical implementation challenges in everyday classroom settings. This gap indicates the need for further empirical investigation into how digital media-based learning is implemented in real educational contexts.

In the Indonesian context, the implementation of digital technology in education is governed by various policies, including Law No. 20 of 2003 on the National Education System, which emphasizes the need for education to develop learners' potential optimally through high-quality and relevant learning processes. This law underscores the importance of innovation in teaching and the development of teacher competencies as part of efforts to improve national education quality. Therefore, integrating digital technology into PAUD represents a strategic measure to enhance early childhood learning quality in Indonesia.

North Jakarta, as one of Indonesia's metropolitan areas, has significant potential for developing digital-based education. Lagoa Subdistrict, Koja District, North Jakarta, Indonesia, hosts several active PAUD institutions that provide early childhood education services to the community. PAUD Pelangi, PAUD Cempaka, and PAUD Kemuning 013 play essential roles in delivering early childhood education in the area. Although digital media is already used in learning activities, implementation has been largely limited to educational videos and simple presentations, while systematic technology integration has yet to be fully realized.

This situation reflects a gap between technological advancements in education and classroom practice. Learning is still dominated by conventional methods such as textbooks, workbooks, and printed media, with digital media use not yet integrated into comprehensive teaching strategies. Consequently, research is needed to provide empirical insights into the implementation of digital media-based learning in local PAUD settings. This study offers several innovations, including examining digital media implementation across three PAUD institutions in the same area, emphasizing teachers' actual practices, integrating digital pedagogy with early childhood education principles, assessing teachers' readiness and digital literacy, analyzing post-digital acceleration implementation, and providing contextually relevant recommendations. These contributions are expected to advance research on technology-based early childhood education.

Accordingly, this study aims to analyze the implementation of digital media-based learning among teachers at PAUD Pelangi, PAUD Cempaka, and PAUD Kemuning 013 in Lagoa Subdistrict, Koja District, North Jakarta, Indonesia. The study employs a descriptive qualitative approach, with data collected through observation, in-depth interviews, and documentation. Research participants include school principals, teachers, and students from the three PAUD institutions. Data analysis follows Miles and Huberman's model, encompassing data collection, condensation, presentation, and conclusion drawing. The study is expected to contribute to the development of digital media-based learning in early childhood education and provide a reference for policy development and teacher training in Indonesia.

2. RESEARCH METHOD

This study employed a descriptive qualitative approach to analyze the implementation of digital media-based learning among Early Childhood Education (PAUD) teachers in Lagoa Subdistrict, Koja District, North Jakarta. The qualitative approach was chosen because the study aimed to gain an in-depth

understanding of digital learning phenomena in a natural context, particularly concerning digital pedagogy practices and the integration of information and communication technology (ICT) in early childhood learning processes. The qualitative approach enables researchers to explore teachers' experiences, perceptions, and actual practices in utilizing digital media, thereby providing a comprehensive understanding of technology-based learning implementation in PAUD settings (Creswell & Poth, 2018; Tracy, 2020; Sugiyono, 2021). Descriptive qualitative research focuses on systematically, factually, and contextually describing phenomena based on field data without manipulating research variables, thereby producing in-depth findings that are relevant to real-world conditions (Miles et al., 2014; Qomaruddin & Sa'diyah, 2024).

The research was conducted in Lagoa Subdistrict, Koja District, North Jakarta, an urban area with a number of active PAUD institutions providing early childhood education. The research sites were selected purposively, considering the availability of PAUD institutions that had begun utilizing digital media in learning, albeit with varying degrees of implementation. The institutions involved were PAUD Pelangi, PAUD Cempaka, and PAUD Kemuning 013, representing the characteristics of PAUDs in the area. The study was conducted in a natural setting to allow direct observation of learning processes, teacher-student interactions, and the use of digital media in teaching and learning activities (Tracy, 2020; Creswell & Poth, 2018).

