

Integration of Digital Literacy in Early Childhood

Education Learning

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ABSTRACT

The development of digital technology has had a significant impact on the field of education, including Early Childhood Education (ECE). The integration of digital literacy into ECE learning represents a strategic effort to prepare children to face technological developments while continuing to consider the characteristics and developmental needs of young children. This study aims to analyze the concept, implementation, and role of digital literacy in supporting the ECE learning process across various aspects of child development. This study employed a qualitative approach using a descriptive method. This research method was used to describe and explain phenomena in depth based on data obtained from research subjects within a natural context. Data were analyzed using content analysis techniques by identifying the main themes related to the integration of digital literacy into learning. The integration of digital literacy can be implemented across various aspects of child development, including moral and religious values, cognitive

development, science, language, and social-emotional development. The successful implementation of digital literacy is influenced by teachers' digital competence, the availability of technological facilities, the quality of learning media, and parental involvement in accompanying children. Based on the findings, it can be concluded that digital literacy represents a learning approach capable of enriching young children's learning experiences when implemented appropriately, purposefully, and in accordance with the principles of play-based learning.

Introduction

The development of information and communication technology has brought significant changes to various aspects of life, including education. Digital transformation has encouraged educational institutions to integrate technology into the learning process so that students acquire competencies that correspond to the demands of the 21st century (Dewi, 2024; Ghazy et al., 2025). At the Early Childhood Education (ECE) level, the use of technology serves not only as a learning medium but also as a means of fostering digital literacy skills from an early age. Digital literacy in young children is not merely understood as the ability to operate digital devices; rather, it encompasses the ability to recognize, understand, use, and interact with digital media safely, creatively, and in accordance with children's developmental stages (Zanni et al., 2025; Maufirah & Maghfirah, 2026; Asmayawati, 2025; Safita & Pentiernitasari, 2026).

In relation to the issues described above, recent studies have shown that digital literacy at the ECE level is also associated with character development, ethical awareness, and 21st-century skills, thereby requiring the active involvement of teachers and parents in the learning process (Dwijantie et al., 2025; Marzuki et al., 2026). Early childhood education serves as a fundamental foundation for fostering children's cognitive, social-emotional, language, motor, and character development (Wisudaningsih et al., 2025). Therefore, the integration of digital literacy into ECE learning needs to be designed proportionally so that technology functions as a medium that supports meaningful learning experiences rather than replacing play activities, which constitute a primary characteristic of early childhood learning. Teachers are required to select educational and interactive digital media that are appropriate to children's developmental needs so that learning remains child-centered (Asnah & Bustami, 2025; Tiara & Pratiwi, 2025; Sari & Salehudin, 2024; Mulyani & Pamungkas, 2026).

Drawing on the concept of literacy from various references, the concept of digital literacy was first introduced by Gilster (1997), who defined digital literacy as the ability to understand and use information from various digital sources effectively. Subsequently, Belshaw (2012) further developed this concept through eight elements of digital literacy, namely cultural, cognitive, constructive, communicative, confident, creative, critical, and social responsibility aspects. Meanwhile, Martin and Grudziecki (2006) explained that digital literacy involves an

individual's awareness, attitudes, and abilities to utilize digital technology to identify, access, manage, integrate, evaluate, analyze, and create new information.

In the context of education, the integration of technology is also supported by the TPACK (Technological Pedagogical Content Knowledge) theory developed by Mishra and Koehler (2006). This theory emphasizes that the success of technology-based learning depends on teachers' ability to integrate technological, pedagogical, and content knowledge in a balanced manner.

In addition to the concepts described above, the constructivist theories of Jean Piaget (1954) and Lev Vygotsky and Cole (1978) provide a foundation for understanding that children construct knowledge through active learning experiences, social interaction, and environmental exploration. Therefore, appropriately designed digital media should enrich these learning experiences through interactive, collaborative, and contextual activities. Accordingly, technology should not become the primary objective of learning but rather function as a tool for facilitating children's optimal development (Nurhayati et al., 2025; Syafei, 2025).

