

The Effect of the Problem Based Learning (PBL) Model Using Diorama Media on Students' Critical Thinking Abilities in Elementary School

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ABSTRACT

This research is motivated by the low critical thinking ability of students in the Natural and Social Sciences (IPAS) subject. The purpose of the study is to determine the effect of the Problem Based Learning (PBL) model assisted by diorama media on students' critical thinking ability. This study uses a quasi-experimental method with a nonequivalent control group design. The study population was all 48 third-grade students of SDN Pawenang. Consisting of 24 students of class III A and 24 students of class III B. The research instrument was a critical thinking test through pretest and posttest. The experimental class used the PBL model assisted by diorama media and the control class used conventional learning. The results showed that the average value of critical thinking ability of the experimental class increased from 41.25 to 89.17, $t_{count} = 11,917 > t_{table} = 2.013$ at a significance level of 5%, so there is a significant difference between the two classes. The N-Gain test of the experimental class obtained an average of 0.84, including the high category with an effectiveness level of 83.78%, including the effective category. The N-Gain test of the control class obtained an average of 0.47, including the medium category with an effectiveness level of 47.02%, including the less effective category. Based on these results, the Problem Based Learning (PBL) model assisted by diorama media has a significant effect on improving the critical thinking skills of third-grade students of Pawenang State Elementary School on the material of the layout of my residence in the 2025/2026 academic year.

Keywords: critical thinking skills, diorama, Problem Based Learning.



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INTRODUCTION

Education is the main foundation in efforts to build a better civilization. As an organized process, education not only serves to develop individual capacity, but also as a forum for forming a quality society. Law Number 20 of 2003 concerning the National Education System, Article 1 paragraph 1, education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual and religious strength, self-control, personality, intelligence, noble character, and

skills needed by themselves, society, nation, and state. Therefore, education is considered important and a need that must be met by every individual. One level of education that plays a role in realizing this goal is Elementary School.

Elementary school is the initial stage of education, providing a foundation for children to develop knowledge, intellectual abilities, and character after receiving education in the family and kindergarten environment. Through learning, each subject plays a role in equipping students to adapt to their environment, one of which is through natural science (IPAS) learning. The use of these two subjects is based on the way elementary school students think, which still views everything holistically and integrately. Therefore, learning emphasizes not only mastery of concepts but also an understanding of natural and social phenomena in the surrounding environment. Natural science learning in elementary school provides learning experiences based on real environments while developing critical thinking skills.

However, in reality, students' critical thinking skills at Pawenang Public Elementary School are still relatively low. This is evidenced by observations from interviews with third-grade teachers, who found that students still experience difficulty providing simple explanations, developing basic skills, and drawing conclusions. This indicates that students' critical thinking skills have not developed optimally, resulting in difficulties analyzing information, providing logical reasoning, and solving problems encountered during the learning process.

This situation is caused by teacher-centered learning, which tends to make students passive and less likely to actively think, ask questions, or express opinions. Furthermore, the use of learning media that support the development of critical thinking skills, such as dioramas, has not been implemented in learning. As a result, students lack concrete and meaningful learning experiences. If students' low critical thinking skills are not addressed, this can have various negative impacts. Students will have difficulty understanding and analyzing information, be less able to solve problems in everyday life, and be less accustomed to drawing logical conclusions. In the long term, this condition can hinder the development of critical thinking skills.

This research is crucial for improving students' critical thinking skills in science learning, particularly on the topic "My Housing Plan." Critical thinking skills are crucial for students to analyze information, understand relationships between places, and solve problems related to their surroundings. These problems can be addressed through the right approach. One learning model considered effective in improving students' critical thinking skills is PBL.

The PBL model is a problem-based learning model, where students are required to think critically in solving problems given by the teacher. This model provides opportunities for students to explore information independently, work in groups, and develop critical thinking and problem-solving skills [1]. To make the PBL model more engaging and effective, learning media also plays a crucial role in supporting the learning process so that learning materials and messages can be conveyed clearly. One form of media that can be used in learning is a diorama.

Dioramas were chosen because they present three-dimensional visual images that resemble real-life situations, making it easier for students to observe, analyze, and understand the concepts being studied. The use of dioramas, which provide realistic and concrete images, facilitates students' understanding of the context of the problem and encourages active involvement in critical thinking through observation, discussion, analysis, and reflection on the visually presented material [2].

Previous research has shown that the PBL model can improve students' critical thinking skills. Based on research by Amalia et al. [3], it was stated that the use of the Problem Based Learning model improves critical thinking skills in the learning process and motivates students to play an active role in their education to achieve predetermined learning objectives. These findings indicate that the PBL model has the potential to improve the quality of learning. However, research on the application of the PBL model assisted by diorama media to the material of the layout of my residence is still limited. Therefore, research is needed to test the effect of the PBL model assisted by diorama media on students' critical thinking skills in this material.

