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Implementing Deep Learning to Enhance Critical Thinking Skills in Early Childhood: A Qualitative Study at Aisyiyah Bustanul Athfal 26 Kindergarten, Malang

Baria Ulfah[1], M. Syahri[2], Dyah Worowirasti Ekowati[3]
Master of Pedagogy Study Program, Faculty of Teacher Training, Universitas Muhammadiyah Malang

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ABSTRACT

This study addresses the persistence of one-way instructional practices in early childhood education that limit the development of children's critical thinking skills. It aims to describe the implementation of a deep learning pedagogical approach and its impact on critical thinking among children aged 5-6 years at Aisyiyah Bustanul Athfal 26 Kindergarten, Malang. A descriptive qualitative method was employed, with data collected through observations, semi-structured interviews, and documentation involving teachers, children, and the school principal. Data were analyzed using an interactive qualitative analysis technique, including data reduction, data display, and conclusion drawing. The findings indicate that deep learning is implemented through meaningful, mindful, and joyful learning experiences, where teachers act as facilitators and children actively engage in exploration and play-based activities. The results show a noticeable improvement in children's critical thinking, reflected in increased curiosity, a willingness to ask questions, the ability to provide simple, logical reasons, and growing independence in solving everyday problems. These outcomes suggest a positive shift in children's thinking from passive reception to more reflective engagement. However, the study does not claim absolute effectiveness, as the results are context-specific and influenced by teacher readiness and learning environment. Overall, the deep learning approach (as a pedagogical model, not an AI-based approach) provides opportunities for children to construct knowledge through meaningful experiences.

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Corresponding Author:

Baria Ulfah
Master of Pedagogy Study Program, Faculty of Teacher Training, Universitas Muhammadiyah Malang
Email: bariaspd71@admin.paud.belajar.id

1. INTRODUCTION

Early childhood education (PAUD) is understood as a strategic foundation for shaping the quality of Indonesian people in the future. Gea et al. [1] emphasized that PAUD is a fundamental foundation because it is during this phase that the direction of children's

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development begins to take shape significantly, both in terms of intellectual and character. Between the ages of 4 and 6, children enter a golden age, which is crucial for cognitive, social, emotional, moral, and creative development [2]. Within this framework, the quality of stimulation is a key factor, as meaningful learning experiences at an early age will influence thinking capacity, learning habits, and character formation at subsequent ages.

Critical thinking is an essential higher-order skill that should be developed from early childhood, involving analysis, evaluation, comparison, and logical reasoning. This competence is increasingly important in addressing 21st-century challenges that require creativity, adaptability, and active problem-solving rather than passive learning [3]. Therefore, early childhood education (ECE) should not only focus on basic academic outcomes but also foster reflective thinking and reasoning skills.

However, this ideal has not been fully achieved in practice. Learning in many ECE institutions remains dominated by rote activities such as imitation, memorization, and worksheets, which limit children's opportunities to question, analyze, and solve problems. This finding aligns with the 2024 ECE monitoring report, which shows that teaching methods in Indonesia still rely heavily on lectures and repetitive drills, while exploration- and problem-based learning remains limited.

These challenges are linked to teacher capacity and learning support. Data from the 2024/2025 ECE Statistics indicate that over 67% of teachers lack adequate academic and pedagogical qualifications to implement higher-order thinking approaches (Kemendikbudristek, 2025). As a result, teaching tends to revert to one-way instruction and routine tasks. Additionally, limited learning facilities hinder the implementation of experiential learning [4].

Regional findings reinforce this issue. A study in East Java shows that most teachers still prioritize basic academic skills over higher-order thinking, citing a lack of training, limited access toest-practice models, and administrative burdens as key constraints (BPSDMPK, 2024). Similar conditions are observed in Malang, where exploratory and problem-solving activities are rarely implemented due to time constraints, conventional teaching habits, and limited understanding of effective learning models.

Developmentally, these practices result in children remaining at a reproductive thinking level focused on memorization rather than analytical or reflective thinking. Although the national ECE curriculum emphasizes reasoning and problem-solving, many teachers lack practical strategies to implement it, indicating a gap between policy and practice [5].

Overall, there is a clear gap between the ideal student-centered learning approach, which encourages exploration, inquiry, and active participation, and the current teacher-centered practices focused on basic academic achievement [6]. This gap limits the development of essential cognitive processes such as observing, questioning, testing, and concluding.