Various previous studies have demonstrated that the integration of digital literacy contributes positively to the quality of ECE learning. Novitasari and Fauziddin (2022) found that the digital literacy competence of ECE teachers plays an important role in their ability to access, understand, evaluate, and distribute digital information, thereby

contributing to learning effectiveness. In addition, a relevant study conducted by Maghfiroh et al. (2025) concluded that teachers' digital literacy skills encourage the creation of more creative and interactive learning innovations that are aligned with the demands of the Society 5.0 era. A systematic review conducted by Rahayu and Arzaqi (2025) also demonstrated that the transformation of digital literacy in ECE involves a shift in the use of technology from merely serving as entertainment to functioning as a learning medium capable of improving children's thinking, communication, creativity, and collaboration skills, although challenges remain in terms of teacher competence, infrastructure, and parental support. Another study on digital storytelling conducted by Puspitasari et al. (2025) also demonstrated that digital media can improve children's early literacy skills when implemented in accordance with their developmental characteristics.

Although previous literature has discussed digital literacy from various perspectives, studies that comprehensively examine how digital literacy is integrated throughout the ECE learning process—from learning planning and implementation to learning evaluation—remain relatively limited. In addition, further investigation is needed into implementation strategies capable of balancing the use of technology with the principle of learning through play, which is a distinctive characteristic of early childhood education.

Methods

This study was conducted at PAUD Tunas Mawar, located on Jl. Kanggraksan Curug, Harjamukti District, Cirebon City, West Java. The study was conducted from February to April 2026 using a descriptive qualitative method. This research method was employed to describe and explain phenomena in depth based on data obtained from research subjects within a natural context. The data collected consisted of words, actions, documents, and observations rather than numerical data. Creswell and Poth (2018) explained that qualitative research focuses on understanding the meanings attributed by individuals or groups to a social problem. In a descriptive design, researchers do not seek to construct a new theory in a complex manner but rather present a factual and systematic description of the phenomenon under investigation.

The subjects of this study were children at PAUD Tunas Mawar, Cirebon City, consisting of 10 children in Group A1 and 12 children in Group B1 during the 2025/2026 academic year. Meanwhile, the object of this study was children's learning outcomes based on the implementation of digital literacy integration in early childhood education learning. The data collection techniques used in this study were observation, interviews, and documentation studies. Meanwhile, the data analysis technique referred to the interactive data analysis model proposed by Miles, Huberman, and Saldaña (2014), which consists of data condensation, data display, and conclusion drawing/verification.

The informants in this study consisted of the principal and two

classroom teachers who were involved in the implementation of learning at PAUD Tunas Mawar, Cirebon City. To maintain the confidentiality of the informants' identities, their names were not presented directly; instead, codes or initials were used. The principal was assigned the code **KS**, while the first and second classroom teachers were respectively assigned the codes **G1** and **G2**. Data were collected through observation, interviews, and documentation. Interviews were conducted to obtain information regarding policies, planning, implementation, supporting factors, and challenges related to the integration of digital literacy into ECE learning.

Result and Discussions

1. Integration of Digital Literacy in ECE Learning

Digital literacy in Early Childhood Education (ECE) refers to the ability of children, teachers, and parents to use digital technology wisely, safely, creatively, and responsibly to support the learning process. The integration of digital literacy does not mean replacing direct play activities; rather, it involves utilizing technology as a learning medium that enriches children's learning experiences. Teachers serve as facilitators who select digital media according to children's developmental characteristics so that the use of technology remains oriented toward the principle of **learning through play**.

The observation results indicate that the successful integration of digital literacy is influenced by three main factors: teachers' digital competence, the availability of technological facilities, and parental

involvement in accompanying children's use of digital media at home. These three factors are interconnected in creating a safe and meaningful digital learning ecosystem.

"The school already has a digital literacy learning policy, but its implementation is still not optimal. Its implementation is carried out by integrating children's developmental aspects into the themes and subthemes discussed in each meeting together with the classroom teachers." (KS)

This statement was reinforced by the teachers directly involved in the learning process. G1 explained that the integration process begins by adjusting the learning materials and themes to children's developmental aspects while also considering the available media. Meanwhile, G2 explained that teachers first identify topics that are relevant to the learning materials and digital literacy concepts before determining the form of learning activities to be implemented.

