



The influence of discovery learning model using loose parts-based media on early childhood critical thinking abilities

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Abstract

Background: The implementation of the independent curriculum in modern education is a breakthrough aimed at improving the quality of education in Indonesia. This curriculum is expected to enhance students' quality in various areas, one of which is the development of critical thinking skills in early childhood.

Aim: This research aims to determine the effect of the discovery learning model using loose parts media on the critical thinking skills of early childhood.

Method: This quantitative research involves 5-6-year-old students at Pos Paud Tanjung as the sample. Data collection was conducted through observation using a one-group pretest-posttest research design. The data analysis technique employed statistical testing using the T-test.

Results: The results of the data analysis indicate that there is an effect of the discovery learning model using loose parts media on the critical thinking skills of early childhood, as evidenced by a significance result of $0,01 < 0,05$ and a negative t-value of $-15,657 < -2,10982$. The average critical thinking skills score of the children before the treatment was 5,77.

Conclusion: Thus, these findings contribute to the understanding of the potential application of the discovery learning model using loose parts-based media in enhancing the critical thinking skills of early childhood.

INTRODUCTION

The use of the independent curriculum in modern education is a breakthrough aimed at improving the quality of education in Indonesia. (Angga et al., 2022; Lestaringrum, 2022; Jannah & Rasyid, 2023). This is reinforced by the statement (Nadhiroh & Anshori, 2023) which states that independent learning supports many innovations in the field of education, particularly advancements in various educational institutions. This curriculum provides opportunities for students to learn freely, calmly, and enjoyably, allowing them to showcase their creativity and express their own thoughts. (Indah Pertiwi et al., 2022) explains that young children's learning is learning through play, because early childhood is fundamentally still in the phase of the play world. Play is a tool for children to learn about the world around them, from the unfamiliar to the familiar, and from what they cannot do to what they can do. (Hasanah et al., 2023; Nurhayati et al., 2021; Veronica, N. 2018).

Observations at Pos Paud Tanjung show that children are not sufficiently stimulated to develop critical thinking skills. The children are more often asked to memorize rather than to learn problem-solving and critical thinking. They also lack the ability to provide simple explanations when given written or oral questions that need to be completed independently. This issue is reinforced by (Irawati & Anggreani, 2023) He stated that the problem is that children are less interested in learning and less actively engaged because the delivery of learning materials is focused only in one direction. The lack of variety in media used in the learning process leads to a lack of concentration in children.

Based on the explanation of the issues above, the researcher states that the cause of these problems is the lack of teacher knowledge regarding various teaching methods that can enhance children's critical thinking skills. Meanwhile, according to (Wafiqni et al., 2023) states that the cause of these problems is the lack of real-life examples in problem-solving, which leads students to only speculate without actually learning about the issues they face. The learning activities conducted are still predominantly teacher-centered. A teacher-centered learning model makes the teacher's role very dominant, while students remain in a passive position. (Aldiyansyah et al., 2024; Ramadani et al., 2024; Ana, N. Y. 2018).

Therefore, a creative and efficient approach is needed to address the difficulties in developing critical thinking skills in early childhood at Pos Paud Tanjung. One promising solution is the Discovery Learning model with Loose Parts-Based Media. This model allows children to learn through discovery, active exploration, and hands-on experience, which are essential components in developing critical thinking skills. Including discovery learning models that emphasize exploration, experimentation, and discovery is the most appealing learning approach. This is reinforced by (Sausan et al., 2023) which states that the implementation of the discovery learning model also provides opportunities for early childhood to expand their critical thinking skills. Children are asked to observe, match, reason, and evaluate various pieces of information they receive. (Fahmi et al., 2023) also states that to make the learning process more engaging, teachers should not only focus on the use of models but also pay attention to the use of learning media. In the modern era, education centers on students who actively participate. One strategy to achieve this is by choosing a learning strategy that aligns with the interests and skills of the children, supported by the necessary resources and facilities. One approach is to implement the discovery learning model, which can be used in the teaching and learning process. In this model, the educator presents a problem, and students are tasked with solving it. Consequently, this approach fosters new ideas that can enhance student creativity, teach them independence, improve their ability to retain material, and provide a sense of satisfaction. (Hendrizar et al., 2021; Munawarah í et al., 2021)

(Kusdiwelirawan & Rusyda, 2023) In his research, he reveals that there are actions you must take before implementing the Discovery Learning method: 1) Stimulus (providing a stimulus): In this activity, an initial overview can be obtained through observations, such as videos or pictures taken from what the children see. 2) Problem Description (identifying the problem): Children are given time to find unusual things or problems they encounter and seek solutions. 3) Data Collection: Children then go through the process of gathering relevant information sources, which they use as a reference to answer questions. 4) Verification (proving what they believe): This step is to affirm or test the validity of what they believe to be true. 5) Generalization (drawing conclusions): This final activity allows students to express and capture the essence of the previous activities. (Rahman, 2021) reveals that the process of implementing the discovery learning model can be applied in early childhood education, where the environment, experimentation, and problem-solving are used for learning.

