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Natural Environment Based Science Learning to Improve Critical Thinking and Creativity Skills in Early Childhood

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Abstract

Science learning in early childhood education is still predominantly instructional and teacher-centered, resulting in limited meaningful learning experiences for children. This condition contributes to the low levels of critical thinking and creativity, which are essential 21st-century competencies. This study aimed to improve early childhood critical thinking and creativity through the implementation of nature-based science learning. The study used a two-cycle implementation of the Classroom Action Research (CAR) method based on the Kemmis and McTaggart model; each cycle had the following steps: preparation; action; observation; and reflection. The research subjects were 15 children aged 4–6 years at TK Darul Quran, Sumedang Regency. Data were collected through observation, documentation, and reflective notes using observation sheets to assess children's critical thinking and creativity skills. Data analysis was conducted using descriptive quantitative and qualitative approaches. The results showed that children's critical thinking skills increased from 10% in the pre-cycle to 60% in Cycle I and 90% in Cycle II. Similarly, creativity skills improved from 20% to 65% and 92%, respectively. These findings indicate that nature-based science learning can in enhancing critical thinking and creativity in early childhood education.

Keywords: *science learning, natural environment, critical thinking, creativity, early childhood education.*

INTRODUCTION

Early childhood education (ECE) is a crucial foundation for children's cognitive, socio-emotional, and motor development. During this golden age, children's brains experience the most rapid development, with high neuroplasticity, making the development of thinking skills optimal (Santrock, 2019; UNICEF, 2023). Globally, UNESCO (2022) emphasizes that early childhood education is designed comprehensively to foster all aspects of child development, including critical and creative thinking skills, now considered essential competencies for the 21st century. Indonesia, as a developing country with a significant early childhood population, according to BPS data (2023), has approximately 28 million children aged 0-6 years. It faces significant challenges in optimizing the quality of education at this level. An institutional framework that promotes play-based, holistic learning has been laid out by Law 20 of 2003, which deals with the National Education System, and Regulation 137 of 2014, which deals with the National Early Childhood Education Standards. However, implementation in the field still shows a gap between the ideals of the policy and the reality of learning practices (Devianti, et al., 2020&Susanto. 2021).

Science learning in early childhood plays a strategic role in building the foundation of scientific thinking from an early age. Research shows that early science exploration can stimulate curiosity, observational skills, and basic science process skills, which serve as modalities for the development of critical and creative thinking (Eshach & Fried, 2005; NRC, 2012). This aligns with Piaget's (1973) constructivism theory, which states that early childhood is in the preoperational and concrete operational stages, requiring direct experience with the environment to build conceptual understanding.

Furthermore, the Ministry of Education Singapore (2023) in its Early Childhood Development Agency Curriculum emphasizes that inquiry-based science learning should be introduced early because it develops problem-solving and divergent thinking skills. However, the findings of Fleer and Pramling (2015) show that science learning practices in many countries, including Indonesia, are still dominated by a teacher-centered approach which hinders the development of creativity and critical thinking. Similarly, in the field, such as at Darul Quran Kindergarten, science learning tends to be instructional, teacher-centered, and provides few opportunities for children to explore directly. Learning activities often use instant media or worksheets, while the natural environment around children is not optimally utilized as a learning resource. This condition results in children being less actively involved in the learning process, rarely asking questions, and not demonstrating optimal critical thinking and creativity skills. This problem is reinforced by initial observations that show that children tend to be passive, waiting for teacher instructions, and are less confident in expressing their opinions. Science learning activities do not fully encourage children to observe natural phenomena in depth and relate them to everyday experiences. However, the natural environment provides a rich, concrete, and contextual learning resource, which is very appropriate for the developmental characteristics of early childhood.