"The implementation begins by identifying materials that are appropriate to the themes and children's developmental aspects, and then examining the media and tools that can be used, although they are still relatively simple." (G1)

This information indicates that the integration of digital literacy is carried out through an adjustment process involving learning materials, themes, children's developmental aspects, and learning media. This finding is important because it demonstrates that the availability of digital devices is not the sole indicator of successful digital literacy integration. Teachers continue to play an important role in determining whether technology is appropriate for children's learning needs.

2. Digital Literacy Integration in Moral and Religious Value Aspects

In the aspect of moral and religious values, digital literacy can be integrated through the use of educational videos, digital stories, animations of exemplary tales, interactive daily prayer applications, and audiovisual media that introduce the values of honesty, responsibility, care, tolerance, and gratitude to God. The teacher's role is crucial in accompanying children so they can understand moral messages while building the habit of using digital media responsibly. Thus, digital literacy not only improves the ability to access information but also strengthens the formation of children's character and spirituality from an early age.

The development of moral and religious values can also be carried out through digital media such as educational videos, stories of the prophets, prayer learning animations, religious songs, and interactive learning applications. These media are able to increase children's learning interest because they are presented in an attractive audiovisual form.

However, the use of digital media must remain under the guidance of teachers so that children do not just become passive viewers, but are able to understand the values contained in the learning materials. This approach is consistent with Vygotsky's constructivism theory which emphasizes the importance of social interaction in building children's knowledge.

Table 1. Integration of Digital Literacy in Moral and Religious Value

Learning

Digital Media	Learning Activity	Competencies Developed
Educational video	Watching exemplary tales	Religious attitude
Religious attitude	Daily prayer practice	Habituation of worship
Religious songs	Singing together	Spiritual values
Digital storytelling	Discussion of character values	Morals and ethics

3. Digital Literacy Integration in Language Learning

In the language aspect, digital literacy integration is carried out through the use of digital storybooks, language-based educational games, interactive videos, and reading and storytelling applications that can enrich vocabulary, improve listening and speaking skills, and foster children's interest in reading. Multimodal digital media, which combines text, images, sound, and animation, provide a more engaging learning experience, thereby supporting the development of emergent literacy optimally.

Digital literacy provides opportunities for children to develop language skills through digital books, story videos, reading games, and interactive applications. The use of multimedia is capable of enriching children's vocabulary because information is delivered through text, images, sound, and animation simultaneously. Teachers can utilize digital storytelling to improve listening, speaking, early reading, and story retelling skills. These activities also train children's communication skills in accordance with the characteristics of 21st-

century learning.

Table 2. Integration of Digital Literacy in Language Learning

Digital Media	Activity	Learning Outcomes
Digital books	Reading Together	Early Literacy
Story video	Listening to Stories	Increased vocabulary
Educational Game	Recognizing Letters	Beginning reading
Digital storytelling	Retelling	Speaking ability

4. Digital Literacy Integration in Science Learning

In the science aspect, digital literacy can support learning through simple experiment videos, simulations of natural phenomena, documentation of environmental observations, and virtual explorations of plants, animals, weather, and objects around children. The utilization of technology allows children to observe objects that are difficult to reach directly while fostering curiosity, the ability to observe, classify, compare, and draw simple conclusions as a basis for scientific thinking skills.

Digital literacy supports science learning through experiment videos, simple simulations, natural documentation, and virtual exploration of plants, animals, weather, and the surrounding environment. Children gain more concrete learning experiences so that curiosity and scientific thinking abilities develop optimally. Digital media does not replace direct experimental activities but serves as a support in clarifying scientific concepts that are difficult to observe

directly.

Table 3. Integration of Digital Literacy in Science Learning

Digital Media	Activity	Competencies
Experiment Video	Observing object changes	Observation
Digital Documentation	Photographing plants	Identification
Weather Simulation	Knowing Seasons	Scientific thinking
Virtual Learning	Knowing Animals	Exploration

5. Digital Literacy Integration in Cognitive Learning

In the cognitive aspect, digital literacy integration can be realized through educational games, digital puzzles, counting applications, pattern recognition, color and shape grouping, and problem-solving activities designed according to the child's developmental stage. The use of interactive digital media can stimulate logical thinking skills, memory, concentration, creativity, and simple decision-making abilities when used in a directed manner and accompanied by teachers and parents.

