



STRATEGIES OF EARLY CHILDHOOD EDUCATION TEACHERS IN INTEGRATING EDUCATIONAL TECHNOLOGY INTO EARLY CHILDHOOD LEARNING

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ABSTRACT (Inggris)

The integration of educational technology in Early Childhood Education (ECE) learning represents both a challenge and a strategic opportunity for early childhood educators to optimize children's holistic development. This study aims to identify teachers' strategies at Aisyiyah Kindergarten in Baubau City in utilizing educational technology, including instructional planning, media selection, the implementation of play-based learning supported by technology, patterns of teacher-assisted interaction, and the evaluation of children's development. The research employed a qualitative approach using a descriptive case study method. Data were collected through participatory observation, in-depth interviews with teachers, and analysis of instructional documents. The findings indicate that teachers' strategies encompass collaborative technology-based lesson planning, the use of age-appropriate educational media, the integration of technology into play-based learning activities, interactive guidance that is responsive to children's needs, and holistic as well as continuous developmental assessment. These results reinforce that educational technology, when implemented through appropriate pedagogical strategies, can enrich learning experiences, enhance motivation, and support the achievement of fundamental developmental competencies in early childhood. The study recommends strengthening the professional capacity of early childhood educators and ensuring the availability of adequate technological facilities.

Keywords: *Teacher Strategies; Educational Technology; Early Childhood Learning*

1. Introduction

Early Childhood Education (ECE) serves as the foundation for the development of children's character, cognitive abilities, socio-emotional skills, and basic competencies prior to entering formal primary education (OECD, 2020). Since this stage represents a critical period of brain development, the quality of learning experiences plays a decisive role in shaping children's future growth and achievement (Heckman, 2020). In the digital era, the integration of technology into learning has become a significant issue, as educational technology holds the potential to enhance imagination, cognitive readiness, and early problem-solving skills (Laurillard, 2021). Despite its considerable potential, many early childhood educators still encounter challenges in developing effective strategies for its implementation. The unique developmental characteristics of young children require learning activities that are play-centered, interactive, and multimodal in nature (Siraj-Blatchford & Whitebread, 2022). Therefore, the integration of educational technology in ECE must be carefully designed to align with pedagogical principles that prioritize active engagement, exploration, and meaningful social interaction.

The advancement of digital technology has expanded rapidly since the beginning of the twenty-first century, prompting many educational institutions to

adopt digital media such as interactive applications, hardware devices including tablets, and audiovisual content as integral components of the learning process (Hirsh-Pasek et al., 2021). These innovations have transformed classroom practices and created new opportunities for enriching children's learning experiences through multimodal engagement. However, the extent to which early childhood teachers strategically integrate educational technology in an effective and developmentally appropriate manner remains insufficiently explored, particularly within local contexts such as Aisyiyah Kindergarten in Baubau City. This condition provides the background for the present study, which seeks to investigate the strategies implemented by teachers, the challenges they encounter, and the impact of technology integration on children's learning experiences.

Early Childhood Education (ECE) refers to educational efforts directed at children from birth to six years of age through stimulation activities designed to support their growth and development in preparation for formal primary education (Law No. 20/2003). Its focus encompasses physical-motor, cognitive, language, socio-emotional, and moral development. Early childhood development is holistic and interconnected, with each domain influencing and reinforcing the others. According to Piaget (1952), young children are in the preoperational stage, during which symbolic thinking develops rapidly. Vygotsky (1978) further emphasizes the importance of social interaction and the Zone of Proximal Development (ZPD) as fundamental principles for effective learning.

Jean Piaget viewed play as an active process through which children construct knowledge. Children build understanding by exploring, manipulating objects, and simulating real-life experiences, all of which form the core of play activities. Play supports the development of cognitive functions such as early problem-solving skills, logical reasoning, and symbolic representation. In the context of early childhood education, this perspective justifies the use of play-based activities that enable children to construct meaning independently through their experiences. Play is considered the primary medium of learning in early childhood because, through play, children formulate hypotheses, engage socially, regulate emotions, and develop creativity (Elkind, 2007; Whitebread, 2012). A play-centered learning approach therefore promotes holistic development. Play occupies a central position in early childhood education since children's natural world is inherently shaped by playful activities. Numerous studies recognize play not merely as recreational activity but as a meaningful learning medium that stimulates cognitive, language, socio-emotional, motor, and creative development (Hartatik, 2025).