In early childhood, science learning should not be understood as the transfer of abstract concepts, but rather as an exploratory process that stems from children's direct experiences with their environment. This aligns with the concept of biophilia introduced by Edward O. Wilson (1984), which states that humans have an innate tendency to connect with nature and living things (an innate tendency to focus on life and lifelike processes). In the context of early childhood, this tendency is reflected in children's natural curiosity about environmental phenomena such as water, soil, plants, and animals. Philosophically, the concept of biophilia asserts that meaningful learning for children should be rooted in direct interaction with nature. Through these experiences, children actively construct understanding, develop observational skills, and foster a scientific attitude from an early age. Thus, science learning should ideally be exploratory, contextual, and child-centered.

However, the reality on the ground demonstrates a gap between this philosophical foundation and current learning practices. Science learning in early childhood education is often dominated by a teacher-centered instructional approach. Teachers tend to convey information verbally, provide one-way explanations, and strictly direct children's activities. As a result, children are given less opportunity to explore, ask questions, and discover knowledge independently. This situation is influenced by various factors. First, the traditional learning paradigm, which views the learning process as the transfer of knowledge from teacher to child, remains strong. This paradigm results in teachers acting more as primary sources of information than as learning facilitators. Second, teachers' limited understanding and competence in implementing exploration-based science learning also poses a barrier. Many teachers lack confidence in facilitating open-ended inquiry activities, thus preferring structured and easily controlled methods.

Third, the demands of the curriculum and learning administration, which emphasize measurable learning outcomes, often encourage teachers to use more practical and efficient approaches, even though they do not provide meaningful learning experiences for children. Fourth, limitations in the learning environment, particularly the limited use of the natural environment as a learning resource, reinforce the dominance of classroom-based learning and artificial media. Furthermore, the development of modern life, which increasingly distances children from nature, exacerbates this situation. Children interact more with artificial environments and digital media than with natural environments. Connecting with nature is crucial for developing children's cognitive, emotional, and social abilities, including understanding scientific concepts holistically (Wilson, 2012).

Based on this description, it can be concluded that there is a mismatch between the nature of science learning, which is based on children's natural tendencies (biophilia), and learning practices that are still teacher-centered. Therefore, efforts are needed to transform science learning in early childhood education (PAUD) towards a more contextual, exploratory, and environmentally-based approach. This transformation aims not only to improve understanding of scientific concepts but also to develop critical thinking skills, creativity, and a love of the environment in children from an early age. To tackle the complicated problems of the modern era, one must possess higher-order cognitive abilities such as critical thinking and creativity. In order to self-regulate, critical thinking requires one to understand, analyze, evaluate, and infer knowledge (Facione, 2020), on the other hand, creative thinking is described as coming up with novel and useful ideas via the use of different perspectives (Guilford, 1967; Torrance, 1974).

Critical thinking and creativity skills in early childhood in Indonesia still tend to be low and require serious attention. This condition is influenced by teacher-centered learning practices, which result in children receiving less opportunity to explore, ask questions, and develop ideas independently. Furthermore, assessment orientations that emphasize outcomes over processes also hinder the development of higher-order thinking skills. This is in line with research showing the limited implementation of experiential learning and the suboptimal competence of teachers in delivering innovative learning as well as inhibiting factors (Yaswinda et al., 2020). This is reinforced by the results of the Programme for International Student Assessment (PISA) study, which showed that the critical thinking, problem-solving, and creativity skills of Indonesian students are still below the global average (OECD, 2023), indicating that the foundation of these abilities from an early age has not been optimally developed.

Mutakinati's (2020) research in several districts/cities in Central Java found that the average critical thinking score of 5-6 year old children was in the low category, with only 23% of children demonstrating adequate analytical and evaluation skills. Similar findings were expressed byAstuti, R., & Aziz, T. (2019)who conducted research in the DIY Province and found that early childhood creativity is still limited to the aspect of fluency without being followed by flexibility and originality of thinking. In the context of science learning, the environment-based learning approach has attracted the attention of researchers and educational practitioners. This approach involves utilizing the surrounding natural resources as a medium and authentic learning context (Sobel, 2004; Smith & Sobel, 2010). Kolb's (1984) experiential learning theory supports this approach by emphasizing that direct experience with the real environment is the optimal cycle for meaningful learning.