To address these needs, a learning approach is needed that not only assesses final results but also strengthens children's thinking processes from the outset. One relevant approach is the deep learning approach [7]. This approach emphasizes meaningful understanding, interconnectedness between concepts, reflection, and students' ability to

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apply knowledge to real-life situations. In the context of early childhood education (ECE), deep learning can be translated into learning experiences that encourage children to explore, ask questions, discuss, try various alternatives, and construct meaning from their activities. This process directly contributes to the development of critical thinking skills, as children not only "do" activities but also learn to reason about why things happen, how to solve problems, and what conclusions can be drawn [8].

Philosophically, deep learning aligns with constructivism, which views children as constructing knowledge through interactions with their environment. Jean Piaget emphasized the importance of concrete experiences in children's cognitive development, while Lev Vygotsky highlighted the role of social interaction in shaping thinking. Thus, immersive learning has the potential to be an effective strategy for providing meaningful experiences that stimulate children's critical thinking skills from an early age, as children learn through active engagement, authentic exploration, and guided dialogue [9].

Based on this description of the phenomenon and data, research on "Implementing Immersive Learning to Improve Critical Thinking Skills in Early Childhood" is crucial. The urgency of this research lies in the need to address the low level of critical thinking skill development in early childhood education (PAUD) and to provide empirical evidence on the effectiveness of the deep learning approach in early childhood. Furthermore, this research is expected to provide theoretical contributions to the development of PAUD concepts oriented toward 21st-century skills, as well as practical contributions for educators in designing more effective, meaningful learning strategies that align with curriculum demands and child development.

2. METHOD

Research Approach and Type

This study employs a descriptive qualitative approach, which aims to provide an in-depth understanding of phenomena in their natural context without intervention [10]. The focus is on understanding processes, interactions, and meaning constructed during learning activities among children aged 5–6 years.

Research Location and Time

The research was conducted at TK Aisyiyah Bustanul Athfal 26 Malang in February of the 2025/2026 academic year. The site was selected purposively due to its implementation of deep learning practices.

Data Sources

a. Primary Data

- ECE teachers: provide insights on strategies, methods, and observed development of children’s critical thinking.
- Children (aged 5–6): observed for critical thinking indicators, including questioning, reasoning, problem-solving, and decision-making.
- School principal: provides information on institutional policies and support.

b. Secondary Data
- Teaching modules
- Children's development records (portfolios, assessments)
- School policy documents
- Scientific literature

Data Collection Techniques

Data collection involves systematic methods to obtain accurate and relevant information [11], including:

1. Observation
   Moderate participatory observation is used to examine classroom activities, teacher practices, and indicators of children's critical thinking, including questioning, reasoning, problem-solving, and conclusion-making.
2. In-depth Interviews
   Semi-structured interviews with teachers, principals, and parents are conducted to explore perceptions of deep learning, teaching strategies, children's behavioral changes, and institutional support.
3. Documentation
   Documents such as teaching modules, children's work, photos/videos, and teacher reflections are collected to support observational and interview data.
4. Field Notes
   Field notes are used to record classroom situations, interactions, and researcher reflections, supporting data analysis.

Data Analysis Technique

Data were analyzed using an interactive qualitative analysis process consisting of: (1) data reduction, (2) coding, (3) categorization, (4) theme development, (5) data display, and (6) conclusion drawing. This process allowed patterns related to the development of critical thinking to be systematically identified.

Data Validity

Data validity was ensured through triangulation of data sources (observation, interviews, documentation), member checking with participants, and **peer review** to validate interpretations. Prolonged observation also strengthened data credibility.

Ethical Considerations

Ethical approval was obtained from the institution. Informed consent was secured from teachers, parents, and the school principal. Children's participation was conducted with parental consent and teacher supervision. All data were anonymized to protect participants' privacy, particularly children's identities.

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3. RESULTS

Implementation of the Deep Learning Approach in Early Childhood Education to Enhance Critical Thinking Skills

1. Understanding Deep Learning

Deep learning is a learning process that emphasizes comprehensive and meaningful understanding, rather than merely memorizing material. In this approach, learners are encouraged to actively think, ask questions, analyze, and connect knowledge with real-life situations. The teacher serves as a facilitator, guiding learners to deepen their understanding of concepts. As a result, learning outcomes become more meaningful, long-lasting, and applicable in everyday life.