The development of Information and Communication Technology (ICT) has brought significant changes to educational practices at various levels, including Early Childhood Education (ECE). In the context of ECE, educational technology is understood as any form of hardware, software, and digital resources intentionally utilized to support learning processes, stimulate exploration, and enrich children's learning experiences (Roblyer & Doering, 2020). Technology, therefore, is not perceived as a dominant tool that replaces human interaction, but rather as a medium that facilitates and expands children's learning horizons. Burns (2022), through the theory of Digital Pedagogy, argues that technology is an integral component of the modern learning environment. He emphasizes that technology

integration must be guided by strong pedagogical principles, combining traditional teaching strategies with digital sophistication. Technology should strengthen teacher-child relationships, provide interactive feedback, and open new contexts for exploring fundamental concepts. In practice, teachers may use tablets or educational applications to extend play experiences while developing symbolic thinking skills, for instance through interactive puzzle games that simultaneously enhance early problem-solving abilities.

Learning in early childhood does not occur through a single sensory channel but through a combination of visual, auditory, kinesthetic, and social interactions. Educational technology, according to Miller and McVee (2023), has significant potential to create rich multimodal experiences, including instructional videos, audio narratives, interactive games, and touch-screen media. Within ECE settings, multimodal experiences have been shown to increase children's engagement and strengthen long-term memory retention. For example, an interactive storytelling application that integrates audio narration, visual animation, and tactile engagement is generally more effective than static media. The theory of Digital Social Connectivity further conceptualizes technology as a tool that expands social interaction spaces in learning environments. White and LeCornu (2024) explain that technology use should be directed toward strengthening interpersonal relationships between children and teachers as well as among peers. Technology used solely for individual entertainment tends to produce less holistic impact compared to technology that supports digital collaboration. This perspective underscores the importance of pedagogical reflection. Yilmaz and Tedick (2025) highlight that teachers must critically evaluate the impact of technology on children's learning processes, identifying what works effectively, what requires adjustment, and how technology can be used ethically and responsibly. Collectively, these theoretical perspectives demonstrate that educational technology in ECE is not synonymous with gadgets or applications alone, but rather represents an integration of pedagogical context, teacher engagement, experiential learning, social interaction, and continuous reflective practice.

The evaluation of early childhood development is a continuous process aimed at understanding children's developmental achievements holistically, encompassing cognitive, language, socio-emotional, motor, and moral domains. In the context of technology-based learning, assessment is conducted not only through conventional observation but also by utilizing technology as a tool for documentation, recording, and analysis of children's developmental progress. Roblyer and Doering (2020) argue that educational technology enables assessment processes to become more systematic and well-documented through digital portfolios, recorded learning activities, and developmental assessment applications. Furthermore, child development evaluation in technology-enhanced settings is supported by the theory of multimodal digital assessment. Miller and McVee (2023) explain that technology-based evaluation allows the integration of various modalities, including visual, audio, and touch interaction, in measuring children's development. This approach is particularly relevant for young learners who acquire knowledge through multisensory experiences. Assessment therefore extends

beyond measuring cognitive understanding to include fine motor skills, emotional responses, and language abilities demonstrated through interactive digital activities.