Research results indicate that nature-based learning has a positive impact on child development. Research by Azizah et al. (2023) demonstrated that the implementation of a nature-based curriculum can improve children's cognitive and motor development through authentic learning experiences. Furthermore, Trina et al. (2024) revealed that nature-based learning environments support the formation of science and STEAM concepts through multisensory exploration and direct interaction with real objects. Furthermore, these findings are reinforced by Suryadi (2025) who stated that nature-based learning can increase child engagement and provide more meaningful learning experiences. Furthermore, research by Campbell and Speldewinde (2023) emphasized that the success of nature-based learning is highly dependent on the availability of facilities and a supportive environment, which is not evenly distributed across all educational units. On the other hand, science learning practices in early childhood education are still dominated by a teacher-centered approach, resulting in children receiving less opportunity to explore and construct knowledge independently. Furthermore, a literature review shows that previous research still has limitations, including the failure to link nature-based science learning to improve critical thinking skills and creativity in early childhood.

International research demonstrates the positive impact of nature-based learning on children's cognitive development. A meta-analysis by Rickinson (2001) and updated by Stern, James, and Fortnum (2023) showed that outdoor learning significantly contributes to science learning outcomes, motivation, and positive attitudes toward learning. Further research byLindfors, et. all(2024) found that children who participated in nature-based learning showed sharper observational skills and higher verbal skills in describing scientific phenomena. At the national level, several researchers have explored natural environment-based learning.Kiviranta,et.all(2024) in an Integrated Islamic Kindergarten showed an increase in children's understanding of science concepts through an outbound learning approach. However, this study focused on cognitive aspects without systematically measuring the impact on critical thinking skills and creativity. Another study by Rahayu et al.(2026) found that project-based learning with an environmental theme was able to increase the creativity of early childhood, but was still limited to the creative product aspect without considering the critical thinking process.

Based on the literature review that has been described, several research gaps can be identified which form the basis for conducting this research, namely; First, most research on natural environment-based science learning in early childhood focuses on conceptual knowledge (science concepts) without systematically exploring its impact on critical thinking skills as a higher-order cognitive process (Hamari, Sherbino, & Richardson, 2022; Zohar & Dori, 2003). Existing research places more emphasis on learning outcomes alone, rather than the underlying thinking processes. Second, studies on creativity in natural environment-based science learning remain fragmented. Most research separates creativity and critical thinking as two separate constructs,without exploring how these two abilities can be developed in an integrated manner through appropriate learning approaches (Beghetto & Karwowski, 2021; Niu & Sternberg, 2002). Third, research exploring natural environment-based science learning in Indonesia is still relatively limited, especially those that comprehensively examine the relationship between learning approaches, environmental context, and the development of higher-order thinking skills. The majority of existing research is qualitative descriptive without a systematic intervention design (Yaswinda,et al., 2023). Fourth, there is still a lack of research operationally testing natural environment-based science learning models specifically designed to simultaneously enhance critical thinking and creativity in the context of Indonesian early childhood education (PAUD). The availability of empirically tested learning models is an urgent need for developing learning practices at the PAUD level.

The natural environment of Sumedang Regency, the research site, is characterized by its agricultural sector, hilly terrain, high biodiversity, and integration with local culture, making it a unique contextual learning resource for early childhood science instruction. Utilizing this environment not only supports cognitive development but also strengthens the connection between scientific concepts and children's real-life experiences and culture, thereby fostering creativity and critical thinking in early childhood.

This research has high urgency from both theoretical and practical perspectives. Theoretically, this research will contribute to the development of early childhood science learning theory using a natural environment-based approach to developing higher-order thinking skills. This research will also enrich the educational literature with empirical evidence on the relationship between direct experience-based learning and metacognitive development in early childhood. Besides that this research has a novelty that significantly distinguishes it from previous studies in the field of early childhood science learning. In general, previous research has focused more on the application of play-based or exploration-based science learning to develop children's basic cognitive aspects, without specifically directing the development of higher-order thinking skills (critical thinking) and creativity in children. The novelty of this research lies in the integration of a natural environment-based science learning approach with the development of critical thinking skills and creativity in early childhood. This approach positions children as active subjects who learn through direct experience (experiential learning), so that they not only acquire knowledge but also develop the ability to analyze, reflect, and control their thought processes.

