

# Improving Higher-order Thinking Skills Through the Implementation of Open-Ended Play for Children aged 5-6 Years

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**Abstract**—This study is aimed to describe the improvement in the quality of learning and higher-order thinking skills in children aged 5-6 years through the application of open-ended play. This research uses the Kemmis & Taggart model classroom action research and is carried out in two cycles. The results showed that the application of open-ended play made learning more effective, engaging, and efficient in developing higher-order thinking skills in children aged 5-6 years. The application of open-ended play can increase the higher-order thinking skills of children aged 5-6 years.

**Keywords**—high order thinking skills, open-ended play, children aged 5-6 years old

## I. INTRODUCTION

One of the goals of educational development is students have the capacity to optimally actualize their potential and human dimensions. Education is directed at enhancing the quality and competitiveness of Indonesian human resources in the era of the knowledge-based economy and creative economic development (Latif, M. 2013). To achieve it, educational services at PAUD institutions place more emphasis on character development. Thus, children are ready to adapt and have self-existence in the industrial revolution 4.0 era and beyond. There are four main competencies in facing challenges in this era, which are critical Thinking, creativity, collaboration, and communicating (Supriano 2018). It can be achieved if children are trained and accustomed to using higher-order thinking skills in their daily lives, especially in gaining learning experience in preschool institutions.

According to the observations at Dharma Wanita Persatuan 1 Karangsono Kindergarten, Trenggalek, efforts to inculcate the basics of competence have not received optimal attention. Learning activities tend to be linear. Children carry out playing and learning

activities regularly and imitate examples and repeat. The learning process is carried out mostly individually. Thus, it does not provide opportunities for children to cooperate and network. The examples of assignments given by teachers tend to demand one correct answer, thus, causing children to have less opportunity to develop critical and creative thinking skills. In addition, learning also does not provide opportunities for children to communicate their learning outcomes in various forms.

The process of communication only appears during reflection activities, and then it is carried out by children who are more active among their friends. This causes 11 out of 13 children (85%) in group A to have low-level thinking skills (LOTS), with an average score of 1.56. The learning process has not directed children in developing higher-level thinking skills. Learning only facilitates children to develop thinking skills at the level of knowledge. Level 1 skills, namely observation, and the attitude aspect tend to be at the level of accepting and responding. The learning strategy used deals with to lead to close-ended play, which is characterized by games that require a right way and do not give children the freedom to compare or find alternative solutions to creative problems. The effectiveness of the implementation of cooperative learning is still low, so that children are not accustomed to cooperation and networking with their friends in class.

To overcome these problems, play-based learning is needed that is open-ended play. Open-ended play gives opportunities for children to manipulate their learning objects optimally (Montessori 2014). Children get the opportunity to develop the ability to work together to develop intensive networking. Learning objects should be managed in order to enable children to develop critical thinking skills through a process of comparing,

problem-solving, and providing opportunities for children to communicate their experiences and learning outcomes through various ways such as simple words/sentences, pictures, graphics, etc.

Based on these alternative solutions, the researcher chose to apply open-ended play. This is because the application of the open-ended play strategy delivers chances for children to improve their imagination and intellectual skills such as employed remembrance, intellectual flexibility and self-regulation. As stated by Rymanowicz,

*"academic" activity, open-ended, and free exploration plays a very important role in learning. When we give children the freedom and opportunity to explore, create, fail, and reassess, we are helping them to form connections in the brain. All engaging experiences – even ones from cardboard boxes – help children learn about the world around them and how they influence it (Rymanowicz 2015).*

It is also in accordance with the result of a previous study which indicates that the learning model with open-ended play basis is effective in triggering and increasing the higher-order thinking skills at group B kindergarten children (Sutama, I Wayan 2018).

Higher Thinking Skills (HOTS) is an educational reform idea based on the taxonomy of learning (e.g., Bloom's taxonomy). The idea tells that some types of learning need more cognitive processing than the others and have more general advantages, too. In Bloom's taxonomy, as like skills related to analysis, evaluation, and synthesis (creating current knowledge) are surpassed in mastering facts and concepts that require other teaching and learning methods. As stated by (Thomas and Thorne 2009) that:

*...higher-order thinking involves the learning of complex judgmental skills such as critical Thinking and problem-solving. Higher-order Thinking is more difficult to learn or teach but also more valuable because such skills are more likely to be usable in novel situations (i.e., situations other than those in which the skill was learned).*

Higher-order Thinking happens when an individual accumulates new and stored information into memory and integrates and/or reorganizes and enlarges the information to reach a goal or find probable answers in confusing situations. (Lewis A 1993). Higher-order thinking occurs if a person seeks the new information by gaining information through his experiences located in his memory. Thus, they can rearrange and expand new information to gain the goals or find the probable answers in confusing situations.

