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USE OF DIGITAL MEDIA IN EARLY CHILDHOOD LEARNING: CASE STUDY IN PLAYGROUPS IN BANDAR LAMPUNG CITY

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Abstract:
This study aims to analyze the use of digital media by educators and their management strategies for effective and safe learning for early childhood playgroups. The study employed a qualitative approach with a case study design at three playgroup institutions in Bandar Lampung City. Data were collected through participant observation, in-depth interviews with principals, teachers, and parents, and documentation. Data analysis employed the Miles, Huberman, and Saldaña model, which includes data condensation, data presentation, and conclusion drawing. The results indicate that each type of digital media provides specific benefits: educational videos improve vocabulary and learning motivation; tablet applications stimulate cognitive and fine motor skills; interactive projectors encourage collaborative learning; interactive e-books strengthen early literacy; and educational audio aids children's language development and musicality. However, challenges remain, including low teacher digital literacy, limited infrastructure, the potential for excessive screen time, and a lack of institutional policy guidance. This study emphasizes the need for selecting developmentally appropriate digital media, technology-based teacher professional development, and active partnerships between Early Childhood Education institutions and parents in supervising digital media use.
Keywords: *Early Childhood Digital Media; Educational Videos; Early Childhood Education Learning; Educational Technology.*

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INTRODUCTION

The rapid development of digital technology in the 21st century has penetrated all aspects of human life, including the world of early childhood education. Children born in this era, often referred to as Generation Alpha, grow up in an environment rich in technological stimulation from a very young age (Nasir, 2024). Data from the Indonesian Internet Service Providers Association in 2023 recorded that internet penetration in Indonesia had reached 78.19% of the total population (Ulya & Zannah, 2024). Recent research shows that digital media exposure also occurs in children aged 0–6 years, where children use digital devices

for an average of two to three hours per day (Hoban, 2019). This phenomenon presents both challenges and opportunities for Early Childhood Education institutions, especially playgroups, to respond meaningfully to the learning needs of the digital generation.

Conceptually, there are various types of digital media that can be utilized in early childhood learning. Each has different characteristics, advantages, and risks. Animated educational videos are the most commonly used media because they are easily accessible and rich in audio-visual stimulation (Endrawati, 2024; Zahroh et al., 2025). Tablet-based educational game applications offer high interactivity and are adaptive to children's abilities. Interactive projectors enable collaborative and participatory learning in the classroom. Digital storybooks (interactive e-books) combine the traditional reading experience with multimedia elements. Meanwhile, educational music and audio podcasts stimulate children's language development and musicality through active listening (Suruambo, 2025). Understanding the specific characteristics of each type of digital media provides an important foundation for teachers in selecting and integrating technology appropriately.

Theoretically, the use of digital media in Early Childhood learning can be understood through the framework of Vygotsky's constructivism theory (Tiara & Pratiwi, 2025) which emphasizes the role of mediation tools, including technological tools, in the construction of children's knowledge. The Zone of Proximal Development explains that children can achieve higher understanding when facilitated by appropriate scaffolding, and digital media has the potential to function as an adaptive digital scaffold. Gardner's Multiple Intelligences Theory (Pratiwi et al., 2026) supports the idea that digital media can stimulate various intelligences in children simultaneously through interactive multimedia content. The American Academy of Pediatrics (AAP) (Ramelan et al., 2025; Sabri & Husnah, 2026; Yulianto, 2025) recommends that children aged 2–5 years can use high-quality digital media with adult supervision, no more than one hour per day.

Various studies have documented the positive impact of digital media on early childhood learning. One (Satriana et al., 2022) study found that digital learning media can stimulate literacy skills in children aged 5-6 years. (Ocha & Laksana, 2025) identified that students engaged in gamified digital learning activities showed higher levels of enthusiasm, longer attention spans, better understanding of concepts, and better retention of learning. According to (Fanni et al., 2022) shows that the influence of animated video media on the literacy skills of Group A kindergarten children, and (Abbas et al., 2025) confirms that digital media can provide interactive, personalized, and collaborative learning experiences.