Practically, the findings of this study are expected to provide recommendations for early childhood education educators in designing and implementing effective science learning. With increasing awareness of the importance of environmental education in Indonesia, as envisioned in the Independent Curriculum and the Adiwiyata Program, this research provides an empirical basis for implementing learning that integrates environmental education with the development of 21st-century thinking competencies.

This study aims to improve critical thinking skills and creativity of early childhood through the application of natural environment-based science learning also provides empirical contributions to the theory of constructivism and experiential learning in the context of early childhood education in Indonesia, enriching educational research literature on the relationship between natural environment-based learning and the development of higher-order thinking skills.

METHODS

This study used a Classroom Action Research (CAR) approach, implemented collaboratively between the researcher and the classroom teacher. Parnawi (2020) stated that CAR is research conducted in the classroom aimed at improving or enhancing the quality of learning practices. This study used the Kurt Lewin model, developed directly by Kemmis and McTaggart (Arikunto, S. & Supardi, 2016). Both cycles of the research process included planning, action, observation, and reflection. The image of the research steps according to the Kemmis and Mc. Taggart model can be seen below.

Figure 1. Kemmis and Mc. Taggart Model (Arikunto, S. & Supardi, 2016)

The research subjects were 15 early childhood children aged 4-6 years in a PAUD unit. The research was conducted at Darul Quran Kindergarten, Cimalaka District, Sumedang Regency, from September 1, 2025, to February 6, 2026. The first cycle of action was implemented on Tuesday, November 11, 2025, for 3 lesson hours, or approximately 180 minutes. This research was conducted during the learning process, starting from the initial activities, core activities, and final activities, namely from 08:00 WIB to 11:00 WIB. The first cycle was attended by all 16 children in Group B of Darul Quran Kindergarten, consisting of 4 stages: the planning stage, the implementation or action stage, the observation stage, and the reflection stage.

Based on the results of the reflection conducted by the researcher and the teacher of Group B of Darul Quran Kindergarten in the first cycle, improvements were made in the second cycle.

The second cycle was implemented on Wednesday, November 26, 2025, from 08:00 – 11:00 WIB for 3 lesson hours, or approximately 180 minutes, consisting of the initial activities, core activities, and final activities.

Data collection techniques include observation, documentation, and reflection notes. The assessment instrument used is an observation rubric to measure the critical thinking skills and creativity of children aged 4–6 years in natural environment-based science learning. This instrument consists of 6 indicators for critical thinking such as observing objects, asking about natural phenomena, grouping, predicting, exploring the surrounding environment and communicating, as well as 6 indicators for creativity such as fluency such as generating many ideas, flexibility in trying various ways, originality producing different ideas, being able to develop ideas, imagination in creating something and curiosity showing a high curiosity. All of these indicators use a Likert scale of 1–4. The assessment in this study uses a 4-level Likert scale modified according to the characteristics of early childhood assessment, namely Not Yet Developing (BB), Starting to Develop (MB), Developing According to Expectations (BSH), and Developing Very Well (BSB). This scale refers to the concept of attitude measurement by Likert (1932) and the PAUD assessment standards from the Ministry of Education and Culture. The scores obtained are then converted into percentages to facilitate interpretation. Furthermore, these percentages are classified into success level categories based on certain intervals, namely: 0–25% (BB), 26–50% (MB), 51–75% (BSH), and 76–100% (BSB).

