

The Implementation of Children's Literacy and Numeracy Learning in the Early Childhood Education Curriculum

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implications for teachers and policymakers in developing literacy and numeracy learning that is more contextual, humanistic, and in accordance with the characteristics of child development.

Keywords: literacy, numeracy, early childhood, Early childhood curriculum, contextual learning, qualitative research.

Abstract

This study aims to analyze the implementation of early childhood literacy and numeracy learning in the early childhood education curriculum in Indonesia and understand the various factors that affect its implementation. The research is motivated by the fact that there is still a tendency for literacy and numeracy learning to be formally academically oriented, so that it is not fully in accordance with the principles of early childhood development. The research uses a qualitative approach with a case study type to gain an in-depth understanding of learning practices in the field. Data were collected through semi-structured interviews, participatory observations, and documentation of selected early childhood teachers, principals, and parents using purposive and snowball sampling techniques. Data analysis was carried out using the Miles and Huberman interactive model through the stages of data reduction, data presentation, and conclusion drawn. The results of the study show that the implementation of literacy and numeracy learning is carried out through a play approach, contextual experience, and exploration of the children's learning environment. The findings of the study reveal three main themes, namely literacy and numeracy learning as contextual learning experiences, implementation challenges due to parents' academic demands, and the importance of family involvement in supporting children's ability development. In addition, the use of digital media has also begun to be used to increase children's interest in learning, although it still requires the right assistance. This research provides a theoretical contribution in strengthening the perspective of social constructivism in early childhood learning and provides practical

INTRODUCTION

Early childhood education (PAUD) is the primary foundation for developing children's literacy and numeracy skills, preparing them for 21st-century developments. Globally, UNESCO has recognized literacy and numeracy as core competencies that determine readiness for lifelong learning and the quality of human resources. In many countries, the implementation of literacy and numeracy at an early age is no longer understood solely as the ability to read, write, and count, but also encompasses critical thinking, communication, problem-solving, and symbol interpretation skills in everyday life. In the Indonesian context, strengthening literacy and numeracy has received increasing attention since the implementation of the independent curriculum, which places these skills as essential learning outcomes starting at the PAUD level. However, the implementation of literacy and numeracy learning in PAUD institutions still faces various challenges, particularly related to teacher readiness, learning approaches, and parents' understanding of the learning characteristics of early childhood. The PAUD curriculum is a set of plans describing learning objectives for early childhood, ranging from 0 to 6 years old, aimed at optimally developing children's potential (Fahmi & Ningsih, 2021).

Fieldwork shows that literacy and numeracy instruction in early childhood is often academically focused and focused on the demands of reading, writing, and arithmetic (calistung) before entering elementary school. This situation results in the learning process being inconsistent with child development principles, which emphasize play as the primary learning medium. Research (Fahmi et al., 2020) in the *Obsession* journal found that early childhood education teachers face pressure from parents and the demands of elementary school, leading to literacy learning strategies being directed toward formal academic skills. Furthermore, research (Hidayah et al., 2023) in the *Obsession* journal revealed that the implementation of family partnership-based numeracy literacy has not been optimal due to misconceptions among teachers and parents regarding the concept of numeracy literacy in early childhood. These findings demonstrate that learning practices in the field are still not fully aligned with the constructivist and child developmental approaches that underpin early childhood education.

On the other hand, developments in digital technology also influence the dynamics of literacy and numeracy learning in early childhood. The use of digital media in learning is starting to be widely implemented to increase children's interest in learning through interactive and fun activities. Study (Krisnasari et al., 2022) shows that the use of the Quizizz application can be a more engaging alternative learning medium for literacy and numeracy for early childhood because it creates an atmosphere of play while learning. However, the use of digital technology also requires appropriate guidance to avoid negative impacts on children's behavior and social development. Fatimah's research revealed a significant relationship between digital literacy and the behavior of early childhood in early childhood education (PAUD), so teachers and parents need to have an adequate understanding of how to integrate technology into the learning process. This condition indicates that the implementation of literacy and numeracy in PAUD is not only related to pedagogical aspects, but also related to the social and cultural dimensions of the family in supporting child development.