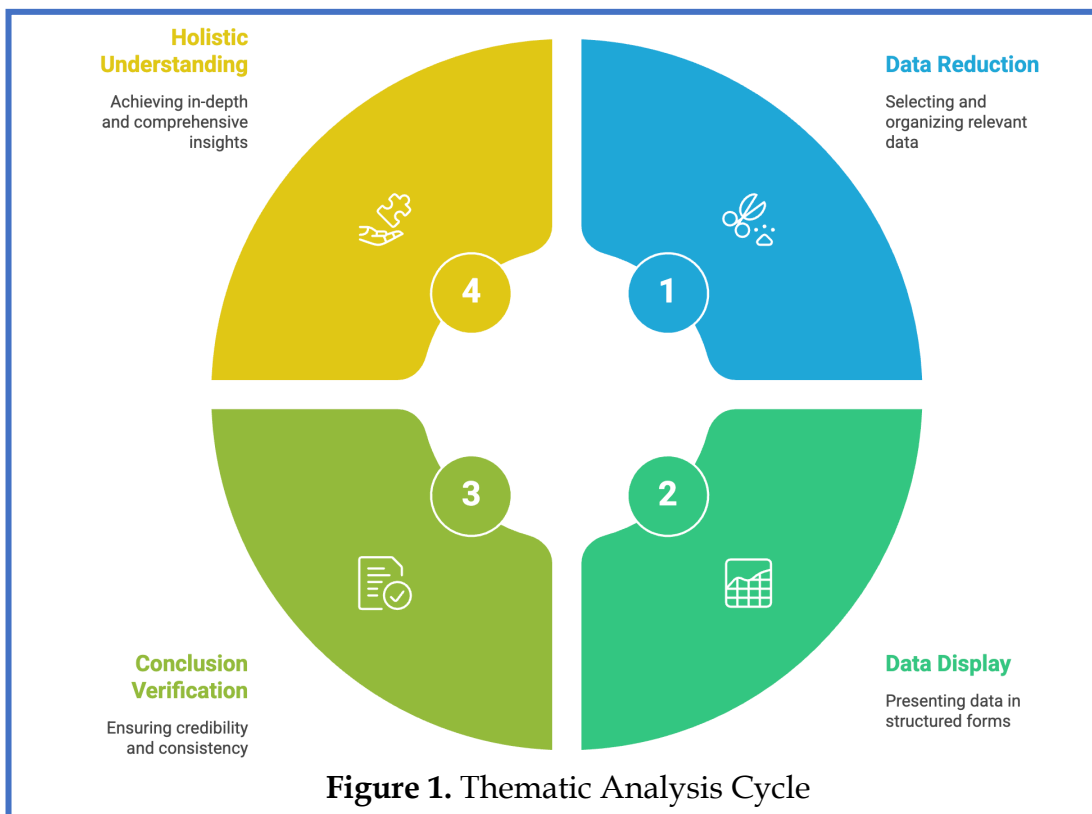
In the socio-emotional domain, technology also functions as a tool to enrich the evaluation of children's behavior and interactions. Research by White and LeCornu (2024) indicates that the use of digital applications and media in learning environments allows teachers to observe patterns of cooperation, empathy, and emotional regulation during technology-based activities. Socio-emotional assessment becomes more comprehensive because children's behaviors can be revisited through systematically stored digital documentation. In addition, the concept of learning analytics has begun to emerge in the evaluation of child development. Crompton et al. (2025) explain that technology-based learning analytics enable teachers to identify developmental patterns through data generated from children's digital learning activities. Although its implementation in early childhood settings remains limited, this concept opens opportunities for more personalized and adaptive assessment, where instructional strategies can be adjusted according to each child's developmental needs. Overall, evaluating child development within technology-integrated contexts requires the active role of teachers as observers, reflective practitioners, and pedagogical decision-makers. Technology serves as a supportive instrument that enriches the evaluation process rather than replacing professional judgment. In line with Hirsh-Pasek et al. (2021), technology-based assessment must remain oriented toward children's well-being and developmental growth, and it should be implemented wisely, proportionally, and in accordance with the core principles of early childhood education.

2. Research Methods

This study employed a qualitative approach using a descriptive case study method. The qualitative design was selected to gain an in-depth understanding of teachers' strategies within their natural educational context. A case study approach allows researchers to explore phenomena comprehensively, focusing on processes, interactions, and meanings constructed by participants in real-life settings. Through this method, the study seeks to capture the complexity of how teachers integrate educational technology into early childhood learning practices. The research was conducted at Aisiyiyah Kindergarten in Baubau City, Southeast Sulawesi Province, during the first semester of the 2025/2026 academic year. The site was chosen purposively based on its active implementation of technology-supported learning activities. Conducting the study within this specific institutional context enabled the researcher to examine authentic instructional planning, classroom practices, and developmental evaluation processes carried out by teachers in their everyday professional environment.

Data were collected through participatory observation of classroom activities involving the integration of educational technology. This technique enabled the researcher to directly observe instructional practices, teacher-child interactions, the use of digital media, and children's responses during technology-supported learning activities. In addition, in-depth interviews were conducted with classroom teachers and the school principal to obtain comprehensive insights into instructional planning, implementation strategies, challenges encountered, and reflections on the effectiveness of technology integration. Documentation was also utilized as a

supporting data source, including lesson plans, instructional media, and children's learning portfolios. These documents provided concrete evidence of how technology was embedded in pedagogical practices and how children's developmental progress was recorded and evaluated. The key informants of this study were classroom teachers who actively implemented technology integration in their teaching practices, as well as the school principal who functioned as the instructional program manager and policy decision-maker within the institution.