However, significant research gaps remain. Most studies focus on kindergarten settings (ages 4–6) using quantitative approaches, resulting in limited understanding of the dynamics of digital media use in younger playgroups (ages 2–4). No studies have comprehensively classified and explored the management strategies for various digital media types developed locally by Early Childhood

Education practitioners in Lampung. This gap serves as the academic justification for this research. Based on this background, this research specifically aims to analyze the use of digital media and teachers' strategies for managing learning in playgroups effectively and safely.

RESEARCH METHODS

This research uses a qualitative approach with a case study design on three Playgroup institutions in Bandar Lampung City that have different characteristics in terms of ownership (public and private), geographic location (urban and suburban), and level of technology adoption. The qualitative approach was chosen because it aims to understand social phenomena in depth from the perspective of the research subjects in their natural context (DeMarrais et al., 2024). The case study design allows for cross-case analysis to identify patterns and uniqueness of digital media use in each institution (Yin, 2018).

Data were collected through three complementary techniques. First, 12 weeks of participant observation (February–April 2026) focused on direct observation of the learning process involving various types of digital media, teacher-child interactions, and classroom management. Second, in-depth interviews with 15 informants (3 principals, 6 class teachers, and 6 parents) using a semi-structured interview guide. Third, documentation in the form of Daily Learning Implementation Plans, activity photos, video recordings, institutional policies, and child development reports.

The main research instrument is the researcher himself (human instrument), in accordance with the characteristics of qualitative research (Lee, 2022). Supporting instruments include (1) an observation guide with indicators of digital media type, duration of use, child response, teacher role, and learning environment conditions; (2) a semi-structured interview guide covering knowledge, attitudes, practices, benefits, challenges, and digital media management strategies; and (3) reflective field notes after each observation session.

Data analysis used the interactive model of Miles, Huberman, and Saldaña, which consists of (1) data condensation, selecting, focusing, and abstracting raw data into meaningful categories; (2) data presentation in matrices, thematic networks, and analytical descriptive narratives; and (3) iterative drawing of conclusions. Data validity was tested through triangulation of sources and methods.

RESULTS AND DISCUSSION

Twelve weeks of participant observation and in-depth interviews identified five main types of digital media used across the three institutions. These findings constitute a key contribution of this study, detailing a digital media typology specific to the context of playgroups (ages 2–4) in Indonesia.

Animated Educational Videos

Animated educational videos were the most dominant type of digital media,

used in all three institutions via projectors or large-screen televisions. Video sources included the YouTube Kids platform, the Ruang Guru Early Childhood Education channel, and institutional learning DVDs. Content included concept introductions (colors, shapes, numbers, letters), developmental songs, digital picture stories, and natural history, with each session lasting 10–20 minutes. Characteristics of effective animated educational videos for early childhood include simple narratives with consistent repetition, expressive and easily identifiable characters, a moderate visual tempo, and a combination of song and movement that encourages physical participation.

The teacher of Playgroup-A, (who has been teaching for seven years, describes her routine use:

"Every morning before the main activity, I always play a video song related to the week's theme, for example, an animal theme. I look for cute animations of animals with dialogue. The kids immediately become enthusiastic, singing along and imitating the movements. It's a very effective warm-up for me."

This statement reveals that educational videos do not only function as information media, but also as a trigger for children's emotional and physical involvement from the beginning of learning in line with the principle of developmentally appropriate practice which emphasizes the importance of fun and meaningful activity transitions (Cade et al., 2022).

Tablet-Based Educational Game Application

Tablet-based educational game applications were found in two institutions with a limited device ratio (6 tablets for 24 children). The types of applications used included puzzle and picture-matching applications (for cognitive and fine motor skills), interactive letter and number recognition applications, digital coloring applications, and touch-based interactive story applications. Characteristics of applications suitable for early childhood (2–4 years old) include a simple and intuitive interface, audio instructions without lengthy text, immediate positive feedback, and adaptive difficulty levels.

The Principal of Playgroup-B explained the rotating use system that was developed:

"We had six tablets for 24 children. At first, it was chaotic because everyone was fighting over them. Eventually, we implemented a rotation system: four children took turns every 10 minutes, while the rest continued with the center activities. This actually led to the development of patience and waiting in line, which are also important character values."