The implementation of literacy and numeracy learning in early childhood education (PAUD) is crucial for research because it directly relates to the quality of children's learning readiness at subsequent levels of education. Theoretically,

Vygotsky's social constructivism approach emphasizes that children's literacy and numeracy skills are developed through social interactions, play experiences, and the support of a meaningful learning environment. Therefore, literacy and numeracy learning in early childhood should be implemented contextually, exploratively, and in accordance with the child's developmental stage. However, various studies indicate that there is still a gap between the ideal curriculum concept and learning practices in the field. Some teachers still position numeracy literacy as an academic target, rather than as a process of developing children's holistic thinking skills. As a result, children lack enjoyable and meaningful learning experiences appropriate to the characteristics of early childhood. It is important to understand that numeracy literacy is not the same as mathematical competence; both are based on the same knowledge and skills, but the difference lies in the empowerment of knowledge and skills. Mathematical knowledge alone does not make someone have numeracy skills. The application of numeracy literacy in thematic learning is an implementation of learning activities carried out by educators by creating learning activities that involve numeracy in several development areas that will be studied (Sudarti, 2022).

Although extensive research on early childhood literacy and numeracy has been conducted, most previous studies have focused on the effectiveness of learning media, improving numeracy skills, or the use of digital technology in learning (e.g., Fevi Rahmadeni et al. 2022; Lidwina Biba et al. 2024; Ika Puspitasari et al. 2022; Rahim 2023; Wahyuni 2022; Sudarti 2022). Research that deeply explores the implementation process of literacy and numeracy learning in the PAUD curriculum, particularly regarding teacher experiences, the meaning of learning, social interactions, and the dynamics of classroom learning practices, remains relatively limited. Furthermore, previous studies tend to use quantitative or experimental approaches, thus not fully revealing the contextual reality of curriculum implementation from the perspective of educators. Thus, there is a need for qualitative research that can deeply explore how literacy and numeracy learning is implemented in the PAUD curriculum in Indonesia and the factors that influence its success.

Based on the above description, this study aims to analyze the implementation of early childhood literacy and numeracy learning in the Early Childhood Education (PAUD) curriculum in Indonesia. The research focuses on the learning implementation process, teacher strategies, children's learning experiences, and the involvement of the family environment in supporting literacy and numeracy. This research is expected to provide theoretical contributions in the form of strengthening the study of Early Childhood Education (PAUD) curriculum implementation based on a constructivist approach and child development, as well as practical contributions for teachers, PAUD institutions, and policymakers in designing literacy and numeracy learning that is more contextual, enjoyable, and appropriate to the characteristics of early childhood.

METHODS

This research used a qualitative approach with a case study. The case study approach was chosen because the research aims to deeply understand the implementation process of early childhood literacy and numeracy learning in the real context of early childhood education institutions in Indonesia. Case studies allow researchers to explore phenomena holistically through observations of learning practices, social interactions, teacher experiences, and parental involvement in the implementation of the early childhood education curriculum. This approach is relevant

to the research objectives, which seek not only to describe phenomena but also to understand the meaning and dynamics that occur in the literacy and numeracy learning process. According to (Yin, 2020), Case studies are highly appropriate for examining contemporary phenomena occurring in real-life contexts and involving multiple data sources in depth. A qualitative approach also allows researchers to obtain rich, contextual, and interpretive data related to participants' experiences in implementing literacy and numeracy learning in early childhood.

The research was conducted at several Early Childhood Education (PAUD) institutions implementing the Independent Curriculum in Indonesia. The research locations were selected purposively, considering the characteristics of institutions that have integrated literacy and numeracy learning into daily learning activities. The study was conducted over four months, from January to April 2026, to allow researchers sufficient time for repeated observations and in-depth data collection. The research subjects consisted of PAUD teachers, school principals, and parents of students involved in the children's learning process. Informants were selected using a purposive sampling technique with specific criteria: teachers with at least two years of teaching experience in PAUD, actively implementing literacy and numeracy learning, and willing to participate in the research. In addition, the snowball sampling technique was used to obtain additional informants based on recommendations from initial participants so that researchers could obtain more comprehensive information regarding the implementation of learning in the field.

Data collection techniques included semi-structured interviews, participant observation, and documentation. Semi-structured interviews were used to explore teachers' and parents' experiences, understandings, and perceptions regarding the implementation of literacy and numeracy learning in early childhood education (PAUD). This technique was chosen because it provided researchers with the flexibility to explore participants' responses in greater depth, tailored to the research context. Participatory observation was conducted during learning activities to directly understand the implementation of literacy and numeracy practices in classroom interactions. Researchers observed play activities, the use of learning media, teacher strategies, and children's responses during the learning process. Furthermore, documentation was used to supplement the data, including teaching modules, learning notes, activity photos, and curriculum documents relevant to the research. The use of various data collection techniques aimed to obtain rich and in-depth data, consistent with the characteristics of qualitative research. Similar research by (Hidayah et al., 2023) shows that a combination of interviews, observations, and documentation is effectively used to reveal the implementation of family partnership-based numeracy literacy learning in PAUD.