Both quantitative and qualitative descriptive methods were used to analyze the data. Observations of the implementation of scientific lessons based on the children's natural environments and results on tests of their creative and critical thinking abilities provided the quantitative data. Data were categorized for development based on percentages of learning accomplishment and children's ability achievements, specifically Not Yet Developing (BB), Starting to Develop (MB), Developing as Expected (BSH), and Developing Very Well (BSB). Qualitative data were analyzed descriptively by comparing observation results in the pre-cycle, Cycle I, and Cycle II to identify changes in the learning process and outcomes. Improvements in children's critical thinking and creativity skills were analyzed based on changes in development categories between cycles.

Researchers and educators engaged in reflective conversations at the conclusion of each cycle to guarantee the reliability and correctness of the study results, and they used triangulation of methods and sources to keep the data valid and trustworthy.

RESULTS AND DISCUSSION

Result

The results of the study showed that children's critical thinking skills experienced a significant increase in each cycle of action. In the pre-cycle stage (initial data), only 10% of children reached the minimum criteria for critical thinking skills with the category of not yet developed. This happened because when science learning was carried out in an instructional manner, children only carried out instructions and listened to what was conveyed by the teacher in class or the teacher only showed pictures stuck on the board. However, after the implementation of science learning based on the natural environment provided a concrete and meaningful learning experience on indicators of critical thinking skills, for example the theme of Plants in the ability to observe such as children directly observe various plants in the yard or school environment by paying attention to the color, shape, size, and texture of the leaves using the senses of sight and touch, asking questions children were encouraged to ask simple questions, grouping objects such as children grouping leaves or plants based on color, size, or shape with teacher guidance, expressing opinions such as children expressing opinions about the healthiest or most frequently watered plants and providing simple reasons, and drawing simple conclusions such as children together with the teacher drawing simple conclusions about the needs of plants to grow, based on the results of observations and discussions conducted in Cycle I the percentage increased to 60% with the category of developing as expected. More optimal improvement occurred in Cycle II, where 90% of children had achieved minimal critical thinking skills with a very well developed category.

A similar pattern of improvement was also found in children's creativity abilities. In the pre-cycle stage (initial data), the percentage of children who achieved minimal creativity abilities was 20%, which was in the undeveloped category, children only recognized plants in pictures shown by the teacher and also colored pictures of leaves and trees. After the action in Cycle I with natural environment-based science learning on creativity indicators including the ability to generate ideas such as drawing plants according to what they saw directly, using natural materials in a variety of ways such as plant collages from natural materials (twigs, dry leaves, seeds), expressing ideas such as telling stories about plants made, and developing simple works such as making simple mini gardens, the percentage increased to 65% with the category of developing as expected. Furthermore, in Cycle II, the percentage of achievement of creativity abilities increased significantly to 92%, with the category of developing very well.

These findings demonstrate that the gradual and continuous implementation of natural environment-based science learning through a cycle of actions can improve the quality of children's learning processes and outcomes. The increased percentage of critical thinking and creativity achievement indicates that children's active involvement in natural environment exploration activities provides meaningful, contextual learning experiences and encourages the development of critical thinking skills from an early age. The increase in children's critical thinking and creativity skills from the Pre-Cycle, Cycle I and Cycle II stages can be seen in the following table.

Table 1. Improvement in Children's Critical Thinking Skills in Each Cycle

Indikator	Pre-Cycle (%)	Cycle I(%)	Cycle II(%)
Observing	2	10	20
Asking	1	10	16
Grouping	2	8	10
Predicting	2	8	10
Exploring	2	14	20
Communicating	1	10	14
Amount	10%	60%	90%
Categori	Not Yet Developed (BB)	Developing as Expected (BSH)	Developing Very Well (BSB)

Based on the diagram above, it can be explained that the percentage of increase in children's critical thinking skills in the initial condition is 10% (BB) after being given action using natural environment-based science learning in cycle I increased to 60% (BSH) so that there was an increase of 50% in the initial condition to cycle I, but has not reached the expected target, therefore the research was continued in cycle II. In cycle II the percentage of achievement increased to 90% (BSB) which means there was an increase of 30% from cycle I to cycle II.