According to King, Goodson (2000) critical thinking, logical thinking, reflective, metacognitive,

and creative Thinking are included in higher-order thinking. When individuals face unusual uncertain issues, ask questions or create dilemmas, critical Thinking, logical Thinking, reflection, metacognition and creative Thinking will be activated. Thinking in a higher-order leads to decisions based on available knowledge or experience. Further, King, Goodson (2000) argues as follows.

*Several major concepts relevant to the higher-order thinking processes are to follow, based on three assumptions about Thinking and learning. First, the levels of Thinking cannot be unmeshed from the levels of learning; they involve interdependent, multiple components and levels. Second, whether or not Thinking can be learned without subject matter content is only a theoretical point. In real life, students will learn content in both community and school experiences, no matter what theorists conclude, and the concepts and vocabulary they learn in the prior year will help them learn both higher-order thinking skills and new content in the coming year. Third, higher-order thinking involves a variety of thinking processes applied to complex situations and having multiple variables (King, Goodson 2000)*

Higher-order Thinking according to three assumptions of Thinking and learning include: (1) The level of Thinking cannot be separated from the level of learning. The level of Thinking and the level of learning are interdependent and involve many components. (2) Thinking could be learned. Subject matter has only one theoretical point. In the fact of real life, children will learn content through social and their school experiences. It will help children in learning higher-order thinking skills and future new content (3) Higher-order thinking involves multiple thought processes and is suitable for complex situations with many variables.

The higher-order thinking process includes five elements which are problem-solving abilities, inquiry abilities, reasoning abilities, communication abilities, and conceptualizing abilities. These elements are interrelated one another. Thus, it is a fundamental way of learning mathematics (Elena Bodrova, Deborah J. Leong 2010). Thinking and using mathematical knowledge is considered important in mathematics education. However, many children's problems in learning mathematics come from their weakness in these skills.

According to the description above, it could be stated that higher-order Thinking is an in-depth thinking process that includes critical thinking abilities, innovative and creative Thinking, collaboration/networking abilities, and communication abilities. Critical thinking abilities are characterized by the ability to question, compare, analyse, and assess/evaluate. Innovative and creative thinking skills are characterized by the ability to create something new

and having problem-solving strategies in multiple ways. Collaboration skills are characterized by the ability to work together and build networks in solving problems. Communicating skills are characterized by the ability of children to convey ideas and information effectively through various ways.

In children aged 4-6, a high level of thinking is manifested in the fact that they think deeply about the critical thinking process. There are 6 main levels for in HOTS (Cinthya 2016). The first level refers to the basic, universal knowledge as well as the child's ability in remembering the data. At this level, children will start to have questions so that their skills are called into question. Children will begin to observe the area and the objects around them and will be connected to their processing of thought through their memories. Children will identify, name, count, and repeat those. Level two is knowledge-based learning. Children will be able in answering and responding to the questions that need work summarization, realize facts and ideas, and can compare, explain, and summarize them.

Level three and four are skill-based learning. For an example is that children should use their knowledge of information and skills dealing with finding the solutions. Other than that, children will be able to respond the questions about a story/activity which offer more thinking about various options. They will explain why, why not, dramatize the answer, recognize or relate to the character. Children will also learn current skills for application in a various of new settings.

The fourth level is skill-based learning. Children will be able to respond the questions that need to be included. They will identify similarities and differences, accept changes in the book (characters/settings, etc.), and experiment with 'what if' scenarios, conclude, and identify motives/cause. Children will also learn some new skills for application in a various of new settings.

Level five is affective-based learning. Children will be able to answer and also respond questions where the opinions, assessing the decisions of self and others, defending and criticizing their choices and those of others are required. They should be able to hold up on their decision (why or why not). Children may have shifts in the way of their process of Thinking (that values, attitudes, interests can change).

Level six is part of affective-based learning. Children will be able to build/destroy, design, arrange and create answers to their own problems. They will be present and stand up on their own judgment, and the actions of others.

Play is the main strategy in learning for early childhood. By experiences of children's early childhood, when the brain is developing rapidly, children have the best opportunity to assist the development of these critical life skills. From birth to 5 years of age, children's brains literally form a

complicated network of synapses that persist throughout their lives, and profoundly affect their social, emotional, physical, and cognitive performance, as stated in the following statement:

*...open-ended play: located towards the left of the continuum and involving play experiences where the teacher provides children with materials suggestive of a biodiversity concept, and with minimal engagement and interaction allows them to examine and explore the materials as a basis for learning about the concept (Mackenzie, Amy Cutter, Susan Edwards 2014).*

Open play materials/equipment allows children to create some choices, express the creativity and support their independence. The materials are openly manipulated and have no predetermined use. The blocks can be a telephone, a doll chair, an ice cream bar or any number of other things at play. It is from these experiences that children can learn best.

Open-ended games allow children to explore their play materials and equipment actively (Semlin 2018). Open games provide opportunities for them to solve problems according to their imagination, with various ways and alternative solutions. In accordance with the stages of play that children are in manipulative play and constructive play, children can reflect on their ideas creatively.

Teaching strategies and learning environments in teaching children to make them think higher-order thinking are appropriate to facilitate children's growth as well as increasing perseverance in monitoring children, opening children's minds, and being flexible in behavior. Higher-order Thinking (HOT) according to Bloom's taxonomy is shown in Figure 1. The general understanding of teachers to develop children's HOT should pay attention to the involvement of children with learning tasks that go beyond the second level of 'understanding' to encourage application, analysis, synthesis and evaluation activities in processing information. This is in line with the definition that HOT includes any thinking ability that requires more than just recalling or memorizing the information (Yen, Tan Shin, & Halili 2015).

Lessons that involve higher-order thinking skills offer special clarity of communication that will minimize ambiguity and confusion and can enhance children's attitudes about thinking tasks (Thomas and Thorne 2009). Lesson plans must include modeling thinking skills, such as adapted Thinking and adapting to the needs of different children (by providing support to students at the beginning of the lesson and gradually requiring children to act independently), as well as promoting children's advanced learning skills development. However, too much or too little assist can hinder development.

Effective learning strategies include training, extension, structure, and meta-cognition. Lessons should be particularly created specific learning strategies to be taught. Direct instruction (teacher-centered information delivery) must be used sparingly. Short presentations (up to five minutes) and in addition to guided exercises for learning skills and knowledge. Questions asked by teachers and / or children about embarrassments, new problems, and new approaches should be left unanswered. (Sutama, I Wayan 2017).

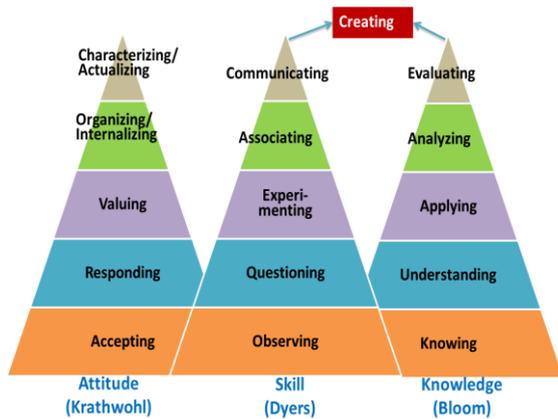


Fig. 1. Bloom's Taxonomy (Nesbit 2007)

Genuine feedback that provides immediate, particular, and corrective information should tell learners of their progress. Small group activities as like question and answer, peer tutoring and collaborative learning could be useful to develop thinking skills. Activities should include the tasks which are challenging, teachers' motivation to stand on the job and current perception of team progress. Computer-mediated communication and instruction will provide access to remote data sources and enable collaboration with children elsewhere. It is useful in developing skills in the areas of verbal analogy, logical Thinking and induction / deductive reasoning.

An effective strategy to trigger higher-order thinking skills in early childhood is through open-ended play. Through open games, children have the freedom to manipulate materials/materials and play equipment at the same time children will face problems in their games. This problem will require children to ask questions, and find solutions creatively (Mackenzie, Amy Cutter, Susan Edwards 2014). Problem-solving will require collaboration with friends when they are unable to solve it on their own, or the children next door are trying to help them.