The research subjects consisted of principals, teachers, and students from the three selected PAUD institutions, chosen using purposive sampling, which entails selecting participants who possess relevant information concerning the research focus. Principals were selected to provide insights on institutional policies and support for digital learning, teachers were chosen to understand digital pedagogy practices and ICT integration, and students were observed to assess their engagement in using digital media. In total, the study involved 39 participants, comprising three principals, six teachers, and thirty students across PAUD Pelangi, PAUD Cempaka, and PAUD Kemuning 013. Each institution contributed one principal, two teachers, and ten students. The students were aged between 4 and 6 years and represented both male and female learners. The participating teachers held qualifications in Early Childhood Education or related fields and had teaching experience ranging from 3 to 15 years. Purposive sampling was used because qualitative research emphasizes information depth and participant relevance to the studied phenomenon (Sugiyono, 2021; Tracy, 2020).

Data were collected through observation, in-depth interviews, and documentation to obtain comprehensive information. Classroom observations were conducted repeatedly in each institution during regular learning activities to examine digital media-based learning processes, the use of technological devices, teacher-student interactions, and student engagement. Each observation session lasted approximately 60–90 minutes and was documented through field notes and observation sheets. In-depth interviews were conducted with all principals and teachers using semi-structured interview protocols. The interviews explored participants' understanding of digital learning, experiences in utilizing digital media, implementation challenges, institutional support, and strategies for improving digital learning practices. Interviews lasted approximately 30–45 minutes, were audio-recorded with participants' consent, and subsequently transcribed verbatim for analysis. Documentation was employed to strengthen the data through the collection of teaching materials, digital media, photographs of learning activities, and relevant school documents. The combination of these three data collection techniques ensured data validity and comprehensiveness (Creswell & Poth, 2018; Miles et al., 2014).

The primary research instrument was the researcher, functioning as a human instrument responsible for collecting and analyzing data directly in the field. Supporting instruments included interview protocols, observation sheets, documentation formats, and field notes structured around digital pedagogy and ICT integration indicators in PAUD learning. Observation indicators focused on teacher planning, digital media utilization, teacher-child interaction, student engagement, and classroom learning activities. Interview questions explored perceptions of digital learning, implementation experiences, institutional support, and challenges encountered in classroom practice. In qualitative research, the researcher serves as the main instrument, determining the research focus, collecting data, analyzing it, and interpreting findings contextually (Tracy, 2020; Sugiyono, 2021).

To ensure ethical compliance, permission to conduct the research was obtained from the principals of the participating PAUD institutions before data collection commenced. Informed consent was obtained from all adult participants, including principals and teachers. Because the study involved young children, parental or guardian consent was also secured prior to observation activities. Participants were informed about the purpose of the study, voluntary participation, confidentiality procedures, and their right to withdraw at any stage. To protect privacy, participants' identities were anonymized using codes, and no personally identifiable information was disclosed in the research report. Observations were conducted in a non-intrusive manner to ensure that learning activities were not disrupted.

Data validity was ensured through source triangulation, method triangulation, and time triangulation. Source triangulation involved comparing data from principals, teachers, and classroom observations; method triangulation compared interview, observation, and documentation data; while time triangulation collected data at different times to ensure consistency of information. Triangulation techniques aimed to enhance the

credibility and validity of findings, ensuring that results could be scientifically justified (Creswell & Poth, 2018; Miles et al., 2014; Qomaruddin & Sa'diyah, 2024).

Data analysis followed the Miles and Huberman model, comprising data collection, data condensation, data display, and conclusion drawing in an interactive and continuous manner. During data collection, the researcher gathered information through observations, interviews, and documentation. Interview recordings were transcribed verbatim and combined with observation notes and documentary evidence. In the data condensation phase, the researcher conducted initial coding by identifying meaningful statements related to digital media implementation. Similar codes were grouped into broader categories, such as teacher planning, digital media adaptation, classroom interaction, institutional support, and implementation challenges. Finally, in the conclusion-drawing phase, data were continuously interpreted until valid and in-depth findings were obtained. The Miles and Huberman model was selected for its ability to provide systematic and structured analysis in qualitative research (Miles et al., 2014; Tracy, 2020).