The figure illustrates a systematic and cyclical process of qualitative data analysis consisting of four main stages. The first stage is data reduction, which involves selecting, focusing, and organizing relevant data obtained from observations, interviews, and documentation. At this stage, raw data are simplified and categorized without losing their essential meaning. The second stage is data display, where the organized data are presented in structured forms such as thematic narratives, matrices, or visual summaries. This process enables the researcher to identify patterns, relationships, and emerging themes related to teachers' strategies more clearly and coherently. The third stage is conclusion verification, which refers to the process of drawing and validating findings through continuous comparison, triangulation of data sources, and consistency checks to ensure credibility and reliability. These interconnected stages ultimately lead to the fourth stage, holistic understanding, where comprehensive and in-depth insights are developed. The process is reflective and iterative, meaning that each stage may be revisited to refine interpretations and strengthen the overall validity of the research findings.

3. Results and Discussion

3.1. Technology-Based Instructional Planning

Instructional planning represents a crucial initial stage that determines the success of integrating educational technology into early childhood learning. At Aisiyiah Kindergarten in Baubau City, technology-based lesson planning is conducted systematically while adhering to child development principles and the play-oriented characteristics of Early Childhood Education. Teachers do not position technology as the primary objective of learning; rather, it functions as a supportive tool to facilitate the achievement of children’s developmental goals.

Based on observational findings, teachers design instructional plans by referring to the Merdeka Curriculum for Early Childhood Education, contextualized to children’s needs and the institutional setting. Educational technology is integrated from the stage of preparing teaching modules and daily lesson plans. Teachers first determine specific learning objectives, such as language, cognitive, or socio-emotional development, and then select the most relevant technological tools to support those objectives. Planning also follows the principle of developmentally appropriate practice, acknowledging that young children are not yet capable of independently engaging with technology without guidance. Therefore, technology is designed as a visual and auditory stimulus that enriches learning experiences rather than replacing direct teacher–child interaction.