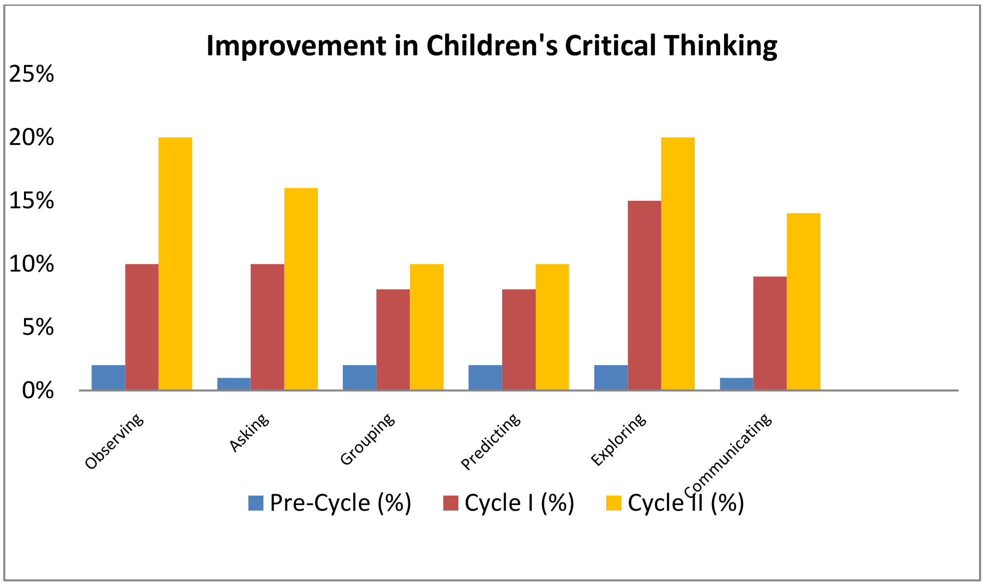

Figure 2. Improving Critical Thinking Skills in Children

Based on the diagram above, it can be explained that the percentage of increase in children's creativity abilities in the initial condition is 20% (BB) after being given action using natural environment-based science learning in cycle I increased to 65% (BSH) so that there was an increase of 45% in the initial condition to cycle I, but has not reached the expected target, therefore the research was continued in cycle II. In cycle II the percentage of achievement increased to 92% (BSB) which means there was an increase of 27% from cycle I to cycle II.

Tabel 2 Improvement in Children's Creativity Skills in Each Cycle

Indikator	Pre-Cycle (%)	Cycle I(%)	Cycle II(%)
Fluency	4	12	16
Flexibility	3	13	16
Originality	3	10	15
Elaboration	3	10	14
Imagination	3	10	18
Curiosity	4	10	13
Amount	20	65	92
Categori	Not Yet Developed (BB)	Developing as Expected (BSH)	Developing Very Well (BSB)

The assessment in this study used a modified 4-level Likert scale to reflect the characteristics of early childhood assessment: Not Yet Developing (BB), Beginning to Develop (MB), Developing as Expected (BSH), and Developing Very Well (BSB). This scale refers to Likert's (1932) concept of attitude measurement and the Ministry of Education and Culture's PAUD assessment standards. The scores were then converted into percentages for ease of interpretation, as suggested by Sugiyono (2019). These percentages were then classified into success level categories based on specific intervals (Arikunto, 2013): 0–25% (BB), 26–50% (MB), 51–75% (BSH), and 76–100% (BSB).