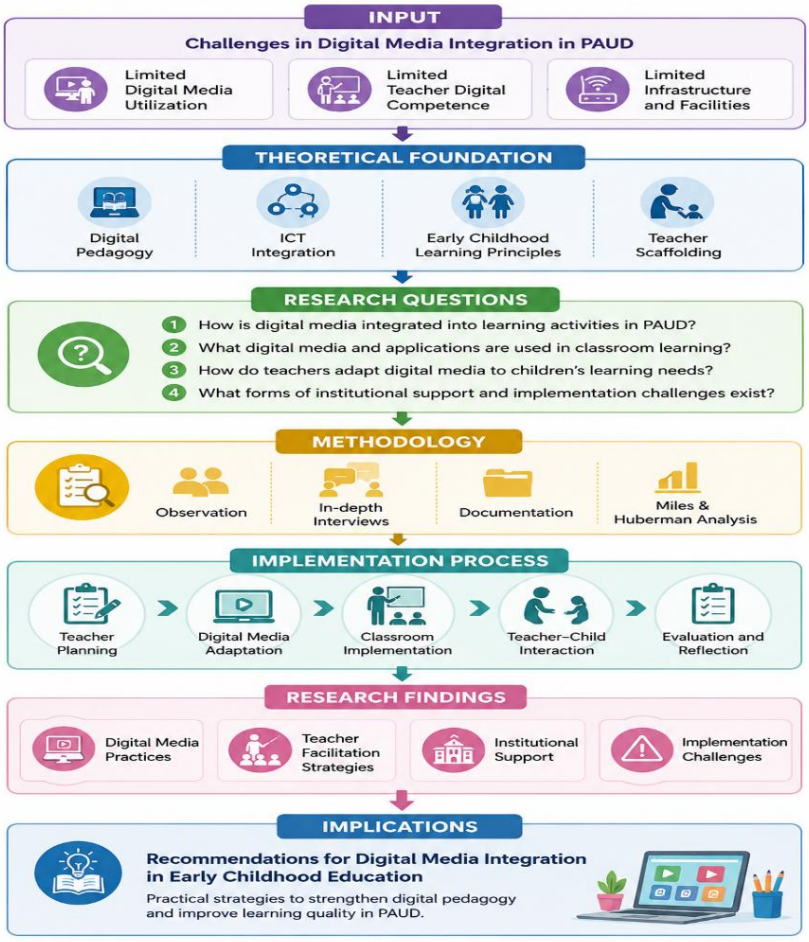

Figure 1. Research Framework

Based on Figure 1, the research framework illustrates a systematic flow of digital media-based learning implementation in early childhood education. The framework begins with the identification of key challenges in digital media integration within PAUD institutions, including limited utilization of digital media, limited teacher digital competence, and inadequate technological facilities. These challenges are examined through four primary theoretical perspectives: digital pedagogy, ICT integration, early childhood learning principles, and teacher scaffolding. These frameworks provide the conceptual basis for understanding how digital media is planned, adapted, and implemented in classroom learning activities.

Based on these theoretical foundations, the study addresses four research questions concerning the implementation of digital media in PAUD learning, the types of digital media used, teachers' adaptation of digital technology to children's learning needs, and the forms of institutional support and implementation challenges encountered in practice. To answer these questions, the study employs a descriptive qualitative approach using classroom observations, in-depth interviews, documentation, and data analysis based on the Miles and Huberman interactive model. The implementation process focuses on teacher planning, digital media adaptation, classroom implementation, teacher–child interaction, and evaluation practices. The framework ultimately produces an output in the form of improved early childhood teacher competence, which leads to the outcome of interactive, educational, and enjoyable digital learning for children, thereby supporting the effectiveness of digital media integration in early childhood education.