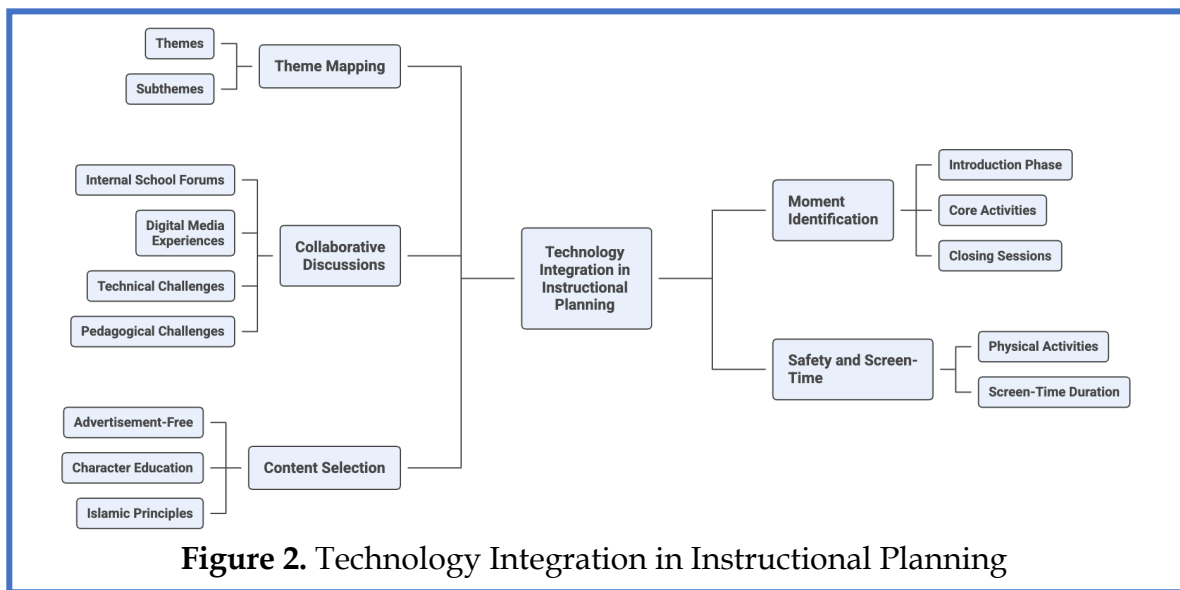


Figure 2. Technology Integration in Instructional Planning

The figure illustrates the systematic framework of technology integration in instructional planning at Aisiyiah Kindergarten in Baubau City. The process begins with theme mapping, where teachers organize themes and subthemes as the foundation of learning design. This thematic structure ensures that technology use remains aligned with curricular objectives rather than functioning as an isolated element. The planning process is strengthened through collaborative discussions conducted in internal school forums, where teachers share digital media experiences and address both technical and pedagogical challenges. In addition, content selection plays a crucial role, emphasizing advertisement-free materials that support character education and reflect Islamic principles as part of the institution’s identity.

The framework further highlights the importance of identifying appropriate instructional moments for technology use. Teachers determine whether digital tools are most suitable for the introduction phase, core activities, or closing sessions, ensuring pedagogical relevance at each stage. Consideration of safety and screen-time management is also central to the planning process. Digital activities are balanced with physical engagement, and screen-time duration is carefully regulated to maintain children's well-being. Overall, the diagram demonstrates that technology integration is intentional, structured, and developmentally appropriate, positioning technology as a supportive medium that enhances rather than dominates early childhood learning experiences. In practice, teachers begin by mapping themes and subthemes before identifying particular moments within the learning sequence where technology can meaningfully enhance instruction. For example, animated videos may be used during the introduction phase, simple interactive applications during core activities, and educational songs during closing sessions. This approach aligns with Laurillard's (2021) perspective that technology should be pedagogically integrated rather than used as a mere visual supplement. Planning is further strengthened through collaborative discussions among teachers in internal school forums, where they share experiences regarding effective digital media and evaluate technical and pedagogical challenges.

This collaborative culture contributes to the continuous development of teachers' digital competencies. Teachers at Aisyiyah Kindergarten also consider safety aspects and screen-time duration. The use of digital media is carefully limited to ensure it does not interfere with children's physical activities. Content is selected to be advertisement-free and aligned with character education values and Islamic principles that reflect the institution's identity. Overall, technology-based instructional planning at Aisyiyah Kindergarten demonstrates a conscious, structured, and child-centered integration process. Technology is positioned as a supportive medium that enriches learning experiences rather than serving as the central focus of classroom activities.

3.2. Selection of Educational Technology Media

The selection of educational technology media constitutes a crucial component of early childhood teachers' strategies, as the type of media used significantly influences the quality of children's learning experiences. The findings indicate that teachers at Aisyiyah Kindergarten in Baubau City apply specific criteria to ensure that technological media align with the developmental characteristics of young learners. The primary consideration is the alignment between media selection, learning objectives, and children's developmental stages. Teachers tend to choose visual, interactive, and simple media such as animated educational videos, letter and number recognition applications, and audio-visual learning songs. These forms of media are considered effective in capturing children's attention and facilitating concrete understanding of concepts.

Ease of use is another important factor in the selection process. The chosen technology must be easily operated by teachers and understandable to children without complex instructions, ensuring that the learning process remains smooth and uninterrupted by technical difficulties. Roblyer and Doering (2020) emphasize that effective educational technology should support learning without

overburdening users. Educational value also serves as a central criterion. Teachers ensure that digital media provide clear instructional content rather than mere entertainment. For instance, animated videos are utilized to introduce moral values, healthy habits, or simple scientific concepts, enabling technology to function as a medium for both knowledge acquisition and value internalization.