Loose Parts are materials that can be opened, dismantled, reassembled, used, combined, arranged, moved, and utilized individually or in combination with others. They can be used as projects or games to stimulate the intelligence of early childhood. (Wilyanita et al., 2024; Lismayani et al., 2023; Khoiriyah et al., 2022).

(Kusumawardani et al., 2023) provides examples of loose parts including: sand, soil, twigs, leaves, shells, pebbles, and stones, bottles, plastic, straws, and pipes, spoons, coins, thread, and fabric; wood and bamboo, marbles, glass, bottles, beads, and recycled packaging. Through these loose parts, children can freely create to the fullest extent of their imagination.

Children need an environment where they can modify, identify, assess, and communicate their thoughts through play. Additionally, by using nearby resources to create art, these materials can help children build connections with their surroundings. This is reinforced by.

(Novitasari & Dirgayunita, 2024) who argues that through loose parts media, children are challenged to create something new using various existing materials, allowing them to work more freely and making play-based learning activities more accessible to them.

The use of loose parts-based media provides children with the opportunity to experiment, create, and face cognitive challenges that enhance their critical thinking skills. This statement is reinforced by (Diana et al., 2023) who states that loose parts act as an attraction for children who have great curiosity and interest. Materials such as stones, twigs, seeds, and dry leaves inspire children to create according to their imagination. This indirectly develops their higher-order thinking skills, which can lead to critical thinking and creativity.

In terms of thinking ability, one of the higher-order cognitive skills that should be developed as early as possible is critical thinking. Critical thinking skills developed in early childhood are understood as the ability to make logical decisions based on rational beliefs. This aligns with the idea of (Rahmasari et al., 2021) that children's critical thinking abilities begin to develop as they start to notice objects around them. In line with their cognitive development stages, the skills that emerge are still simple.

Child development requires a supportive environment that enables activities and encouragement. Synthesis, analysis, and evaluation are three components of critical thinking skills in early childhood. According to (Fitria Anggraini et al., 2020) Critical thinking in early childhood is one of the fundamental skills that helps children learn about themselves and their environment, as well as expand their problem-solving abilities. Critical thinking is not merely a cognitive attribute that allows you to memorize information, but a higher level of thinking that enables you to analyze information, develop new ideas, and utilize your environment as a learning medium through activities that create knowledge in your life. (Itsna et al., 2022)

(Khusnun & Muthia, 2020) In his research, he explains that there are four aspects of critical thinking skills in early childhood, which include: the ability of children to ask reasoning questions, think rationally, take perspectives, and analyze existing problems. These indicators show that critical thinking in early childhood is not just about the product, but about the process of thinking systematically. The indicators of critical thinking aspects are that children are able to: 1) manipulate materials and objects (symbolic thinking), 2) understand geometric concepts, 3) easily recognize cause-and-effect relationships, and 4) understand relationships or patterns.

Based on the research conducted by (Kusdiwelirawan & Rusyda, 2023) who concluded that the use of the Discovery Learning method has a significant impact on children's critical thinking skills. This method is widely used in educational institutions because it can enhance concept understanding, information management, decision-making, and children's ability to act. According to the research conducted by (Ratna Emilia & Dwi Tresna Santana, 2022) states that the utilization of recycled materials and surrounding environmental materials (loose parts) as learning media can enhance critical thinking skills, starting from asking questions, telling stories, evaluating, and discovering.

Based on the explanation above, the researcher aims to combine the discovery learning model with loose parts-based media. According to the literature mentioned, previous research has not addressed the combination of the discovery learning model using loose parts-based media. Therefore, this study will fill the knowledge gap and provide valuable insights to develop more effective learning practices at the early childhood education level. The objective of this research is to understand the impact of the discovery learning model by applying loose

parts-based media on early childhood critical thinking skills. This research makes a significant contribution to future studies, such as extending the observation period to assess the sustainability of the discovery learning model with loose parts media, exploring various types of loose parts materials to determine their effectiveness, and conducting research in different educational fields. Additionally, further research can investigate the impact of this model on other learning outcomes, such as creativity and collaboration, integrating technology into education, and combining discovery learning with other approaches like Project-Based Learning or STEAM. The research can also uncover the role of teachers in facilitating this education, including teaching strategies and professional development to achieve more effective implementation.