3. RESULTS AND DISCUSSION

Data were collected through observation, interviews, and documentation, and subsequently analyzed to understand the dynamics of digital learning, children's responses, teacher roles, and institutional support. The analysis not only described actual practices in the field but also connected the findings with previous research and early childhood education (ECE) learning theories.

Table 1. Key Finding form the Field

No	Data Type	Key Findings	Relevance to Previous Research
1	Observation	- Digital media-based learning was applied in a structured, creative, and interactive manner. - Children were enthusiastic, engaged in exploration, questioning, and collaboration. - Multisensory approaches were used: audio, visual, and direct interaction.	Nurhasanah, et al (2025): Digital media enhances children's engagement and motivation. Angrosino (2022): ECE observations help understand the meaning of play activities. Huberman & Saldaña (2020): Qualitative observation identifies social interaction patterns. Mayer (2021): Multimedia learning is effective through multiple sensory channels.
2	Interviews	- Principals emphasized support for infrastructure and teacher training. - Teachers utilized YouTube, Capcut, and Canva, adapting materials to children's characteristics. - Children were happy, motivated, and active, especially with interactive media. - Challenges: unstable internet connection and limited data quotas.	Cohen, Manion, & Morrison (2021): Structural support is crucial for implementing innovations. Rahmawati & Hartono (2020): Digital media increases children's interest, comprehension, and motivation. Setyowati, Wahyuni, & Santoso (2021): Digital media supports creative exploration. Sugiyono (2020): Teacher roles are essential for effective digital learning.
3	Documentation	- Adequate facilities: comfortable classrooms, digital devices, safe play areas. - Visual documentation showed teacher-child interaction and peer collaboration.	Miles, Huberman, & Saldaña (2020): Documentation is important for data triangulation. Moleong (2024): Documentation enhances validity in qualitative research.

3.1. Implementation of Digital Media

Data analysis indicated that digital media implementation in early childhood learning was systematic, creative, and interactive. Digital media served not only as a content delivery tool but also as a stimulus for cognitive, language, socio-emotional, and motor development. For instance, interactive animation applications and educational videos encouraged children to explore concepts of shapes, colors, and patterns, while simultaneously improving hand-eye coordination. These activities aligned with the learning by playing approach, emphasizing that children learn optimally through enjoyable, hands-on experiences (Angrosino, 2022; Huberman & Saldaña, 2020).

Classroom observations revealed that digital media was integrated into learning activities through educational videos, animated content, and interactive visual presentations. During an observation session at PAUD Pelangi, the teacher displayed an animated video introducing geometric shapes. Children actively responded by naming the shapes shown on the screen and relating them to objects found in their classroom environment. Several children voluntarily raised their hands to answer questions and eagerly participated in follow-up drawing activities.

One teacher explained:

"*Children become more enthusiastic when learning materials are presented through videos and animations. They pay more attention and are more willing to participate in discussions compared to conventional learning activities using only printed materials*." (Teacher 2)

Similarly, another teacher stated:

"*Digital media helps children understand concepts more easily because they can directly see examples through pictures, animations, and videos*." (Teacher 5)

These observations indicate that digital media served not only as a learning resource but also as a stimulus for active participation and classroom interaction.

Teachers applied multisensory strategies by integrating audio, visual, and direct interaction, providing stimulation through multiple sensory channels. This strategy reinforced Mayer's (2021) findings on multimedia learning, which suggest that delivering content through more than one sensory channel improves information retention and conceptual understanding. In practice, teachers combined animated videos with oral questioning, group discussions, and interactive drawing activities, encouraging children to think critically, express opinions, and collaborate. These activities not only increased motivation but also supported

the development of 21st-century skills, such as creativity, communication, and collaboration, which are fundamental in early education (Nurhasanah, et al., 2025).