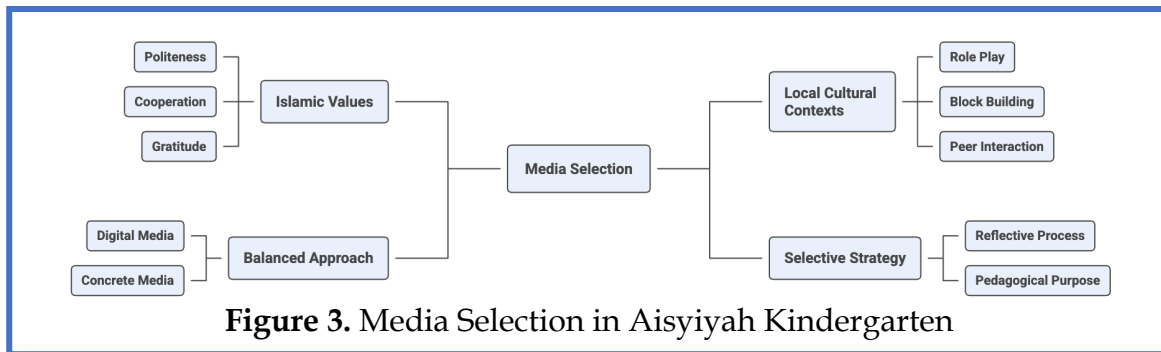


Figure 3. Media Selection in Aisyiyah Kindergarten

Within the context of Aisyiyah Kindergarten in Baubau City, media selection is further adapted to Islamic values and local cultural contexts. Teachers prioritize content that reflects politeness, cooperation, and gratitude, demonstrating that educational technology can be contextualized without diminishing its pedagogical purpose. A balanced approach between digital and concrete media is also maintained. Technological tools do not replace traditional educational play materials; instead, they complement them. Children continue to engage in role play, block building, and direct peer interaction, while technology serves as a variation that enriches learning experiences. Through a selective and reflective media selection strategy, teachers are able to optimize the use of educational technology while upholding the fundamental principles of early childhood education.

3.3. Play-Based Learning Supported by Technology

Play-based learning serves as the primary approach in early childhood education. The findings reveal that teachers at Aisyiyah Kindergarten in Baubau City creatively and contextually integrate educational technology into play activities. Technology is utilized to support symbolic, exploratory, and imaginative play. For example, teachers display short videos about animals before children engage in role play as veterinarians. The video functions as an initial stimulus that enriches children’s imagination and expands their vocabulary.

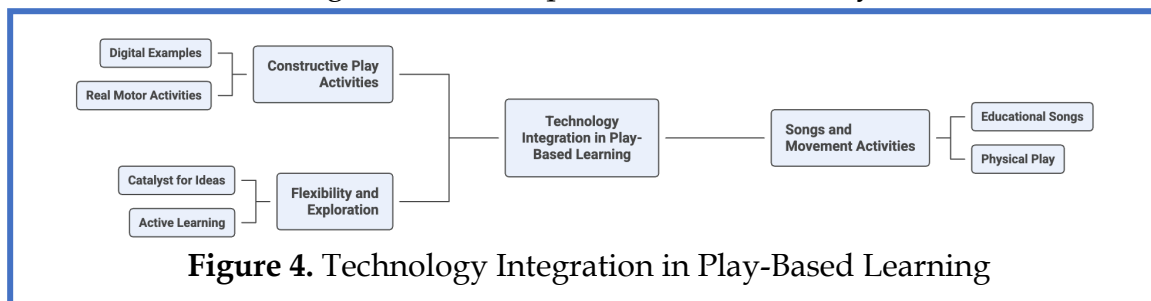


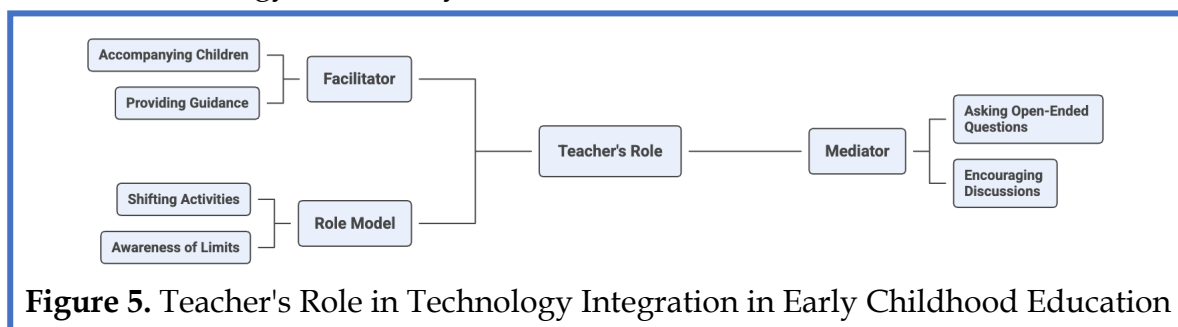
Figure 4. Technology Integration in Play-Based Learning