At the kindergarten level, deep learning is an approach that places children as the main subjects in the learning process. In early childhood, deep learning does not mean delivering difficult or overly academic material; rather, it means providing meaningful, enjoyable, and developmentally appropriate learning experiences. Through this approach, children are not only introduced to surface-level knowledge but are also encouraged to understand, feel, try, and express what they have learned in daily life. Thus, learning in kindergarten is not merely about knowing something, but about directly experiencing the learning process that shapes thinking, attitudes, and creativity from an early age [12].

One key emphasis of deep learning in kindergarten is play-based learning. Play is the natural world of children; therefore, learning becomes more effective when presented through educational, engaging, and curiosity-driven activities. Through play, children can learn about colors, shapes, numbers, language, rules, and social relationships without feeling forced to learn. Play provides a natural learning environment where children are involved with joy, freedom, and enthusiasm. In this context, play is not only entertainment but also a learning medium that gradually builds children's understanding of basic concepts in a fun way.

In addition, deep learning strongly emphasizes direct experience. Young children understand concrete experiences more easily than abstract explanations. Therefore, learning activities should allow children to see, touch, try, observe, and engage directly. For example, when learning about plants, children not only listen to explanations but also plant seeds, water them, and observe their growth. Such direct experiences help children build real understanding through interaction with their environment, making learning more memorable because it is based on action rather than words [13].

Deep learning in kindergarten is also characterized by active child involvement. Children are not passive listeners; they are encouraged to ask questions, answer, try, choose, move, and interact with peers and teachers. This active engagement fosters confidence, independence, and a sense of interest in learning. It also helps teachers understand each child's thinking patterns, interests, and needs. As a result, learning becomes more dynamic, communicative, and child-centered.

Furthermore, deep learning supports the development of basic thinking skills. Although young children are not expected to think in complex ways, they can develop foundational skills such as observing, distinguishing, classifying, comparing, recognizing simple cause-and-effect relationships, and expressing reasons. For example, when children

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explain why plants need water or why toys must be tidied up, they are practicing simple logical thinking. These skills form the foundation for critical thinking in later education [14].

Deep learning also provides space for self-expression and creativity. Each child expresses ideas, feelings, and imagination in different ways. Therefore, learning should allow children to express themselves through drawing, coloring, storytelling, singing, dancing, role-playing, and creating. These activities help children communicate their thoughts and emotions in their own way. Creativity develops when children are free to experiment and explore without fear of making mistakes. In deep learning, self-expression and creativity are essential parts of the learning process, helping children become confident, imaginative, and capable individuals [15].

Overall, deep learning in kindergarten is an approach that emphasizes meaningful, active, and experience-rich learning processes rather than outcomes alone. This is crucial because early childhood is a foundational stage for character, learning habits, thinking skills, and creativity. Teachers should design activities aligned with children's world, utilize the environment as a learning resource, and provide opportunities for play, exploration, questioning, thinking, and expression. Through deep learning, children not only gain basic knowledge but also develop into active, confident, and creative individuals ready for further education.

2. Experiences of Deep Learning

Deep learning in kindergarten offers significant benefits for children's development, as it emphasizes meaningful learning experiences rather than just outcomes. Early childhood is a critical developmental period; therefore, appropriate learning approaches greatly influence attitudes, habits, and foundational skills. Deep learning allows children to actively engage, participate directly, and understand learning through play, exploration, interaction, and simple reflection. Through this process, children construct their own knowledge from what they see, feel, do, and think.

One major benefit is the development of learning independence. Children are encouraged to engage in activities such as choosing materials, completing simple tasks, organizing tools, and making decisions. This fosters independence, responsibility, discipline, and confidence in decision-making. Independent learners are better prepared for future educational challenges [16].

Another benefit is the development of curiosity. Deep learning offers children opportunities to ask questions, observe, explore, and try new things. When children interact directly with their environment, curiosity develops naturally. For example, children may ask why leaves are green or how water flows. Curiosity is fundamental to learning, as it motivates children to explore and engage actively [17].