Moreover, digital media implementation was differentiated according to individual children's characteristics and needs. Visual learners were provided with animation- and image-based materials, while kinesthetic learners received interactive activities requiring physical movement. Differentiation was crucial in bridging children's learning styles, as emphasized in recent research (Setyowati, Wahyuni, & Santoso, 2021). Consequently, digital media functioned not merely as a delivery tool but also as an instrument capable of tailoring learning processes to individual characteristics, enhancing both effectiveness and learning quality.

3.2. Teacher and Institutional Roles

Data showed that teachers performed multiple roles as planners, facilitators, and digital content creators. Teachers prepared materials, designed interactive activities, and guided children in using digital media. This approach aligns with Vygotsky's scaffolding theory, where teachers provide support appropriate to the child's ability level to reach their zone of proximal development (ZPD). Teachers not only delivered information but also directed, stimulated creativity, and encouraged active participation, enabling children to explore materials in an enjoyable and challenging manner.

Interview findings demonstrated that teachers viewed themselves not merely as information providers but also as facilitators of children's interaction with digital media.

One teacher commented:

"*We do not simply play videos for children. After watching, we ask questions, encourage them to share their ideas, and connect the content to their daily experiences*." (Teacher 3)

During classroom observations, teachers frequently paused videos to ask children questions, invite predictions, and encourage discussion. For example, during a lesson about animals, the teacher stopped an educational video and asked, "Where does this animal live?" and "Have you ever seen this animal before?" Several children responded enthusiastically and shared personal experiences, creating interactive classroom discussions.

The principal of PAUD Cempaka also emphasized the importance of teacher readiness:

"*Digital devices alone are not enough. Teachers need continuous training so that technology can be used effectively and appropriately for children's developmental needs*." (Principal 2)

Institutional support was equally important for digital learning implementation. Schools provided facilities such as laptops, projectors, audiovisual devices, internet access, and regular teacher training. This support ensured that teachers could implement digital media optimally and consistently, corroborating Cohen, Manion, & Morrison (2021), who emphasized the importance of structural support in educational innovation adoption. Availability of resources and trained teachers allowed digital media-based learning to be effective and free from technical constraints.

Furthermore, teachers adapted methods to children's characteristics, for example by simplifying instructions, adding music, or introducing competitive activities to increase motivation. This finding is consistent with Rahmawati & Hartono (2020) and Sari & Putra (2022), highlighting that successful digital media implementation relies on both teacher roles and institutional support. Teacher-child interactions were dynamic, with teachers acting as creative facilitators balancing instruction, free exploration, and group collaboration.

Documentation and interview data indicated that all three institutions had made efforts to support digital learning implementation through the provision of laptops, projectors, internet access, and teacher development activities.

As explained by one principal:

"*The school regularly encourages teachers to learn new digital applications and provides opportunities for them to participate in workshops and training programs*." (Principal 1)

However, participants also reported several challenges. One teacher stated:

"*Internet connectivity is sometimes unstable, especially when we use online videos. This occasionally interrupts learning activities*." (Teacher 4)

Another teacher added:

"*Some teachers still need additional training because digital applications continue to develop rapidly*." (Teacher 1)

These findings suggest that successful digital media implementation depends not only on technological facilities but also on sustained institutional support and professional development opportunities.

3.3. Challenges and Contextual Considerations in Digital Media Implementation

Although digital media supported children's engagement and participation in classroom activities, several challenges were identified during implementation. First, teachers demonstrated varying levels of digital competence, influencing their ability to design and adapt digital learning materials effectively. Teachers with greater familiarity with digital applications tended to integrate technology more creatively, whereas others relied primarily on videos and presentation-based media.