METHODS

In this study, the researcher applied a pre-experimental research design of the one-group pretest-posttest type. Because it lacks a control variable and the sample was not randomly selected, this type of research is classified as pre-experimental. Therefore, the results of this study cannot be fully attributed to the independent variable due to the influence of external variables. The independent variable in this study is the loose parts-based discovery learning model (*X*), and the dependent variable is the critical thinking skills of early childhood (*Y*).

The research design used is a pretest-posttest type, where a pretest is given before the intervention. One group of students is given a pretest (*O1*), then undergoes the treatment (*X*), and ends with a post-test (*O2*). The research design can be observed in more detail through the table below:

Table 1. Research Design

Pretest	Treatment	posttest
O1	X	O2

Description : O1 : Pretest Score
 X : Treatment
 O2 : Posttest Score

This research was conducted at Pos Paud Tanjung in Rembang District, Pasuruan Regency. The subjects of the research include all students at Pos Paud Tanjung, while the research focus is on 5-6-year-old children at Pos Paud Tanjung. The population in this study consists of all early childhood students at Pos Paud Tanjung, totaling 30 children, with a sample of 18 children from Group B selected using purposive sampling technique. This study was carried out over 2 months, from February to March 2023. Data collection techniques included direct observation and documentation. Data analysis techniques were performed to test the formulated hypotheses using non-parametric statistics.

The hypothesis testing used is the t-test. Before conducting the t-test, the researcher performed reliability and validity tests, data normality tests using the Kolmogorov-Smirnov test, data homogeneity tests using Levene's test, and variance analysis using the SPSS application.

RESULTS AND DISCUSSION

A. Result

This study aims to understand the effect of the discovery learning model using loose parts media on early childhood critical thinking skills. Data analysis from the one-group pretest-posttest design shows significant findings related to changes in early childhood critical thinking skills after being involved in the treatment using the discovery learning model with loose parts media. The data analysis began with normality and homogeneity tests and concluded with hypothesis testing. The normality test determines whether the data for each variable is normally distributed.

The results of the normality test using SPSS version 29 statistical software are presented in the following table :

Table 2. Normality Test

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.248	18	.005	.851	18	.009
Posttest	.175	18	.152	.907	18	.078

a. Lilliefors Significance Correction

According to the results in the table above, the data used is normally distributed. The pretest result is 0,09, which is $H. 0,09 > 0,05$. The posttest result is 0,78, which is $0,78 > 0,05$. Therefore, the data is normally distributed. Next, the researcher conducted a homogeneity test.

To obtain homogeneous data, the researcher used SPSS. The results can be seen in the table below :

Table 3. Uji Homogenitas

Test of Homogeneity of Variance

Hasil		Levene	df1	df2	Sig.
		Statistic			
	Based on Mean	2.023	1	34	.164
	Based on Median	1.977	1	34	.169
	Based on Median and with adjusted df	1.977	1	32.052	.169
	Based on trimmed mean	2.069	1	34	.159

Based on the results in the table above, it can be concluded that the data used is homogeneously distributed, with a significant result of $0.164 > 0.05$. Next, to address the research problem, hypothesis testing was conducted. In this case, a t-test analysis was performed using SPSS version 29. The data analysis can be verified through the t-test results as follows :

Table 4. T-Test Results

Base	Paired Differences	Paired Samples Test							Significance	H0 is		
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df			One-Sided p	Two-Sided p
					Lower	Upper						
rejected, as t	Pair 1 PRETEST - POSTEST	-7.22222	1.95706	.46128	-8.19544	-6.24900	-15.657	17	<.001	<.001	refore,	

it can be concluded that the discovery learning approach using loose parts media is effective and can be used to enhance the critical thinking skills of 5-6-year-old children. According to the research results, the average critical thinking skills score of the children before the treatment was 5.77. After the treatment, the children's critical thinking skills score increased from 7.23 to 13. Based on the research findings, it can be concluded that the study subjects are children at Pos Paud Tanjung, focusing on 5-6-year-olds. This study found that early childhood critical thinking skills are significantly influenced by the implementation of the Discovery Learning model with loose parts-based media.

The observed improvement indicates that the discovery learning method using loose parts media positively influences the critical thinking skills of 5-6-year-old children. With this treatment, each child's critical thinking skills have increased. Among the ten children who developed well, eight progressed as expected. To further enhance children's critical thinking abilities, it is necessary to employ a discovery learning approach using loose parts media in the learning process. This is due to the fact that, prior to the treatment, some children lacked the ability to easily understand, engage in symbolic thinking, grasp geometric concepts, comprehend cause and effect, and recognize patterns or sequences of events. Children are active, dynamic, enthusiastic, and very curious individuals.