To ensure the validity and credibility of the data, this study employed source and method triangulation techniques. Source triangulation was conducted by comparing data from interviews with teachers, principals, and parents to ensure consistency of information. Meanwhile, method triangulation was conducted by comparing data from interviews, observations, and documentation to ensure more accurate and reliable data interpretation. The researcher also employed member checking techniques by asking participants to review the interview results and data interpretation to ensure the accuracy of the meaning intended by the informants. In addition, this study employed an audit trail, which systematically recorded the entire research process, from data collection and analysis to conclusion drawing. This validation technique is important in

qualitative research to maintain data validity and increase the level of trust in the research results. According to (Nowell et al., 2020), The application of triangulation and member checking can strengthen the credibility of thematic analysis in qualitative research. Analisis data dalam penelitian ini menggunakan model interaktif (Miles et al., 2020) This study encompasses three main stages: data reduction, data presentation, and conclusion drawing/verification. In the data reduction stage, researchers select, focus, and organize data from interviews, observations, and documentation based on the research focus. The next stage is data presentation in the form of descriptive narratives, matrices, and theme categorizations to systematically understand the relationships between the data. Next, researchers draw conclusions through interpretation of the patterns, themes, and meanings emerging from the research data. Analysis was conducted repeatedly and simultaneously throughout the data collection process, allowing researchers to delve deeper into the findings emerging in the field. A thematic analysis approach was used to identify key themes related to the implementation of literacy and numeracy learning, teacher strategies, children's learning experiences, and family involvement in supporting the learning process in early childhood education (PAUD).

Ethically, this study adhered to the principles of confidentiality and informed consent. All informants were provided with an explanation of the research objectives, interview procedures, data use, and the participant's right to discontinue participation at any time during the research process. Participants' identities were disguised to maintain the privacy and confidentiality of the information provided. Using this methodology, this research is expected to produce in-depth, contextual, and valid data on the implementation of early childhood literacy and numeracy learning within the PAUD curriculum in Indonesia. The case study approach employed allows this research to provide an empirical overview of learning practices in the field and serve as a basis for developing learning policies and strategies that better align with the developmental characteristics of early childhood.

RESULTS AND DISCUSSION

Results

Based on interviews, observations, and documentation conducted at several early childhood education institutions implementing the Independent Curriculum, it was found that early childhood literacy and numeracy learning was implemented through a playful approach, environmental exploration, and contextual activities integrated into children's daily activities. Teachers no longer position literacy and numeracy as formal academic learning, but rather as part of a fun learning experience. During learning activities, children are introduced to the symbols of letters, numbers, shapes, and patterns through block games, storytelling, singing, role-playing, and counting concrete objects in the surrounding environment. Observations indicate that this approach encourages children to interact more actively and demonstrate enthusiasm during the learning process.

One of the main themes emerging from this research is "literacy and numeracy as contextual learning experiences." Teachers utilize various real-life situations in children's daily lives to introduce literacy and numeracy concepts. For example, activities such as counting toys, recognizing letters in friends' names, reading picture symbols, and grouping colors and shapes are used as learning media close to the children's experiences. One teacher stated that children grasp numbers and letters

more quickly when they learn through play. We usually encourage them to count toys or read pictures around the classroom so they feel it's part of the game, not a stressful learning experience. This statement demonstrates that contextual learning helps children build understanding naturally according to their developmental stage. Furthermore, documentation of learning activities shows that the use of visual media and educational games is a dominant strategy in implementing literacy and numeracy in early childhood education (PAUD).

The second theme identified was "challenges in implementing literacy and numeracy due to parental academic demands." Although teachers have attempted to implement play-based learning, some parents still perceive that PAUD success is measured by a child's ability to read, write, and do arithmetic formally before entering elementary school. This situation leaves some teachers facing a dilemma between implementing child development principles and meeting parental expectations. One informant explained that many parents still ask when their child will be able to read fluently or do arithmetic quickly. They sometimes compare their child with other children who can already read, write, and count. This phenomenon demonstrates the tension between the early childhood education paradigm that emphasizes the developmental process and the academic culture of society that still focuses on formal learning outcomes. Based on the results of observations, several teachers tried to overcome this condition by conducting intensive communication with parents regarding the importance of play-based learning and children's social-emotional development.

The third theme relates to "the role of the family environment in supporting literacy and numeracy." Interview results indicate that parental involvement has a significant influence on the development of children's literacy and numeracy skills. Children who receive learning stimulation at home, such as being read stories, being encouraged to do simple arithmetic, or playing educational games with their parents, tend to be more active and confident in learning activities at school. However, not all families have sufficient understanding and time to support their children's learning at home. Some parents admitted to having difficulty balancing time between work and supporting their children's learning. Therefore, teachers strive to build partnerships with families through regular communication, providing simple activities at home, and involving parents in school activities.

Furthermore, this study found that the use of digital media is beginning to become part of the implementation of literacy and numeracy in early childhood education (PAUD). Teachers utilize educational videos, interactive games, and simple learning applications to increase children's interest in learning. Based on observations, digital media can increase children's attention and participation during learning. However, teachers also emphasize the importance of mentoring and limiting digital media use so that children continue to experience direct play and balanced social interactions. Thus, the implementation of literacy and numeracy in PAUD is not only influenced by teacher learning strategies, but also by family support, community learning culture, and the development of digital technology.

Discussion

The research results show that the implementation of literacy and numeracy learning in early childhood education (PAUD) is more effective when conducted through play and contextual experiences. This finding aligns with Vygotsky's social constructivism theory, which emphasizes that children's developmental abilities are

formed through social interactions and meaningful learning experiences. Play activities, environmental exploration, and the use of concrete objects provide opportunities for children to actively construct understanding according to their developmental stage. This finding also supports research (Sulistyawati & Fauziddin, 2022) which states that play-based learning can improve the literacy and numeracy skills of early childhood because children learn through direct experience and enjoyable social interactions.

This study also shows that the implementation of the independent curriculum in early childhood education (PAUD) faces challenges in the form of academic pressure from parents who are still focused on formal literacy skills. This finding aligns with research conducted by (Fahmi et al., 2020) who found that early childhood education teachers often face parental demands that children be able to read and count before entering elementary school. From a sociocultural perspective, this situation indicates that society still views the success of early childhood education based on academic achievement, rather than the child's holistic development. As a result, teachers face a dilemma between implementing play-based learning principles and meeting societal expectations regarding children's academic abilities.

Findings regarding the importance of family involvement in literacy and numeracy learning also strengthen the research results (Hidayah et al., 2023). Research shows that school-family partnerships are crucial for the successful implementation of numeracy literacy in early childhood education (PAUD). This study found that stimulating learning at home positively influences the development of children's language, communication, and problem-solving skills. Within the context of Bronfenbrenner's ecological theory, the family is the child's closest environment and plays a significant role in shaping the learning experiences and cognitive development of early childhood. Therefore, the implementation of literacy and numeracy learning cannot be solely the responsibility of schools but requires active collaboration between teachers and families.

Furthermore, the use of digital media in learning demonstrates a transformation in PAUD learning practices in the technological era. Digital media can increase children's motivation and participation, particularly through engaging visual displays and interactive activities. However, this study also found that the use of digital media must be done proportionally to avoid diminishing children's social interactions and authentic play experiences. These findings provide a new perspective: implementing literacy and numeracy in the digital age requires a balance between technology, play activities, and social interactions as part of holistic child development. This is often known as outdoor learning. According to Ratnasari (2020), outdoor learning is an activity designed to engage children in various ways. Outdoor learning experiences can be memorable for a lifetime. Integrating learning and experiences outside through hands-on play provides curriculum relevance in ways that are difficult to achieve indoors. Outdoor learning is fun, creative, challenging, and helps children learn from experience.

Theoretically, this study strengthens the social constructivist view that literacy and numeracy learning in early childhood is a social process built through interactions between children, teachers, families, and the learning environment. This study also expands the study of the implementation of the independent curriculum in PAUD by showing that the success of implementation is not only influenced by the formal curriculum, but also by community culture, parental perceptions, and teacher readiness in implementing child-centered learning. In line with the opinion of Retnaningsih &

Khairiyah (2022) who stated that the independent curriculum is a new curriculum, developing a new curriculum is not easy for every educational unit. This is a polemic that is often felt by PAUD educators and their administrators every time the curriculum changes. However, the independent curriculum is not yet mandatory for every early childhood education institution. Furthermore, Retnaningsih et al. stated that in developing the independent curriculum, what needs to be considered is the basic framework and structure of the curriculum. The objectives of national education are related to the profile of Pancasila students, namely (1) having faith, being pious to God Almighty and having noble character; (2) being independent; (3) working together; (4) global diversity; (5) critical reasoning; (6) creativity.

Practically, the results of this study provide implications for early childhood education (PAUD) teachers to develop literacy and numeracy learning strategies that are more creative, contextual, and based on children's experiences. Schools also need to strengthen communication and education with parents regarding the importance of play-based learning in early childhood. Furthermore, the government and education policymakers need to provide ongoing training for teachers regarding the implementation of the Independent Curriculum and the use of learning media appropriate to children's developmental characteristics. This supports previous findings that state that in developing an independent curriculum for early childhood education, there are at least three learning outcomes that children must achieve, including: a) religious values and character; b) identity; c) fundamentals of literacy, mathematics, science, technology, engineering, and the arts (Retnaningsih & Khairiyah, 2022).

This research shows that the implementation of early childhood literacy and numeracy learning in the Indonesian Early Childhood Education (PAUD) curriculum is carried out through a playful approach, contextual experiences, and social interactions tailored to the characteristics of child development. Therefore, it can be said that the urgency of introducing literacy concepts to early childhood is quite high. This is because numeracy literacy is a fundamental skill required in the 21st century, and early childhood is the golden age where up to 80% of a child's intellectual maturity is formed (Rahmadeni et al. 2022). Therefore, literacy and numeracy learning is understood not only as academic skills in reading, writing, and arithmetic, but also as a process of developing thinking, communication, problem-solving, and interpreting children's learning experiences in everyday life. The research results show that play-based learning strategies and environmental exploration can increase children's participation, enthusiasm, and active involvement in the learning process.

This research also found that the implementation of literacy and numeracy learning still faces various challenges, particularly the academic demands from parents who are still focused on formal literacy skills before children enter elementary school. This is supported by previous research which reports that the numeracy literacy skills of early childhood cannot be significantly improved through numeracy literacy learning involving families in kindergarten institutions. Literacy skills should be understood as children's ability to hone critical, creative and collaborative thinking to solve problems in their daily lives. This is often a misconception for teachers and families (Hidayah et al, 2023). In addition, family involvement has proven to be an important factor in supporting successful literacy and numeracy learning, especially through learning stimulation provided at home and partnerships between schools and parents. This condition shows that there is a gap between the early childhood education paradigm

which is centered on child development and the academic culture of society which places more emphasis on formal learning outcomes.

Theoretically, this research strengthens the social constructivism perspective, which positions learning as a social process built through interactions between children, teachers, families, and the learning environment. This research contributes to the development of studies on the implementation of the Merdeka Curriculum at the Early Childhood Education (PAUD) level by emphasizing the importance of a contextual, humanistic, and experience-based learning approach. Practically, the results of this study can serve as a reference for PAUD teachers in designing literacy and numeracy learning that is more creative, enjoyable, and developmentally appropriate. For educational institutions and policymakers, this research provides input on the importance of strengthening teacher training, educating parents, and developing PAUD learning policies that are more oriented towards holistic child development. Optimal implementation of the Merdeka Belajar curriculum has been shown to improve student achievement. The key to the success of the Merdeka Belajar curriculum is that teachers and students develop a mindset of willingness to make changes so that the Merdeka Belajar curriculum can be implemented optimally. The implementation of the Merdeka Belajar curriculum will build students' character to be more creative, independent, responsible, collaborative, critical, and communicative (Indah Noer Ashfarina, et al. 2023).

CONCLUSION

The research findings above indicate three main themes: literacy and numeracy learning as contextual learning experiences, implementation challenges due to parental academic demands, and the importance of family involvement in supporting children's development. Furthermore, the use of digital media is beginning to be utilized to increase children's interest in learning, although appropriate support is still required. This research provides a theoretical contribution by strengthening the social constructivist perspective on early childhood learning and offers practical implications for teachers and policymakers in developing literacy and numeracy learning that is more contextual, humanistic, and appropriate to children's developmental characteristics.

This research still has limitations because it was conducted within a specific early childhood education institution, so the results cannot be generalized to all early childhood education contexts in Indonesia. Therefore, further research could be conducted with a broader scope or using an ethnographic approach to more deeply understand the culture of literacy and numeracy learning in various social contexts. Further research could also explore the influence of digital technology use on early childhood literacy and numeracy development more comprehensively.

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