In the cognitive aspect, digital media can also take the form of educational games that train logic, counting, recognizing patterns, shapes, colors, and simple problem-solving. According to Piaget's theory, early childhood is in the preoperational stage, so learning must use concrete media. The use of interactive applications combined with real play activities can increase logical thinking abilities without losing the characteristics of how children learn.

Table 4. Integration of Digital Literacy in Cognitive Learning

Digital Media	Activity	Ability
Digital Puzzle	Assembling Pictures	Logic
Counting Game	Counting Objects	Numeracy
Matching Game	Grouping Shapes	Classification
Interactive Quiz	Answering Questions	Problem Solving

6. Digital Literacy Integration in Social-Emotional Learning

In the **social-emotional** aspect, digital literacy can be integrated through collaborative activities using digital media, video-based group discussions, simple documentation projects, and interactive games that teach cooperation, empathy, communication, and conflict resolution. Teachers also play a role in introducing digital ethics (**digital citizenship**) from an early age, such as taking turns using devices, respecting others' work, communicating politely, and maintaining personal safety when using digital media. This approach helps children build social skills that continue to develop even though learning utilizes digital technology.

Social-emotional learning can be developed through collaborative games, character learning videos, group discussions using digital media, or simple documentation projects. Additionally, children begin to be introduced to digital ethics (*digital citizenship*), such as taking turns using devices, respecting friends, asking permission before borrowing a device, and using technology responsibly.

Table 5. Integration of Digital Literacy in Social-Emotional Learning

Digital Activity	Values Developed
Group Play	Cooperation

Simple Presentation	Confidence
Character video	Empathy
Class Discussion	Communication

7. Supporting Factors and Challenges Based on various studies, there are several factors that affect the success of digital literacy implementation in ECE.

Supporting Factors Hambatan (Obstacles)

- Teacher competence Low teacher digital literacy
- Parental support Lack of supervision at home
- Technological facilities Limited devices
- School policy Limited internet access
- Learning Media Misuse of gadgets

Thus, the integration of digital literacy in ECE learning does not stand as a separate competency, but becomes a learning strategy that supports the development of all aspects of child development. The use of digital technology that is pedagogically designed, appropriate to the developmental stage, and accompanied by teachers and parents will create a learning experience that is more contextual, interactive, and enjoyable, while also being able to prepare children to face life's challenges in the digital era.

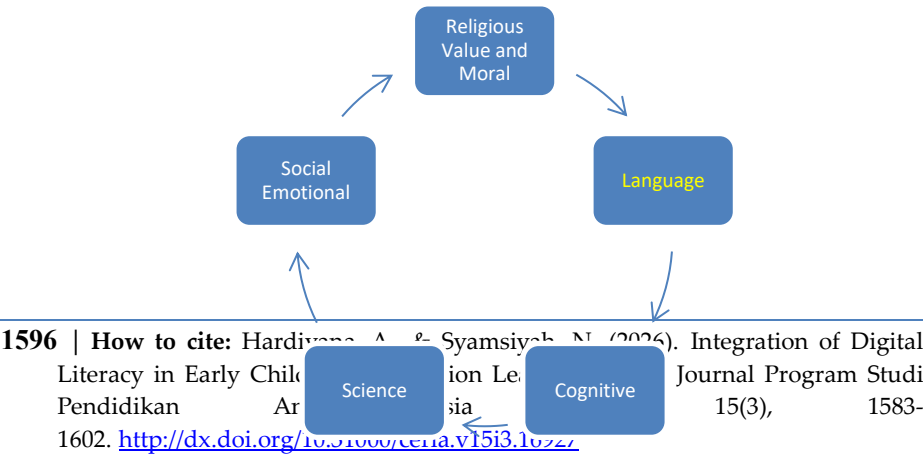


Figure 1. Diagram of Digital Literacy Integration in Early Childhood Learning

The following presents the integration of digital literacy in early childhood with percentage levels based on the implementation carried out by teachers in Group A and Group B of PAUD Tunas Mawar, Cirebon City, for the 2025/2026 academic year.