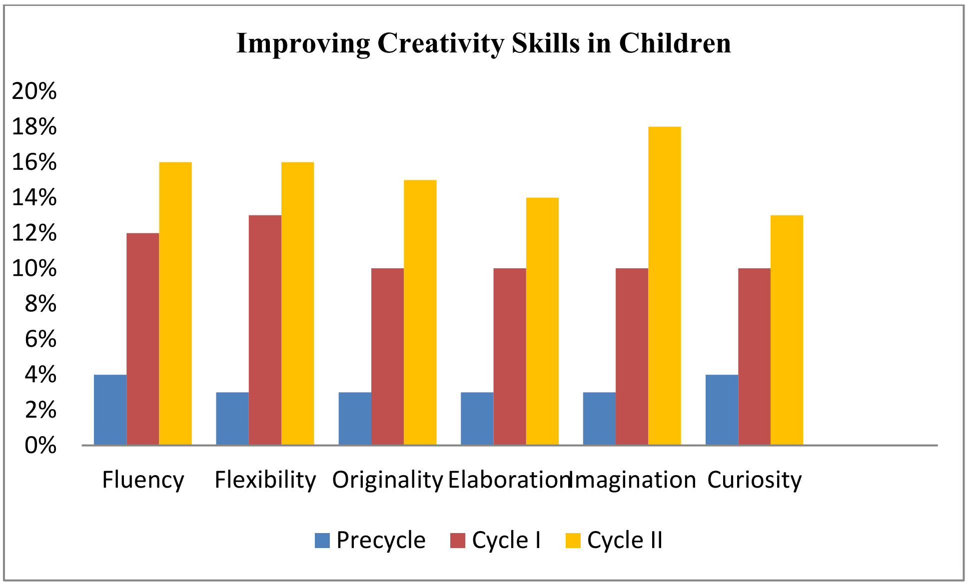

Figure 3. Improving Creativity Skills in Children

Discussion

The natural environment has unique characteristics compared to structured classroom learning environments. One of the main strengths of the natural environment is its unstructured and open nature, providing ample opportunities for children to explore independently. In this situation, children are not faced with a single correct answer, but rather with a variety of possibilities that encourage them to observe, ask questions, experiment, and discover. This naturally stimulates the development of critical thinking skills.

Cognitively, when children interact with the natural environment, they encounter real-world phenomena that are complex and dynamic, such as changes in water quality, plant growth, or animal behavior. These situations create cognitive conflict that encourages children to think more deeply, for example by asking "why," "how," and "what if" questions. This process is the essence of critical thinking: the ability to analyze, evaluate, and draw conclusions based on direct experience. Furthermore, the completely unpredictable nature of nature also encourages children to conduct simple experiments and find solutions independently, thus strengthening inquiry skills.

From a creativity perspective, the natural environment provides a variety of loose materials such as leaves, rocks, sand, and water that can be used flexibly according to children's imaginations. The absence of rigid usage restrictions allows children to create new possibilities, fostering creativity through the exploration process. Thus, the natural environment not only stimulates critical thinking but also enriches children's divergent thinking skills.

This aligns with research findings showing that natural environment-based science learning significantly improves children's critical thinking and creativity. In the pre-cycle phase, children's critical thinking skills were in the "Undeveloped" category, with a percentage of 10%. After the intervention in cycle I, this increased to 60%, categorized as "Developing as Expected," and in cycle II, this significantly increased to 90%, categorized as "Developing Very

Well." A similar pattern of improvement was also seen in children's creativity, from 20% in the pre-cycle to 65% in cycle I, and reaching 92% in cycle II.

This significant improvement demonstrates that natural environment-based science learning provides concrete, contextual, and meaningful learning experiences for children. Through direct interaction with the environment, children not only receive information but also actively construct knowledge through exploration and discovery. Therefore, it can be concluded that the open, unstructured, and stimulus-rich nature of the natural environment is a key factor in stimulating the development of critical thinking skills and creativity in early childhood.

From a sociocultural perspective, the findings of this study align with Lev Vygotsky's (1978) sociocultural theory, which states that children's cognitive development occurs through social and environmental interactions. The natural environment provides a space for children to collaborate, discuss, and learn with peers and teachers in meaningful contexts. Through scaffolding within the zone of proximal development (ZPD), teachers act as facilitators, helping children develop higher-order thinking skills, including critical thinking, through open-ended questions and appropriate stimulation.

This finding aligns with the constructivist theory proposed by Jean Piaget (1952), which asserts that children's knowledge is constructed through active interaction with their environment. Learning activities involving direct observation of natural objects encourage the processes of assimilation and accommodation. Thus, children's critical thinking skills, such as observing, categorizing, and drawing simple conclusions, develop naturally through meaningful learning experiences.