Based on this analysis, it could be concluded that if learning uses open-ended play, the higher-level thinking skills in children will increase. It is because through open-ended play, children try to manipulate game materials/tools and learning objects creatively, deal with problems and they try to find solutions. The function of the teacher is as a playing partner and trigger for the development of higher-order thinking skills.

II. METHOD

This research uses a classroom action research design. This design is used because the purpose of the study is to enhance learning conditions and improve higher thinking skills through the application of open play. This study uses a chemistry and tagging model which includes planning, action, observation and reflection (Sanjaya 2012).

Researchers plan, analyze, and reflect on learning situations, especially those related to children's high thinking skills, and planned actions using RPPH with play-based open learning. During the observation phase, the researchers noted the child's learning process and greater massage ability (Table 1). This step is carried out simultaneously with the action phase. Teachers work as role models, and researchers work to make observations and assessments. During the reflection phase, the researcher analyzed the results of first, second, and third meetings. The results of the analysis were used as a reference to determine the advantages and disadvantages of actions in cycle 1. The basic reference for planning the next cycle.

TABLE I. ACTION SUCCESS CRITERIA

Observation Aspect	Before Action	After Action
Quality of learning	The low quality of learning is marked by learning conditions that are less effective, attractive and efficient, and less triggering higher-order thinking skills.	Learning conditions are effective, interesting and efficient to facilitate the learning process of children according to their level of development.
Higher-order Thinking Skills:		
critical Thinking	Most children are not able to think critically	Most children are able to demonstrate critical thinking skills
Innovation and creativity	Most children have not been able to show innovation and creativity	Most children show the ability to create something innovatively and creatively
Collaboration and networking	Most children still work independently even in group management	Children show the ability to cooperate and help each other in completing the tasks of the game
communicating	Most children are only able to communicate ideas and information when asked by the teacher	Most children have initiative to communicate ideas, information, or learning outcomes in various ways such as simple words/sentences, pictures, graphics, etc.

This research is conducted at Dharma Wanita Persatuan 1 Karangsoke Kindergarten, Trenggalek. The reason for this selection is because it has a very strategic place, and is easily accessible if this program is followed up and spread to other preschool institutions

in the vicinity, and this preschool has been accredited with an A grade which optimally directing their learning to the development of higher-order thinking skills in their students. The subjects of this study are 13 children in Group B with the age range of 5-6 years.

The data collection techniques used in this study were interviews and observation. The interview technique was used to discover initial information and the child activity tendency to ask questions in everyday life. Observation techniques were used to collect data on children's higher-order activities and thinking abilities while learning and at the time of action. The tools used to collect the data in this study consisted of 1) observation sheets, 2) field notes, and 3) interview guidelines. The observation sheet is used as a reference in the observation of high skills. Field notes are used to observe the learning situation during the action.

The interview guidelines were used to guide and guide the collection of data on conditions before and during the implementation of the action. The research data were processed using quantitative and qualitative analysis techniques. Quantitative techniques were used in analyzing the data on the frequency and number of children who were actively involved in asking the questions. Qualitative analysis was used to analyze data on the quality of learning at the time of action. The steps of qualitative data analysis include data reduction, data presentation, and drawing conclusions. Quantitative data were analyzed using the percentage formula. The steps of qualitative data analysis include data reduction, data presentation, and drawing conclusions.

**III. RESULT AND DISCUSSION**

In cycle 1, the application of intensive open-ended play-based learning in learning has an impact on the learning quality and outcomes in the form of higher-

order thinking skills. In the area of learning quality, children began to show enthusiasm in participating in play activities. Children seem to be challenged to learn and no child chooses activities in the safety corner. It means that they are enthusiastic, interested, and feel challenged by the learning process that uses open-ended play.

Learning becomes very effective to achieve learning outcomes (Table 2). This is evidenced by the majority of 80.71% of children achieving the criteria for success (developing according to expectations and developing very well). The average score of children's development achievement is also very high, reaching 3.29. Based on the data in cycle one, the following findings are obtained. The advantages of research results in cycle one, are described as follows. (1) Learning becomes more effective, as evidenced by learning that applies the principles of the 2013 Curriculum. Children become active in learning through play that emphasizes the child's direct experience.

First cycle weaknesses include: a) children are not used to critical Thinking, so the quality of questions is still low, b) children still need encouragement to do any activity, c) children are not they are used to. template. In new learning, one can get used to closed learning patterns, (d) children are used to doing homework on their own, even in group models, and (e) children are used to receiving examples of something (e.g., creativity far from the optimal learning process in cycle II was better.

Children are still interested in this activity. They are finding the core activities in cycle 1. Meeting two shows that the children are very excited to learn educational activities. Almost all children are currently actively participating in class.

TABLE II. RECAPITULATION DATA OF CYCLE I

Aspect	Critical Thinking	Creativity and innovation	Cooperation	Communication	Average
%	76.92	100	76.92	69	80.71
Average score	2.92	3.62	3.23	3.38	3.29

Children can ask about today's topic, which is goats. At the first meeting of cycle 2, many questions arise, and, of course, the children are looking for the answers. The teacher is only a facilitator for the children to find the answers they are looking for. Finding in the process of core activities at meeting 2 of cycle 2 shows that children are enthusiastic when taking part in participating in the learning activities. The result of cycle 2 can be seen in Table 2.

The learning atmosphere is very conducive and provides opportunities for children to think critically. Children seem challenged by play activities that are open-ended play. In addition, children are free to be creative without many imitations from the teacher.

What children produce is in accordance with their imagination and creativity. Children's work becomes diverse. To find out what is done/produced, children are given the opportunity to communicate it in front of the class. In working on the creative maze, the children collaborated with other group members. Therefore, learning becomes more quality and meaningful for children.

Based on the result of the measurement of higher-order thinking skills, an average of 90.39% of children achieved success (the category developed according to expectations and developed very well). Children's learning achievement scores are also very high, namely 3.56 from the ideal maximum score of 4. On average,

children develop in the category of developing according to expectations and developing very well. When compared with the initial conditions, the application of open-ended games can improve the quality of learning and can trigger the development of children's higher-order thinking skills. For comparison, it shows in the Figure 2.



Fig. 2. Percentage of Children Who Meet Success Criteria

The improvement of children's higher-order thinking skills through the application of open-ended play from the initial conditions in cycle 1 and cycle 2 is very high (Figure 3).

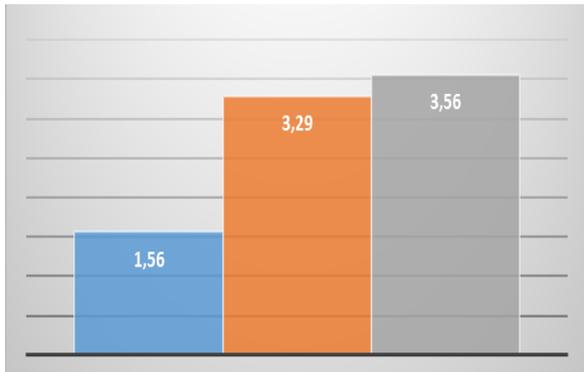


Fig. 3. Improving HOTS Learning Outcomes

Between the initial conditions and the end of cycle 1, it increases by 1.73, and in the second cycle increases to 3.56 (2.0). It shows a very significant increase. The application of open-ended play in early childhood learning provides opportunities for children to learn to explore their play environment optimally. It appears that through the application of open-ended play, the quality of learning increases.

Learning becomes more effective, interesting, and efficient. It is indicated by the condition that children

are very enthusiastic about participating in playing activities through exploration, distinguishing, asking questions, creating, and even showing literacy in mathematics, science, and language (Elena Bodrova, Ph.D., Deborah J. Leong 2010), specifically stated as follows.

*One set of researchers look into the use of play elements, play environments, or play motivation as a way to enhance instruction in core subjects such as literacy, mathematics or science, or as a way to promote specific areas of development such as the development of children's social-emotional competencies, oral language or gross and fine motor skills, etc. These studies are primarily focused on the respective academic domains or areas of development, with play viewed as a means to foster child development in these domains. The results of these studies are translated into practical suggestions on how to create math- or literacy-rich play environments and on how to incorporate math, science, or literacy language into children's play.*

Children can develop their imagination to be creative and create their work freely according to their own interpretations (Yates and Twigg 2017). It makes learning more attractive and effective in triggering higher-order thinking skills of children (King, Goodson 2000). Children think more constructively, reason, and evaluate the things they observe (Al-Fadhli and Khalfan 2009). Therefore, educators need to reorient learning that is linear, convergent, leading to divergent thinking processes that can trigger children to think at higher levels (how to create) and not just imitate something that already exists (Harcourt and Jones 2016).

The result of this study has shown a significant improvement in critical thinking skills (76.92%) with a mean score of 3.46. Children can distinguish, analyze, and question something different. It is in accordance with the opinion that the application of open-ended play can trigger analytical and critical thinking skills in solving the problems they face ((Changwong, Sukkamart, and Sisan 2018), (Egan 2019), (Irwanto et al. 2018).

In the field of creativity, the application of open-ended play also shows a very significant improvement. Children who initially only imitate (folding, looking for traces, pairing numbers with objects) become creative and make things according to their creativity.

TABLE III. RECAPITULATION DATA OF CYCLE 2

Aspect	Critical Thinking	Creativity and Innovation	Cooperation	Communication	Average
%	76.92.	100	84.62	100	90.39
Average score	3.46	3.54	3.54	3.69	3.56

Starting from cycle one and cycle two, all children (100%) and their average score in the achievement of development in the field of creativity is 3.54, showing creativity in solving problems or in working on projects. It is because the learning process prioritizes problem-based learning (Hung Stephen, 2015) and (S. et al., 2017)).

By the aspect of collaboration skills, there is also an increase. From the beginning, the children sat in groups (group learning model) but worked individually to become collaborative activities. Most of the children (84.62%) are with an average score of 3.54 for the development of the ability to work together. It shows that learning using open-ended play can trigger the ability to work together and build networks in children ((student 2017), (The Effect of Learning Model on Higher-order Thinking and Student Science Process Skills in Ecology 2017), (Lee 2014)).

By the aspect of communication skills, the result shows that all children (100%) dared to appear and communicate their learning outcomes. They actively convey/tell the result of their work to their friends and teacher. It shows that with a variety of children's work, children have an obligation to tell their work. Thus, other people know what they have done. Based on this, in addition to the cognitive and social fields, children's communication skills can develop through the application of open-ended play ((Sustainable and Zaman 2017), (Munawati 2019), (Mulyaningsih and Itaristanti 2018)).

Based on the overall results showed that there is a significant improvement in the quality of learning and higher-order thinking skills in 5-6 years old of children through the application of open-ended play. It is because children really experience a process of learning that is appropriate to their level of development, which requires meaningful learning (Dahar 1988). In addition, the application of open-ended play-based learning provides opportunities for children to practice and develop higher-order thinking which includes critical, creative/innovative thinking skills, cooperation, and communication ((Nourdad, Masoudi, and Rahimali 2018), (Semlin 2018), (student 2017)).

However, the development of higher-order thinking skills as measured in this study remains on the principles of children's development (Birbili 2013) (Costello 2013). Therefore, higher-order thinking skills that develop in children are still in problem-solving in perspective and reach of children (Section B - Children's Developing Skills and the Early Childhood Curriculum 2016). This is, of course, different from the context of elementary school children and at higher levels of school.

#### IV. CONCLUSION

Based on the data presented above, it can be proposed as follows. (1) The application of open-ended play can progress the value of learning for children in

the age of 5-6 years old. It is indicated by effective, interesting, and efficient learning conditions to facilitate the children's learning process according to their level of development in triggering the growth of children's higher-order thinking skills. (2) The application of open-ended play can improve higher-order thinking skills in 5-6 year old children. It is indicated by an increase in higher-order thinking skills from an average score of 1.56 in pre-action, increasing to 3.29 in cycle 1, and 3.56 in cycle 2. The percentages of children who meet the criteria for success (develop according to expectations and develop very well) increase from 15% in pre-action, 80.71% in cycle 1, and became 90% in cycle 2.

According to the finding and conclusion of this study, it can be suggested as follows. (1) The teacher should improve the quality of their learning by applying games that are open-ended play because learning becomes more effective, interesting, and efficient, and in accordance with the development of children. (2) The education office should encourage teachers to develop games that are open-ended play. Thus, learning becomes more quality, and children can develop higher-order thinking skills more effectively and optimally. (3) Further researchers should be followed up by conducting experimental research so that the application of open-ended play is truly tested and can be applied to a wider target audience.

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