This finding is interesting because it suggests that device limitations, initially perceived as a barrier, fostered institutional creativity that inadvertently integrated character education. This is consistent with the argument (Samuelsson et al., 2022) that limited technological resources in early childhood education can foster richer social interactions between children.

Interactive Projector with Touch Screen

Interactive touchscreen projectors are available only at Playgroup-C (a private institution) and are used for whole-class collaborative activities. These activities include: connecting pictures to words, selecting answers from illustrated options, digital collaborative drawing, and large-scale color and shape matching games. A specific advantage of this medium for early childhood is its ability to create what researchers call a "collaborative stage" where one child interacts directly with the screen while their peers become "active audiences" providing suggestions and support.

Playgroup C Class Teacher shares her experience:

"With the touch projector, kids can come right up to the front and touch the screen to connect images, choose answers, or draw together. One child takes the 'go ahead' button, while the others become active audience members, shouting out suggestions. The class becomes very lively."

This description depicts a learning dynamic that goes beyond mere child-technology interaction, generating rich social interactions for children. Interactive projectors enhance the ZPD (Wertsch, 2024) through the mechanism of peer scaffolding, where the child who is watching actively provides cognitive assistance to his/her friend who is interacting with the screen.

Digital Story Book (Interactive E-Book)

Interactive e-books were found to be a relatively new medium introduced in two institutions, generally accessed via tablets or computers. Unlike regular storybooks, interactive e-books for Early Childhood have features: animated characters that move as the pages are read, sound effects that reinforce the narrative, interactive buttons that reveal additional information (for example, touching a butterfly image produces the sound of its wings flapping and its Latin name), and automatic word pronunciation to help children learn to read. The types of content used include fables based on local Lampung culture, digital Indonesian fairy tales, and illustrated popular science books.

The teacher of Playgroup-B shared her experience using interactive e-books:

"The kids are really interested when they touch the images on the tablet and the sound appears. For example, if they touch the lion, it immediately makes a roar. It keeps them curious and makes them want to listen to the story until the end. It's different when I read a regular book, where their attention can easily drift."

Interactive e-books combine the benefits of shared reading with digital multisensory stimulation. Research (Outhwaite & Van Herwegen, 2023) shows that well-designed interactive e-books can significantly improve story comprehension and engagement in preschoolers, especially when the interactive features support the narrative rather than disrupt it.

Educational Music and Audio Podcasts

Educational music and audio are the most "invisible" yet consistently used digital media across all three institutions. These include developmental songs in

Indonesian and regional languages, interactive children's story podcasts (where teachers play recordings of illustrated stories read expressively), nature sound recordings for relaxation activities, and musical instruments for movement and dance accompaniment. These media are typically played through Bluetooth speakers connected to teachers' phones or tablets.

The Principal of Playgroup-A explains the philosophy of using educational audio at his institution:

"We believe that children's ears need to be trained just as much as their eyes. Every transition from free play to circle sitting, from snack to nap, is accompanied by music. It's not just a time filler; it's our way of teaching children to read rhythm and mood through music."

The use of educational audio aligns with a music-based learning approach that has been proven effective in phonological development, pattern recognition, and early language skills in early childhood (Parker et al., 2022). Music also serves as an emotional transition that helps children self-regulate, a crucial skill for the 2-4 year old playgroup.

Benefits of Digital Media for Early Childhood Development

All teacher and principal informants consistently reported increased child engagement during digital media-based sessions. In the context of the three playgroups studied, observational data indicated a tendency toward longer attention spans during digital sessions, reaching 15-18 minutes, compared to 7-10 minutes in sessions without digital media an improvement of nearly 80% within this specific sample. However, specific benefits varied depending on the type of media used.

Animated educational videos proven to be most effective in expanding vocabulary and instilling new concepts. The teacher of Playgroup B described the phenomenon of vocabulary transfer that she witnessed:

"After we played a video about professions like doctors, farmers, and pilots, a few days later, during a role-play, the children used words from the video. One said, 'I want to check with a stethoscope,' even though the word stethoscope hadn't been in their vocabulary before. I even recorded the moment because I was so excited."