Furthermore, the results of this study also support the experiential learning theory proposed by David A. Kolb (1984). Kolb emphasized that effective learning occurs through direct experience (concrete experience) followed by reflection. Natural environment-based science learning provides children with opportunities to learn through real-world experiences, such as observing plants, water, soil, and animals. This process encourages children to think critically in understanding natural phenomena while stimulating creativity through open-ended, exploratory activities.

Natural environment-based science learning also reflects the principles of contextual learning as proposed by Elaine B. Johnson (2002), who stated that learning will be more meaningful when linked to students' real-life experiences. Using the surrounding environment as a learning resource makes science concepts more relevant and understandable, thus deepening children's understanding compared to abstract instructional learning. The increase in children's creativity in this study also aligns with E. Paul Torrance's (1966) theory of creativity, which emphasizes the importance of a learning environment that provides freedom to explore and think divergently. An open, natural environment allows children to generate a variety of ideas and solutions, without being limited by a single correct answer.

Research results show that natural environment-based science learning can enhance the creativity of children aged 4–6 years. This improvement is evident in children's ability to generate ideas, utilize natural materials in a variety of ways, and develop their imagination during exploration activities. These findings align with research suggesting that direct interaction with the natural environment can enhance children's creativity and learning engagement (Kuo, Barnes, & Jordan, 2019). These findings can also be explained by the Biophilia Hypothesis proposed by Edward O. Wilson, which states that humans have a natural inclination to interact with nature. Natural environments provide rich sensory experiences that can stimulate creative ideas in children (Gill, 2014). Furthermore, these research findings align with the Place-Based Education approach, which emphasizes the importance of the local environment as a contextual and meaningful learning resource. Environmentally-based learning has been shown to enhance children's creative thinking and problem-solving skills (Ardoin, Bowers, & Gaillard, 2020). Thus, the natural environment acts as an effective stimulus in developing children's creativity because it provides authentic, contextual learning experiences and supports free exploration.

However, this study has several limitations that need to be considered when interpreting the results. Variations in teacher competency in implementing natural environment-based learning also influenced the results. Furthermore, environmental and weather conditions during the activity could potentially impact the consistency of learning implementation.

Overall, the results of this study confirm that experiential, exploratory, and contextual science learning is more effective than teacher-centered learning in developing creativity and critical thinking skills in early childhood. This finding aligns with recent research showing that direct involvement of children through the use of the natural environment can significantly improve cognitive abilities (Yaswinda et al., 2023). Furthermore, a recent study (Permatasari et al., 2025) revealed that nature-based learning and hands-on experience contribute to increasing children's creativity, independence, and problem-solving skills. Experiential learning approaches, such as gardening activities, have also been shown to strengthen conceptual understanding through connections to real-life contexts. Thus, learning that emphasizes exploration, experimentation, and active child involvement has been shown to be more optimal in supporting cognitive development such as critical thinking and creativity. Therefore, the use of the natural environment as a learning resource should be optimized in early childhood education.

CONCLUSION

Based on the research results, which showed an increase in critical thinking skills from 10% in the pre-cycle to 60% in Cycle I and 90% in Cycle II. Children's creativity skills increased from 20% to 65% and 92%, respectively. These findings indicate that natural environment-based science learning can improve critical thinking skills and creativity in early childhood. Therefore, it can be concluded that the implementation of natural environment-based science learning through Classroom Action Research has been proven to improve critical thinking skills and creativity in early childhood

This study is also useful for PAUD educators in providing alternative learning approaches that can be adapted and implemented in the context of daily learning, for PAUD managers to provide policy recommendations in the preparation of learning programs that develop critical thinking skills and creativity, for policy makers to be a consideration in the development of PAUD curriculum and learning standards that integrate environmental education with 21st century competencies and benefits for parents can provide insight into the importance of direct experience-based learning with the natural environment in supporting children's thinking development

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