Based on the explanation above, the purpose of this study is to determine the effect of the application of the Problem Based Learning (PBL) model assisted by diorama media on students' critical thinking skills in the material on the layout of my residence, grade III at Pawenang State Elementary School, Jatinunggal District, Sumedang Regency, in the 2025/2026 academic year.

LITERATURE REVIEW

Critical Thinking Ability

In everyday life, humans cannot escape from the activity of thinking because every activity carried out always involves the process of understanding, consideration, and decision-making. Critical thinking skills are very important to have. Critical thinking is a person's ability to analyze information, evaluate the truth, and draw conclusions logically and rationally. By thinking critically, a person does not easily accept information, but is able to examine, question, and can prove its truth. Susanto, et al. [4] state that critical thinking is the skill of active thinking, reflection, and reasoning from every piece of information obtained. Critical thinking is also a way of thinking actively and skillfully in analyzing and evaluating information obtained to reach a final conclusion that can be proven true.

Mayers in [5] explains that the development of critical thinking skills must be supported by a classroom environment that encourages discussion, questioning, inquiry, and deliberation. Such a classroom environment can be created through time management that allows for more discussion and through the creation of effective and clear assignments. Critical thinking helps individuals make informed decisions, be independent, and resist being easily deceived. Furthermore, critical thinking also encourages creative ideas, understanding others, and collaboration for a better community. Given the importance of critical thinking skills, indicators are needed to measure and develop students' critical thinking skills in the learning process.

According to Ennis in [6] critical thinking skills consist of five indicators, namely (1) providing simple explanations, (2) building basic skills, (3) concluding, (4) making further explanations, (5) strategies and tactics. In this study, researchers limited the measurement of critical thinking skills to three indicators, namely (1) providing simple explanations, (2) building basic skills, (3) concluding. These three indicators were chosen because they best suit the characteristics of cognitive development of grade III elementary school students who are still at the concrete operational stage. At this stage, students find it easier to understand things that are simple, real, and close to everyday life, such as the material on the Plan of My Residence.

Students' critical thinking skills are measured using a test instrument designed based on these three indicators and tailored to the subject matter. This aligns with the opinion of Susanto

[4], who stated, "Critical thinking also needs to be drilled into questions. Critical thinking skills will also develop through the ability to answer questions within specific categories".

Problem Based Learning (PBL) Model Assisted by Diorama Media

The PBL model is a problem-based learning model that places students at the center of learning through collaborative real-world problem solving. Aldriansyah, et al. [1] stated that "The Problem Based Learning (PBL) learning model is a problem-based learning model, where students are required to think critically in solving a problem given by the teacher." This opinion is reinforced by Anugraheni in [7] that "The Problem Based Learning learning model or problem-based learning model is a learning model that involves students in learning activities and prioritizes real-world problems both in the school, home, or community environment as a basis for acquiring knowledge and concepts through critical thinking and problem-solving skills." Based on this understanding, the application of the PBL model is carried out through several stages designed to guide students in solving problems systematically.

According to Haryanti in [1] the steps of the PBL model include (1) orienting students to problems, (2) organizing students to learn, (3) guiding individual and group investigations, (4) developing and presenting work results, (5) analyzing and evaluating the problem-solving process. These five stages form a student-centered learning process by emphasizing systematic learning solution activities. Through these stages, students are encouraged to actively seek information, analyze problems, find solutions, and draw conclusions so that critical thinking skills can develop optimally.

The PBL model has advantages in helping students understand the material more deeply through problem solving, stimulating critical thinking skills, increasing activeness, and facilitating the application of knowledge in everyday life. In addition, the PBL model also has disadvantages such as not being able to be applied to all learning materials, requiring a long time, requiring adequate facilities and infrastructure, and facing obstacles in dividing tasks among heterogeneous students, so its implementation needs to be adjusted to the conditions and readiness of the school and students. To make the PBL model more interesting and effective, learning media also has an important role in supporting the learning process so that the material and learning messages can be conveyed clearly.

The word media comes from the Latin word *medius*, which literally means intermediary or messenger. Linguistically, media is an intermediary or conveyor of messages from sender to recipient. Akbar et al. [8] state that "Learning media is a vehicle or instrument that plays a role in facilitating the teaching and learning process to improve the quality and efficiency of knowledge delivery from educators to students." Based on the definition of learning media that has been put forward, the researchers chose dioramas as their learning medium.

A diorama is a three-dimensional visual medium or miniature imitation object designed to aid the learning process because it is able to present realistic images of objects or events in a simpler form. In this study, the researcher chose an open diorama medium because it has no dividing walls so that objects can be clearly observed from various angles. This condition makes it easier for students to understand the relationships between objects and supports a more effective learning process. Dioramas play an important role in improving the quality of learning because they are able to visualize objects in a concrete and three-dimensional manner, thus facilitating student understanding. