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IMPLEMENTATION OF A DEEP LEARNING APPROACH IN DEVELOPING THE COGNITIVE ABILITIES OF 4-5 YEAR-OLD CHILDREN

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Abstract

This study aims to analyze the implementation of the immersive learning approach in developing the cognitive abilities of 4-5-year-old children in early childhood education institutions. The background of this research is based on the importance of appropriate stimulation during the golden age period, as well as the continued dominance of teacher-centered learning practices, which do not support optimal cognitive development. This study used a qualitative approach with data collection techniques through observation, interviews, and documentation. The results indicate that the implementation of the immersive learning approach was carried out through active, contextual, and experience-based learning activities, such as educational games, exploration, and simple project-based activities. The teacher acted as a facilitator, providing stimulation through open-ended questions to encourage children's thinking processes. Furthermore, observations showed an increase in children's cognitive abilities, characterized by the ability to observe, classify, compare, and solve simple problems. Thus, the immersive learning approach has proven effective in improving the cognitive abilities of 4-5-year-old children through a meaningful, active learning process that is appropriate to the developmental characteristics of early childhood.

Keywords: *Deep learning, cognitive abilities, early childhood, 4-5-year-old children, early childhood education*

INTRODUCTION

The foundation of child development begins with early childhood education, as it is a fundamental phase. During this period, rapid growth occurs in a child's cognitive, social, emotional, and motor skills. The ages of 4–5 are considered the golden age, during which a child's brain develops rapidly and is highly responsive to appropriate and targeted environmental stimulation. In the context of Early Childhood Education, the quality of learning experiences during this phase is crucial for a child's successful development in subsequent educational stages (NAEYC, 2020; Shonkoff et al., 2021). Early childhood cognitive abilities encompass basic processes such as observing, remembering, grouping, understanding simple cause-and-effect relationships, and solving problems in concrete contexts. These abilities do not emerge automatically but develop through appropriate stimulation, direct experience, and active interaction with the learning environment. Therefore, learning approaches in early

childhood need to provide space for children to actively explore and construct knowledge independently (Brod, 2021; Hattie & Donoghue, 2021). However, various studies show that learning practices in early childhood education institutions still tend to be teacher-centered, resulting in children receiving information passively. Activities such as memorization and imitation remain dominant, while opportunities for exploration, discussion, and independent discovery of concepts are limited. This condition can hinder the development of basic thinking skills such as simple reasoning and problem-solving (UNICEF, 2022; Ministry of Education, Culture, Research, and Technology, 2022).

Furthermore, less meaningful and less contextual learning also poses challenges to improving children's cognitive development. Children aged 4–5 years essentially learn most effectively through play, direct experience, and social interaction. Therefore, learning that does not align with children's developmental characteristics can lead to low engagement and motivation to learn (NAEYC, 2020; Hirsh-Pasek et al., 2022).

To address these challenges, a learning approach is needed that can create active, meaningful, and contextual learning experiences. One relevant approach is the immersive learning approach. This approach emphasizes children's active involvement in the learning process, where they not only receive information but also construct knowledge through exploration, hands-on experience, simple reflection, and social interaction.
Recent research shows that immersive learning in early childhood education can be implemented through project-based activities, educational games, and collaborative activities that can enhance all aspects of child development holistically, including cognitive development (Fullan et al., 2021; Jayawardana, 2025). With this approach, children are encouraged to observe, compare, classify, and draw simple conclusions based on real-life experiences.

The immersive learning approach also aligns with constructivism theory, which emphasizes that knowledge is actively constructed by students through learning experiences. In the context of cognitive development, children aged 4–5 are in the preoperational stage, where they still think concretely and require concrete media to understand concepts (Piaget, 1972; Vygotsky, 1978; Berk, 2022).

However, the implementation of the immersive learning approach in early childhood education is still relatively limited and has not been studied specifically for the 4–5 age group. Most research focuses on play-based approaches or project-based learning in general, leaving a research gap regarding the effectiveness of immersive learning approaches on early childhood cognitive development.

Based on this description, this study is crucial to analyze the implementation of immersive learning approaches in developing the cognitive abilities of children aged 4–5 years. The results are expected to provide theoretical and practical contributions to the development of more effective, meaningful, and developmentally appropriate learning strategies for early childhood.

METHODOLOGY

This study uses a qualitative approach with a descriptive type that aims to describe in depth the implementation of the deep learning approach in developing the cognitive abilities of children aged 4-5 years. This approach was chosen because the study focuses on the learning process that occurs naturally and the interaction between teachers and children in the classroom. The study was conducted in one of the Early Childhood Education institutions with research subjects including children aged 4-5 years, class teachers, and the principal as supporting

informants. Subjects were selected purposively based on direct involvement in the learning process. Data collection was carried out through participatory observation, semi-structured interviews, and documentation. The research instrument was the researcher as a human instrument supported by observation, interview, and documentation guidelines that refer to indicators of children's cognitive abilities, such as logical thinking, problem solving, and object grouping. Data analysis was carried out interactively through the stages of data reduction, data presentation, and drawing conclusions. Data validity was tested using triangulation of techniques and sources as well as member checking. This study also pays attention to research ethics through institutional permission, parental consent, and maintaining the confidentiality of the subject's identity.

RESULTS AND DISCUSSION

1. Implementation of an In-Depth Learning Approach in Developing the Cognitive Abilities of 4-5 Year Old Children in Early Childhood Education Institutions

The study results indicate that the implementation of an immersive learning approach in the context of Early Childhood Education is carried out through an active, contextual learning process based on children's direct experiences. This approach emphasizes that children not only receive information from teachers but also construct knowledge through exploration, social interaction, and meaningful activities appropriate to their cognitive developmental stage. In line with the findings of Jayawardana (2025), immersive learning in Early Childhood Education can be implemented through simple project-based activities, educational games, and sensory-motor activities that encourage children to observe, experiment, and draw conclusions from learning experiences independently. This approach has been proven to increase children's engagement in the learning process and strengthen the foundation of their overall cognitive development.

In practice, teachers act as facilitators, not only providing instructions but also creating a learning environment that stimulates children's curiosity. Teachers provide stimulus in the form of open-ended questions such as "what happens if...", "why are these shapes different?", or "how do I group these objects?". This strategy aligns with the principles of constructivism, which emphasizes that knowledge is built through children's direct experiences and simple reflection. Research by Hattie & Donoghue (2021) confirms that children's active involvement in the learning process is a crucial factor in improving the quality of understanding and retention of concepts. In this context, immersive learning enables children not only to retain information but also to understand the relationships between concepts more meaningfully. Furthermore, Hirsh-Pasek et al. (2022) explain that early childhood learns most effectively through playful learning, or directed, play-based learning. This is relevant to the implementation of immersive learning in early childhood education (ECE), where children learn through play activities designed to develop thinking, classification, and simple problem-solving skills.

Other findings from UNICEF (2022) indicate that child-centered, experiential learning can significantly enhance cognitive development, particularly in basic skills such as attention, memory, and simple reasoning. This demonstrates that the immersive learning approach has strong relevance to the developmental needs of children aged 4–5 years. However, its implementation in the field still faces several challenges. Studies show that some teachers are still accustomed to conventional, teacher-centered learning patterns, preventing children from fully exploring independently (Ministry of Education, Culture, Research, and Technology, 2022). This situation results in the learning process not fully reflecting the principles of deep learning.

Furthermore, teacher readiness is also a crucial factor in successful implementation. Teachers are required to have the ability to design learning activities that are creative, contextual, and appropriate to the child's developmental stage. Without proper planning, deep learning can become unfocused and fail to achieve the desired cognitive development goals. Overall, the implementation of the deep learning approach in Early Childhood Education (ECE) shows that learning processes based on experience, play, and social interaction can optimally develop the cognitive abilities of children aged 4–5 years. This confirms that meaningful learning focuses not only on the final outcome, but also on the child's thinking process and learning experiences.

2. Development of Cognitive Abilities of 4-5 Year Old Children After Implementing an In-Depth Learning Approach Based on Field Observation Results

Based on field observations, the cognitive development of children aged 4–5 years showed significant improvement after the implementation of an immersive learning approach. This improvement was evident in basic thinking skills such as observing, classifying, comparing, sequencing, and solving simple problems. In the context of Early Childhood Education, this development demonstrates that active and meaningful learning processes play a significant role in optimizing children's cognitive function.

This finding aligns with research by Jayawardana (2025), which states that implementing immersive learning in early childhood education (PAUD) through project-based activities, educational games, and sensory-motor activities can improve children's cognitive abilities holistically. Children not only receive information but also construct knowledge through direct, contextual and meaningful experiences.

This improvement in children's cognitive abilities was also evident in their increased ability to complete simple problem-based tasks. Children demonstrated the ability to try several alternative solutions before finding the correct answer. This indicates development in flexible thinking skills and early reasoning skills. According to Hattie & Donoghue (2021), active involvement in the learning process is a key factor influencing the depth of understanding and retention of information in early childhood.

Furthermore, observations indicate an improvement in children's attention and concentration skills during the learning process. Children are more able to persist in exploratory activities compared to conventional learning. UNICEF (2022) confirms that experiential learning and active interaction can significantly increase children's cognitive engagement, particularly in attention, memory, and basic thinking skills.

In terms of conceptual development, children also demonstrate an improved ability to understand simple cause-and-effect relationships. For example, when engaging in light experiments or exploratory games, children are able to link actions to outcomes. This aligns with the cognitive development characteristics of children aged 4–5, who are still in the preoperational stage, where children learn optimally through concrete experiences (Berk, 2022; Piaget, 1972). Furthermore, Hirsh-Pasek et al. (2022) explain that structured playful learning can improve children's thinking processes by providing opportunities for them to explore, discuss, and discover concepts independently. The immersive learning approach aligns with these principles because it positions children as active subjects in the learning process. In addition to improving cognitive aspects, observations also indicate development in children's cognitive communication skills, namely the ability to explain their thoughts simply. Children are able to provide reasons for decisions made in activities such as grouping or comparing objects. This indicates the development of early metacognitive skills, namely children's

awareness of their own thought processes.

However, the development of children's cognitive abilities does not occur uniformly. There are differences in developmental levels between children influenced by internal factors such as learning readiness and prior experiences, as well as external factors such as family support. This aligns with the view of the Ministry of Education, Culture, Research, and Technology (2022), which emphasizes that learning in early childhood education (PAUD) must be differentiated and tailored to the individual needs of children to ensure optimal development.

Overall, the results of this study indicate that an in-depth learning approach is effective in improving the cognitive abilities of children aged 4–5 years through active, meaningful, and experiential learning. This improvement not only affects learning outcomes but also affects children's thinking processes, cognitive engagement, and their ability to solve simple problems independently.

3. Supporting and Inhibiting Factors in the Implementation of the Deep Learning Approach in Developing the Cognitive Abilities of 4–5 Year Old Children

The research results show that the implementation of an in-depth learning approach to developing the cognitive abilities of children aged 4–5 years is influenced by various factors, both supporting and inhibiting. These factors are interrelated and determine the success of the overall learning process. One of the main supporting factors is:

1. Teacher competence in understanding and applying in-depth learning concepts. Teachers with a good pedagogical understanding tend to be able to design exploratory, contextual, and child-centered learning. In this case, teachers act as facilitators, providing stimulation through open-ended questions, problem-solving activities, and meaningful learning experiences. This aligns with Hattie & Donoghue (2021), who emphasized that active student involvement in the learning process contributes significantly to depth of understanding and cognitive development.
2. A conducive learning environment is also an important supporting factor. An environment that provides a variety of learning resources, educational play tools, and flexible spaces allows children to explore optimally. Hirsh-Pasek et al. (2022) stated that playful learning supported by a stimulus-rich environment can improve thinking skills, creativity, and problem-solving in early childhood.
3. Parental support is also an equally important factor. Parental involvement in providing stimulation at home and creating a positive learning environment can strengthen children's learning experiences at school. UNICEF (2022) emphasized that synergy between the family and school environment plays a crucial role in optimizing children's sustainable cognitive development.

However, the implementation of the immersive learning approach also faces various obstacles. One of the main obstacles is:

1. Teachers' limited understanding of the concept of immersive learning, resulting in a teacher-centered learning environment. This situation reduces children's opportunities to actively explore and construct their own knowledge. This finding aligns with the Ministry of Education, Culture, Research, and Technology (2022) report, which states that the transformation of learning in early childhood education (PAUD) still faces challenges in shifting learning paradigms.
2. Limited facilities and infrastructure are also a hindering factor in the implementation of immersive learning. The lack of adequate learning media can limit children's exploratory activities. Furthermore, the relatively large number of children in a class makes it difficult

for teachers to provide individual attention, even though each child has different characteristics and developmental needs.
3. Differences in children's abilities and readiness to learn also pose a challenge. Children with prior learning experience tend to respond more easily to exploration-based learning, while those with less experience require more intensive support. Therefore, a differentiated learning approach is necessary to ensure each child's developmental stage (Berk, 2022).

Overall, the success of implementing an immersive learning approach is determined not only by the method used, but also by teacher readiness, the learning environment, parental support, and the child's characteristics. Therefore, efforts are needed to improve teacher competency through ongoing training, the provision of adequate learning resources, and strengthening collaboration between schools and families. This way, the immersive learning approach can be optimally implemented to develop the cognitive abilities of children aged 4–5 years.

SIMPULAN

Based on the research findings, it can be concluded that the implementation of the immersive learning approach in early childhood education institutions is systematic, planned, and child-centered. This approach is realized through active, contextual, and experiential learning activities, such as educational play, environmental exploration, and simple project-based activities. In this process, teachers act as facilitators, not only delivering material but also creating a conducive learning environment, providing stimulation through open-ended questions, and encouraging children to think, explore, and construct knowledge independently. Furthermore, the research results indicate that the implementation of the immersive learning approach has a significant positive impact on the cognitive development of children aged 4–5 years. This improvement is evident in various cognitive ability indicators, such as the ability to observe, group, compare, sequence, understand simple cause-and-effect relationships, and solve problems in concrete contexts. Furthermore, children also show improvements in attention, concentration, and active engagement during the learning process, which are important indicators of cognitive development in early childhood.

Furthermore, the immersive learning approach also contributes to the development of children's cognitive communication skills, enabling them to express their thoughts and simple rationales for their actions. This demonstrates early development in reasoning and metacognition, which lays an important foundation for the development of advanced thinking skills in subsequent stages of education.

However, this study also found that children's cognitive development does not occur uniformly. Variations in development occur between children, influenced by internal factors, such as learning readiness and prior experiences, as well as external factors, such as family support and the quality of learning interactions at school. Therefore, a differentiated and adaptive learning approach is needed to ensure each child's optimal development, tailored to their individual characteristics and needs.

Overall, it can be affirmed that the immersive learning approach is an effective and relevant learning strategy for implementation in the context of Early Childhood Education, particularly in developing the cognitive abilities of children aged 4–5 years. This approach emphasizes not only the achievement of learning outcomes but also the quality of the learning process, which is meaningful, active, and child-centered. Therefore, the implementation of the immersive learning approach is expected to be an innovative alternative for improving the quality of learning and supporting the sustainable optimization of early childhood development.

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