Tablet application provides the most significant benefits in the development of cognitive and fine motor skills. The Playgroup-A Class Teacher noted significant changes in the child with attention challenges:

"There was one kid, let's call him R, who usually only lasted 3-4 minutes before running away. But when we used a puzzle app on his tablet, he could sit for a full 15 minutes until he finished all the levels. I was amazed."

The optimal response to the stimulus of this tablet application can be explained through Csikszentmihalyi's concept of flow state, a condition of optimal engagement that occurs when the level of challenge matches the child's abilities, which is more easily created by adaptive applications than by conventional classroom activities (Nichols & LeBlanc, 2020).

Interactive projector provides unique benefits in developing social skills and group speaking skills. Children who take turns practicing self-confidence and decision-making, while children who watch practice waiting, offering advice, and responding constructively to peers.

Interactive e-book proven effective in strengthening story comprehension and early reading motivation. A mother from Playgroup-C reported her observation:

"My son, Dafa (3.5 years old), after learning about colors at school using a tablet app, at home he grouped his toys by color while saying their names. He said, "This is red, like in the game, Mom." So he himself connected school learning with home activities."

This observation reveals that the transfer of learning across contexts (school-to-home transfer), which is an important indicator of learning quality, shows that digital media not only produces declarative knowledge, but encourages meaningful procedural applications.

Educational audio provided the most consistent benefits in emotion regulation and activity transitions. Teachers reported that music played during transitions between activities significantly reduced the frequency of children's conflicts and tantrums compared to transitions without music.

Challenges of Using Digital Media in Playgroups

Five categories of challenges were identified through interviews and observations. The first and most fundamental challenge was teachers' low digital literacy. The teacher of Playgroup B acknowledged her limitations:

"I learned to use a tablet from YouTube, completely self-taught. I didn't receive any special training from any institution or government agency. Sometimes I wanted to find new and better apps, but I didn't know how to judge which ones were good for kids and which ones were just regular games. In the end, I just used the same ones because I already knew how to use them."

This recognition exposes the phenomenon of the technology comfort zone the tendency for teachers to stick with familiar technologies due to the lack of structured professional development. This situation is exacerbated by the absence of critical digital literacy, namely the ability of teachers to evaluate the pedagogical quality of digital media, not just operational technical skills (Kumpulainen et al., 2020).

The second challenge is parental concern about the accumulation of screen time across contexts. A mother from Playgroup A voiced her concern:

"At school, they use tablets and projectors, but at home, they keep asking for YouTube. I'm at a loss as to what to do. If I forbid it at home but use it at school, it'll confuse them. I've asked teachers, but their answers aren't specific, just saying 'limit it.' Limiting it to how many hours, or what content it's unclear."

The third challenge is the lack of written policies at the institutional level. The principal of Playgroup A provided a surprising confirmation:

"We don't have a written SOP for digital media use. Everything is based on each

teacher's habits and judgment. I myself have never received training on digital media management in Early Childhood Education. Honestly, we only realized the need for this after several parents asked about their children's screen time."

This statement indicates that institutional awareness of the need for new digital media policies emerged reactively, triggered by parental inquiries, rather than proactively based on academic or regulatory studies. This reflects an unstructured, bottom-up pattern of technology adoption (Xie et al., 2023).

The fourth challenge is limited infrastructure, which creates operational frustration. A Playgroup A teacher shared her experience:

"I've prepared the video, set up the projector, and the kids are sitting neatly and enthusiastically, and suddenly the internet goes dead. The kids, already excited, are disappointed. I have to quickly switch to another activity, but their learning mood has already dropped. That's the hardest part; we can't predict it."

A fifth challenge specific to interactive e-books and tablet apps is the potential for interactive features to be distracting, rather than supporting, learning. Some apps on the market include advertisements, notifications, or paid features that can distract children from the primary pedagogical objective.