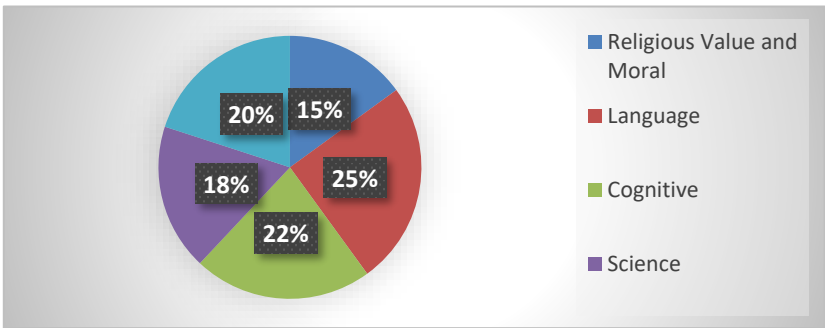


Figure 2. Percentage of Digital Literacy Integration in Early Childhood Learning

Based on the overall findings, the pattern of digital literacy integration implementation at PAUD Tunas Mawar can be formulated as a process that starts from school policy, followed by the identification of themes and developmental aspects, selection of materials and media, implementation of play-based and child-centered learning, teacher guidance, as well as evaluation and improvement. This pattern is evident from the consistency of information between the school principal and teachers regarding theme integration, adjustment to child

development, selection of media, play activities, limited facilities, and the need for cooperation.

Thus, the research findings provide an understanding that digital literacy integration in ECE is not merely an activity of using digital devices. This integration is a pedagogical process that connects technology with the curriculum, child development, play, social interaction, and teacher competence. Technology becomes meaningful when used to expand children's learning experiences and remains within the framework of learning that suits the characteristics of early childhood education.

The contribution of this research lies in the mapping of digital literacy implementation at the ECE unit level by showing the relationship between school policy and teacher practice. Previous research has focused more on teachers' digital competence or the effectiveness of specific media, such as research by Novitasari and Fauziddin (2022) regarding the digital literacy of educators and Maureen et al. (2018) regarding digital storytelling. This study complements that perspective by showing how digital literacy is translated into learning planning and implementation across developmental aspects, while also highlighting the institutional and pedagogical factors that influence its implementation.

However, these research findings need to be understood according to the characteristics of the research design. The study used a qualitative descriptive approach in one ECE unit with data obtained through

observation, interviews, and documentation. Therefore, the findings are not intended to prove cause-and-effect relationships or to generalize the effectiveness of technology on children's developmental achievements. The main value of the research lies in the contextual understanding of how digital literacy integration is planned, implemented, and faces various real conditions in the ECE environment.

Conclusion

The results of the study indicate that the integration of digital literacy at PAUD Tunas Mawar has been implemented through school policies, thematic learning, a child-centered approach, and play-based activities tailored to children's developmental needs. The utilization of digital media supports the stimulation of various developmental aspects, including religious and moral values, language, cognitive and science, as well as social-emotional skills. However, its implementation still faces obstacles such as limited infrastructure, varying levels of digital literacy among teachers, and the need for strengthened support and cooperation between parties. Therefore, the integration of digital literacy in early childhood education must be supported by appropriate lesson planning, teachers' pedagogical competence, mentoring, and the use of technology that aligns with developmental characteristics and the principles of children's play.

Based on the findings of this study, future research is suggested to empirically test the effectiveness of digital literacy integration on each aspect of early childhood development using quantitative, qualitative,

or mixed-methods approaches. Furthermore, there is a need to develop digital literacy-based learning models that align with the characteristics of the *Kurikulum Merdeka* and the needs of students across various educational contexts. For teachers and ECE administrators, improving digital competence through continuous training and strengthening collaboration with parents are strategic steps to optimize the implementation of digital literacy in learning.

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