Second, technological infrastructure remained an important consideration. Participants reported occasional internet connectivity problems and limitations in digital resources, which sometimes restricted the use of online learning materials. These findings suggest that successful digital media integration depends not only on teacher readiness but also on adequate institutional support and technological infrastructure.

Another important consideration concerns the selection of age-appropriate digital content. Early childhood learning emphasizes active exploration, play, social interaction, and direct experiences. Therefore, digital media should function as a complementary learning resource rather than a replacement for hands-on activities. Teachers in this study generally used digital media as a stimulus for discussion, storytelling, drawing, and collaborative activities, helping to maintain a balance between technology use and developmentally appropriate pedagogical practices.

The findings also highlight the importance of contextual factors in North Jakarta PAUD institutions. Supportive school leadership, availability of digital devices, and teacher participation in training programs contributed to more effective implementation of digital media-based learning. These contextual conditions help explain why teachers were able to incorporate digital technology into classroom activities despite existing challenges.

3.4. Relevance to Previous Research

The results reinforced prior findings that digital media is effective when employed with appropriate pedagogical strategies and adequate resources. Digital media increased children's motivation and engagement, consistent with Nurhasanah et al. (2025). Children were particularly enthusiastic and active when digital media presented interactive and visually appealing elements, turning the learning process into an enjoyable and meaningful experience.

Digital media also facilitated social interaction and creative exploration, aligning with Setyowati et al. (2021). Collaborative group activities, discussions, and interactive games encouraged children to learn from peers and develop socio-emotional skills. Teachers used digital media creatively, adjusting content to children's characteristics and creating enjoyable learning experiences, as noted by Rahmawati & Hartono (2020).

Finally, the successful implementation of digital media required institutional support and teacher competence, making teacher training and provision of devices key success factors (Cohen et al., 2021; Sari & Putra, 2022). Theoretically, this aligns with Mayer (2021), who emphasized the effectiveness of multimedia learning through multisensory integration, and PAUD pedagogical principles, which focus on learning through play, exploration, and social interaction. Therefore, this study not only supports previous findings but also provides updated empirical evidence on the balance of teacher roles, institutional support, and pedagogical strategies in maximizing the potential of digital media for early childhood learning.

4. CONCLUSION

This study examined the implementation of digital media-based learning in three PAUD institutions in North Jakarta, Indonesia. The findings indicate that digital media integration was not solely determined by the availability of technological tools but was strongly influenced by teacher facilitation, institutional support, and the adaptation of digital learning activities to the developmental characteristics of young children. Teachers played a central role in planning learning activities, selecting appropriate digital resources, and facilitating meaningful interactions between children and digital content. Institutional support, including access to digital devices, internet facilities, and professional development opportunities, further contributed to the implementation of digital pedagogy practices in classroom settings.

The findings suggest that digital media can support children's engagement, participation, and interaction when integrated within developmentally appropriate, play-based learning activities. Rather than functioning as a substitute for traditional learning experiences, digital media served as a complementary tool that enriched classroom interaction and learning experiences.

This study contributes to the growing literature on digital pedagogy in early childhood education by providing empirical evidence from multiple PAUD institutions within the same urban context. The findings highlight the importance of balancing technological innovation with child-centered pedagogical principles in early childhood learning environments.

Several limitations should be acknowledged. The study was conducted in only three PAUD institutions located within one urban subdistrict in North Jakarta. Therefore, the findings reflect a specific educational context and should not be generalized to all PAUD institutions in Indonesia. In addition, the relatively short observation period limits the ability to examine longer-term patterns of digital media implementation.

Based on these findings, teachers are encouraged to continue developing their digital competencies and to select digital resources that are appropriate for children's developmental needs. School leaders and policymakers should strengthen support for digital infrastructure, teacher training, and sustainable digital learning initiatives in early childhood education. Future research may involve broader geographical settings,

longer observation periods, comparative institutional studies, or mixed-method approaches to further explore the role of digital media in supporting children's engagement and learning experiences over time.

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