Digital Media Management Strategies Developed by Teachers

Despite the lack of formal policy support, teachers developed adaptive strategies that demonstrated a high level of pedagogical sensitivity. The first strategy involved active mentoring during practical digital media use, which approximates the concept of guided interaction (Samuelsson et al., 2022). The teacher at Playgroup C described her approach:

"I never let my kids watch a video alone without interaction. I always pause it in the middle and ask: 'What animal is that?' 'What color is it?' 'What is it doing?' Or I ask them to guess what will happen next. This way, the video becomes a discussion topic, not passive viewing."

This pause-and-question practice instinctively replicates a dialogic reading strategy proven effective in early childhood education research. This strategy transforms viewing from a receptive to an interactive experience, stimulating children's critical thinking and expressive language, reinforcing findings (Grady et al., 2022) on the effectiveness of adult active mediation in maximizing the cognitive benefits of digital media.

The second strategy is integrating digital media with follow-up physical activities, designed to prevent motor stagnation. The Playgroup B teacher explains the formula she developed:

"After 15 minutes of video, I always move straight to a movement activity. For example, after watching a video about butterflies, we immediately 'fly' around the classroom with our arms like wings. Or after a video about rain, we clap the raindrops while standing. Children can't sit still for long periods of time; it's not in their nature. Technology should be a bridge to real-life activities, not a substitute for them."

This philosophy of "technology as a bridge, not a replacement" reflects an

intuitive understanding of the principle of embodied learning: early childhood builds knowledge most effectively through physical-kinesthetic experiences. This digital-physical transition approach actually reflects recommendations (WHO, 2019) about the importance of balancing screen time with physical activity for children under 5.

The third strategy involves involving parents as digital learning partners. The principal of Playgroup B described the communication practices he developed:

"Every Friday, in the class WhatsApp group, teachers send out a 'Digital Summary of the Week,' which includes the name of the video or app used, the topic covered, and one or two questions parents can ask their children at home. For example, 'What did you learn about at school?' or 'Tell me about the animal you saw in the video.' This way, parents can continue learning at home without having to provide more gadgets."

The Digital Summary of the Week initiative is an example of a smart, low-cost home-school communication innovation. This strategy operationalizes the concept of home-school continuity, enabling parents to support the consolidation of their children's learning without increasing screen time, while also educating parents on how to use digital media meaningfully through guided conversations.

DISCUSSION

The findings of this study confirm and extend those of previous studies by presenting a more detailed typology of digital media for the playgroup context. The five identified digital media types educational videos, tablet apps, interactive projectors, interactive e-books, and educational audio have distinct benefit and risk profiles and therefore cannot be treated generically in early childhood learning planning.

The nearly 80% increase in attention span observed in this study which should be interpreted as a tendency within this specific three playgroup sample rather than a generalizable finding aligns with findings (Booton et al., 2023) that tablets increase the engagement of 3–5-year-olds in literacy activities. This can be explained through the Dual Coding theoretical framework (Palmer, 2024) information presented multimodally (a combination of visual, audio, and interactive) is processed more effectively by the brain than monomodal information.

Specifically, Dual Coding Theory posits that verbal and non-verbal information are encoded through separate but interconnected cognitive channels; when both channels are simultaneously activated as occurs with animated video combining narration, moving image, and sound effects memory consolidation and retrieval are significantly enhanced. This mechanism directly explains why children in all three institutions retained vocabulary from video sessions more reliably than from conventional instruction. Furthermore, the interactive dimension of tablets and projectors adds a third layer of engagement through motoric-kinestgetic

processing, creating what can be theorized as a triple coding effect not fully captured by the original Dual Coding framework. However, it is important to note that increased engagement does not automatically equate to increased learning; the quality of teacher interaction during the use of digital media is a critical determining variable.