In constructive play activities, technology is used to present examples of simple structures or shapes that children subsequently replicate using blocks or natural materials. This approach enables children to connect digital experiences with real motor activities, making learning more meaningful and concrete. Teachers also

incorporate technology-based songs and movement activities to support physical play. Educational songs played through digital devices accompany dancing, exercise routines, or group games, thereby enhancing engagement while promoting gross motor development and body coordination. The integration of technology within play-based learning follows a principle of flexibility, allowing children space to explore and take initiative while technology acts as a catalyst for ideas. This practice aligns with Hirsh-Pasek et al. (2021), who emphasize the importance of active and meaningful learning in digital contexts. Consequently, educational technology at Aisyiyah Kindergarten does not diminish the essence of play; instead, it enriches and expands children's play experiences.

3.4. Teacher Assistance and Interaction in Technology-Based Learning

Teacher assistance plays a crucial role in the successful integration of technology in early childhood education. Research findings indicate that teachers at TK Aisyiyah Baubau City actively function as facilitators, mediators, and role models in promoting the wise use of technology. Teachers consistently accompany children during technology use, provide simple guidance, and help them understand the displayed content. This guidance ensures that children do not merely watch passively, but also engage cognitively and emotionally with the learning materials. Teacher-child interaction remains central to the learning process. Teachers frequently ask open-ended questions, encourage discussions, and connect digital content with children's everyday experiences. This interaction pattern supports the development of children's critical thinking and language skills. Teachers are also responsive to children's reactions. When children show signs of boredom or fatigue, teachers promptly shift the activity to non-digital learning experiences. This approach demonstrates teachers' awareness of the appropriate limits of technology use in early childhood education.



The figure illustrates the central role of teachers in integrating technology into early childhood education. The teacher's role is positioned at the core and is represented through three interconnected functions: facilitator, mediator, and role model. As a facilitator, the teacher accompanies children during the use of technology and provides clear and simple guidance to support their understanding. This role ensures that technology is not used independently by children without direction, but rather as a structured learning tool that enhances engagement and comprehension.

As a mediator, the teacher stimulates active learning by asking open-ended questions and encouraging discussions related to digital content. This interaction strengthens children's critical thinking and language development by connecting

technology-based materials with meaningful dialogue. In addition, as a role model, the teacher demonstrates awareness of appropriate technology use by recognizing its limits and shifting activities when necessary. The inclusion of “shifting activities” and “awareness of limits” highlights the importance of balance between digital and non-digital experiences, ensuring that technology supports rather than dominates the learning process in early childhood settings.

3.5. Evaluation of Children’s Development in Technology-Based Learning

The evaluation of children’s development is conducted holistically and continuously. Teachers at TK Aisyiyah Baubau City employ authentic observation, anecdotal records, and portfolios to assess children’s progress during technology-based learning activities. Assessment does not solely focus on academic abilities, but also encompasses social-emotional, language, and motor development. Teachers carefully document how children interact with peers, respond to technological stimuli, and express their ideas throughout play-based activities. The results of the evaluation serve as a foundation for reflection and instructional improvement. Teachers adjust learning strategies and technology-based media according to children’s needs and interests, ensuring that the learning process remains responsive and adaptive. This approach demonstrates that assessment in early childhood technology integration is not merely a measurement of outcomes, but a dynamic process that supports continuous development and meaningful learning experiences.

4. Conclusion

This study concludes that early childhood teachers at TK Aisyiyah Baubau City implement educational technology integration through well-planned, selective, and developmentally oriented strategies. Technology is positioned as a supportive tool within play-based learning, rather than as the main focus of instruction. Intensive teacher guidance ensures that children actively engage with digital content in meaningful ways. Holistic and continuous evaluation further strengthens the implementation process, as it allows teachers to monitor not only academic growth but also social-emotional, language, and motor development. Appropriate technology integration enriches children’s learning experiences without compromising the fundamental principles of early childhood education. The balance between digital and non-digital activities reflects teachers’ awareness of developmental needs and the importance of direct interaction, exploration, and play. These findings highlight that effective technology use in early childhood settings depends primarily on pedagogical wisdom, thoughtful planning, and responsive instructional practices.

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