Deep learning also enhances children's self-confidence. Active participation allows children to speak, answer questions, present their work, try new activities, and express opinions. When children feel valued and heard, their confidence grows. Confident children are more willing to participate, interact, and try new experiences, supporting their social-emotional development [18].

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Another important benefit is the development of creativity and imagination. Activities such as drawing, role-playing, storytelling, and building encourage children to generate ideas and express unique ways of thinking. Creativity develops through exploration, while imagination grows as children envision beyond what is directly observed. These skills support language, thinking, emotional development, and problem-solving abilities [19].

Through deep learning, children not only learn basic concepts but also develop independence, curiosity, confidence, and creativity. These interconnected benefits form a strong foundation for overall development. Therefore, deep learning is highly suitable for kindergarten, as it creates meaningful, enjoyable, and developmentally appropriate learning experiences. It prepares children not only academically but also mentally, socially, and emotionally for the next stage of education.

4. DISCUSSION

Early Childhood Critical Thinking Skills After the Implementation of Deep Learning

1. Understanding Critical Thinking

Critical thinking is the ability to understand, evaluate, and analyze information logically before drawing conclusions or making decisions. This ability is reflected in habits such as questioning, observing, comparing, and seeking appropriate reasons for events or problems. Through critical thinking, individuals do not accept information passively; instead, they examine its validity, causal relationships, and the most appropriate solutions. In learning, critical thinking is essential as it helps students become more active, careful, and capable of solving problems effectively.

In kindergarten, critical thinking is a basic ability that begins to develop from an early age through developmentally appropriate learning activities. At this level, critical thinking is not seen as complex reasoning like that of adults, but rather as children's ability to observe, show curiosity, express their thoughts, and attempt to find simple answers or solutions to situations they encounter. This ability is important to instill early, as it helps children become more active, more sensitive to their environment, more confident in expressing opinions, and more accustomed to using their thinking skills in learning experiences [20].

One key aspect of critical thinking in kindergarten is observation. Observing is a fundamental activity closely related to children's daily lives, as young children learn through what they see, hear, touch, and feel. Through observation, children begin to recognize differences, similarities, changes, shapes, colors, sizes, sounds, and other aspects of their surroundings. When children observe plants, animals, weather, classroom objects, or peer behavior, they are using their thinking skills to understand their environment. Observation forms the foundation of critical thinking, as it stimulates curiosity and encourages children to understand what is happening. Therefore, teachers should provide ample opportunities for direct observation to create meaningful learning experiences.

Another important aspect is questioning. After observing, children naturally develop curiosity that leads them to ask questions. Even simple questions indicate that children

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are thinking and trying to understand something. For example, children may ask why leaves fall, why it rains, why water flows, or why some objects sink while others float. These questions show active thinking. In kindergarten learning, questioning should be encouraged and valued, as it reflects the development of critical thinking. Children who ask questions tend to be more active, engaged, and curious. Teachers play a crucial role in fostering this habit by creating a safe, enjoyable environment where children are not afraid to make mistakes.

In addition to observing and questioning, critical thinking is also reflected in children's ability to express opinions. Expressing opinions means children can communicate what they think, feel, or understand about an object, event, or experience. Although their opinions are simple, they are an important part of cognitive development. For example, a child may say that plants need water to avoid wilting or that toys should be tidied to keep the classroom clean. Such statements show that children are beginning to understand meaning, not just perceive information. This ability also builds confidence, communication skills, and respect for others' perspectives. Teachers should provide opportunities for children to speak, answer questions, tell stories, and express their observations in age-appropriate language [21].

Furthermore, critical thinking in kindergarten is related to solving simple problems. In daily classroom life, children face situations that require them to think and find solutions, even in simple ways. For instance, arranging blocks so they do not fall, sharing toys with peers, reaching objects placed too high, or deciding what to do when water spills. These situations train children to think, try, consider possibilities, and make simple decisions. Problem-solving is essential because it fosters independence, persistence, and resilience. Teachers can develop this skill through games, simple experiments, discussions, and daily activities relevant to children's experiences [22].

These four elements—observing, questioning, expressing opinions, and solving simple problems—are interconnected in the development of children's critical thinking. Children begin by observing, which leads to curiosity and questioning. They then attempt to understand and express opinions, followed by finding simple solutions. This process shows that critical thinking develops naturally when supported by appropriate learning experiences. Therefore, kindergarten learning should focus not only on outcomes but also on processes that allow children to observe, ask, speak, try, and solve problems independently. By consistently developing these aspects, children become more active, confident, sensitive, and prepared for further learning.