B. Discussion

Based on the research findings presented above, the researcher has not found previous studies or reports that have examined or applied the discovery learning method in early childhood education institutions, especially in relation to developing critical thinking skills in young children. However, the use of the discovery learning model has been reported to deepen critical thinking skills and is beneficial for enhancing learning outcomes in elementary school students, as well as the use of loose parts media as a complementary innovation. This is supported by Gustina's research, which concluded that the use of Discovery Learning improves the critical thinking skills of 5th-grade students at SDN Gugus Dr. Soetomo. Dwi Suryaningrum & Satya Wacana Christian University (2023). ([Dwi Suryaningrum & Universitas Kristen SatyaWacana, 2023](#))

Similarly, Sekar's research shows that the Discovery Learning model of teaching media can have a significant impact on students' critical thinking skills. This is evidenced by the Wilcoxon test result with an Asymp. Significance value of $0.00 < 0.05$. This means there is a significant change in the average of the two paired samples. H_0 is accepted, H_a is rejected. ([Sekar et al., 2023](#)) The use of loose parts media has also been reported to enhance children's critical thinking skills. This is evidenced by findings from Sumarseh, which show a significant impact on children's critical thinking skills after implementing science experiments and using loose parts media in their learning activities. ([Sumarseh & Yaswinda, 2023](#))

From a series of learning activities conducted during the implementation of discovery learning models, children were encouraged to draw conclusions from data collection processes and experiments. They were also able to present their findings in front of their classmates. Furthermore, the addition of loose parts media played a crucial role during the learning process. Children were able to freely create and solve problems, thus enhancing their critical thinking skills through the approach and media utilized. This aligns with the research findings conducted by ([Ratna Emilia & Dwi Tresna Santana, 2022](#)) Using recycled materials and environmental resources as learning media (Loose Parts) can enhance your child's critical thinking skills.

The Discovery Learning model can also foster long-term learning motivation in children. In this strategy, children are encouraged to actively participate in learning and take on

the role of knowledge discoverers, thereby expanding their critical thinking skills. (Sausan et al., 2023) As previously explained, critical thinking skills are among the high-level cognitive abilities that should be developed as early as possible, and the discovery learning model is capable of enhancing children's cognitive abilities. Children need critical thinking as a life skill to help them analyze and consider various information they receive. (Rahmasari et al., 2021)

The ability of children to think critically is not separate from the role of parents. Parents act as educators, laying the foundation for a child's intellectual, emotional, and spiritual intelligence. Critical thinking skills can be taught to children through critical thinking patterns acquired from their environment. Introducing critical thinking patterns to children helps them develop critical thinking skills.

(Utari et al., 2022) With the interactive and exploratory nature of the Discovery learning approach, which provides children with opportunities to enhance their critical thinking skills through experiments and direct discoveries. Additionally, the media develops children's critical thinking from an early age through various aspects such as symbolic thinking (manipulating objects), understanding geometric concepts, grasping simple cause and effect relationships, and understanding patterns and sequences of events. This improvement can be attributed to Loose Parts providing additional stimulation that encourages children's creativity and imagination, helping them enhance their critical thinking skills. This learning can assist children in learning individually or in groups, based on each child's experiences. In enhancing the critical thinking skills of 5-6 year old children at Pos Paud Tanjung, Rembang District, Pasuruan Regency, researchers used the discovery learning method with loose parts media.

Based on the explanation and elaboration above, the implementation of this learning model is still rarely applied in early childhood education environments, especially for children's critical thinking skills. Therefore, with this research, teachers can design the discovery learning model using loose parts media as an innovation and gain a proper understanding of what, why, and how this model and media are applied, as well as supporting curriculum development that utilizes manipulative materials.

Despite the reported results, certain limitations of this study should be noted. These limitations include a limited sample size, relatively short intervention duration, and focus on a specific learning context or environment. Therefore, the results of this study may not be directly generalized to early childhood education institutions broadly. Further research with larger sample sizes, longer intervention durations, and broader contextual variations can address these limitations and provide deeper insights into the effectiveness of discovery learning using loose parts.

CONCLUSIONS

Based on the results of the previous research obtained, it can be concluded that this method has a significant impact on the critical thinking abilities of young children, as evidenced by the increase in scores before and after the tests. The discovery learning model facilitates active and explorative learning, while loose parts-based media stimulates creativity and innovation, working together to maximize cognitive development in children. Thus, this study affirms that the combination of these two variables is effective in enhancing the critical thinking skills of young children and has practical implications for improving educational standards in Indonesia.

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AUTHOR CONTRIBUTIONS STATEMENT

The author contributions for this study are as follows: TNS conceived the research idea and designed the methodology. PHP contributed to the literature review and data collection. H.H. performed the data analysis and interpretation. All authors were involved in the writing and editing of the manuscript. TNS drafted the initial manuscript, while PHP and HH revised it critically for important intellectual content. Each author provided critical feedback and helped shape the research, analysis, and manuscript. All authors have read and approved the final manuscript, ensuring the accuracy and integrity of the work.

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