The findings on vocabulary transfer from educational video content to children's conversations and role-playing are consistent with research (Guellai et al., 2022) on the role of video programs in preschool language development. Key to their effectiveness, as demonstrated by Playgroup C's teacher's 'pause-and-question' practice, is the teacher's role as an active co-viewer who asks questions during viewing. Within the framework (Colelli et al., 2025), this practice represents social scaffolding within the child's ZPD, where the teacher functions as a more knowledgeable other who mediates the meaning of digital content. It is important to theoretically distinguish between two dimensions of ZPD mediation observed in this study: (1) vertical scaffolding, where the teacher actively extends children's cognitive reach by posing questions that guide them toward concepts beyond their independent understanding; and (2) horizontal scaffolding, observed with the interactive projector, where peers collectively assist one another through a shared public screen. Both forms align with Vygotsky's broader argument that all higher cognitive functions first appear on the social plane before being internalized. Digital media in this study thus functioned not merely as a stimulus, but as a socially constituted mediational tool a distinction with significant implications for how teacher professional development should be designed.

The findings on interactive e-books provide an important nuance: not all interactive features in digital media are learning-supportive. The research (Huntington et al., 2023) distinguishes between 'enhancement features', which strengthen narrative comprehension, and 'distracting features', which distract from the story. The practical implication is that teachers need to be able to evaluate the pedagogical quality of e-books, not just their technical ability to operate them.

The low level of digital literacy among teachers and the identified "technology comfort zone" phenomenon reflect systemic issues within the Indonesian Early Childhood Education ecosystem. These findings align with research (Han et al., 2022)that shows that Early Childhood Education teachers in developing countries generally adopt technology in a reactive and unstructured manner. The testimony of teachers who learned independently from YouTube exposes the absence of formal digital professional development pathways, a condition that is considered (Paul et al., 2023) the strongest predictor of low-quality technology integration in Early Childhood Education.

The pragmatic strategies developed by active mentoring teachers, digital-physical transitions, and weekly digital communication reflect the remarkable adaptive capacity of field practitioners working within structural constraints. However, this research uncovers a fundamental tension: these innovative strategies

rely entirely on individual teacher initiative, creating significant inconsistencies in quality across institutions. (Ogegbo & Aina, 2022) warn that unsystematic technology implementation can negatively impact child development. Therefore, codifying individual best practices into structured, sustainable, and evaluable institutional policies is needed.

This research has four practical implications. First, Early Childhood Education institutions need to develop a comprehensive media use policy that includes classification of media types permitted by age group, duration of use, content selection procedures, and parental involvement mechanisms. Second, the Department of Education needs to conduct digital literacy training for Early Childhood Education teachers that includes skills in evaluating the pedagogical quality of digital media, not just technical skills. Third, parents need to be strengthened as active digital partners through family media literacy workshops. Fourth, researchers need to develop a contextualized digital media integration evaluation framework for Indonesian playgroup settings.

CONCLUSION

The use of digital media in learning at playgroups in Bandar Lampung City, namely (1) animated educational videos are the most dominant in expanding vocabulary and instilling concepts; (2) tablet-based educational game applications excel in developing cognitive and fine motor skills; (3) unique interactive projectors in encouraging collaborative learning and children's self-confidence; (4) interactive e-books are effective in strengthening early literacy and story comprehension; and (5) educational music and audio podcasts are consistent in supporting children's language development and emotional regulation. Each type of digital media provides a different profile of benefits for Early Childhood development, so media selection must be based on the specific developmental goals to be achieved rather than simply the availability of devices or teacher preferences. Within this specific sample, the tendency toward vocabulary transfer, a nearly 80% increase in attention span, and the emergence of peer scaffolding through interactive projectors are findings that enrich the literature on the potential of digital media in Early Childhood Education. However, this potential has not been systematically optimized due to three interrelated structural barriers: low teacher digital literacy, limited infrastructure, and the absence of adequate institutional policies.

The management strategies developed by teachers, although innovative and in line with international research recommendations, are still individual and inconsistent. For further research, it is recommended that: (1) develop and test a contextual digital literacy training model for playgroup teachers that includes an evaluation of the pedagogical quality of digital media; (2) conduct a longitudinal study on the long-term impact of the use of various types of digital media on school readiness; (3) develop a standard assessment instrument to evaluate the quality of integration of each type of digital media in Indonesian Early Childhood Education;

and (4) explore an adaptive media use policy model for playgroups with varying infrastructure limitations.

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