2. Experiences of Critical Thinking

Deep learning at the kindergarten level is an effective approach to fostering critical thinking from an early age. At this stage, critical thinking is understood as children's ability to observe, show curiosity, understand simple relationships, and respond to experiences. Deep learning supports this process by involving children directly in activities such as play, observation, simple experiments, interaction, and real-life experiences. Through these processes, children actively use their thinking skills,

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gradually developing critical thinking as they progress through their developmental stages.

One indication of developing critical thinking is increased observation. In meaningful learning activities, children are encouraged to notice, differentiate, and recognize elements in their environment, such as leaf colors, fruit shapes, weather changes, or water flow. Observation is the first step in understanding the environment. Children who frequently observe become more sensitive to differences and changes. Through deep learning, observation evolves into an effort to understand situations, marking the beginning of the development of critical thinking [23].

Deep learning also increases children's tendency to ask questions. As observation grows, so does curiosity, which is expressed through simple questions about causes and meanings. In a supportive learning environment, children feel free to ask questions without fear, making them more active and engaged. Frequent questioning indicates active thinking and is a key sign of developing critical thinking skills.

Additionally, deep learning helps children explain simple reasons. At this stage, children move beyond answering "what" to explaining "why." For example, they may explain that plants need water to stay healthy or that hands must be washed to stay clean. These explanations show the development of logical thinking. Children begin to understand cause-and-effect relationships rather than merely imitating information. Deep learning enables children to engage in activities directly and to express reasoning based on their observations [24].

Another outcome is improved responses to new situations. Children engaged in meaningful learning are more prepared to face new experiences, such as unfamiliar toys, new peers, or new activities. They respond with curiosity, willingness to try, and efforts to understand. This indicates that children are not passive but actively adapt and respond. New experiences become learning opportunities, helping children develop thinking, adaptability, and decision-making skills [25].

Children who actively observe gain more experience, which leads to curiosity and questioning. This process continues as children attempt to explain reasons and respond effectively to new situations. Thus, deep learning creates not only enjoyable experiences but also a gradual and natural development of thinking skills [26].

Therefore, deep learning is essential in kindergarten, as it lays the foundation for critical thinking. Through active, concrete, and meaningful learning, children become more observant, more willing to ask questions, better able to explain simple reasoning, and more responsive to new experiences. These abilities form a crucial foundation for children's intellectual and social development. Through deep learning, children do not merely receive information but learn to understand, interpret, and respond to the world around them in developmentally appropriate ways.

Practical Implications

For early childhood educators, the findings suggest the need to:

- design learning activities that prioritize exploration and questioning,
- adopt facilitative teaching strategies rather than directive instruction,

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- use simple and authentic assessment methods such as observation and portfolios,
- continuously develop pedagogical competence through training and collaboration.

Limitations

This study is limited to a single kindergarten context, which may restrict the generalizability of findings. The qualitative design focuses on in-depth understanding rather than measurement of impact. In addition, the short observation period may not fully capture the long-term development of critical thinking skills. Future studies are recommended to involve multiple institutions and longer observation durations.

5. CONCLUSION

The study indicates that implementing the deep learning pedagogical approach supports the development of early childhood critical thinking at Aisyiyah Bustanul Athfal 26 Kindergarten, Malang. Children showed observable progress in questioning, offering simple reasons, and solving basic problems through play-based, experience-driven learning activities. These findings suggest that structured, child-centered learning can encourage more active and reflective engagement. The main contribution of this study is in provide empirical evidence on how deep learning can be operationalized in early childhood classrooms, particularly by transforming teacher roles from instructors to facilitators who guide exploration and inquiry.

However, this study is limited to a single institutional context, uses a qualitative design, and has a relatively short observation period, which may limit broader generalizability. Future research is recommended to involve multiple settings and longer-term observations to examine the sustainability of critical thinking development and to refine assessment strategies for young children. Overall, the findings highlight the potential of deep learning as a pedagogical approach in early childhood education, while emphasizing the need for careful implementation aligned with children's developmental characteristics.

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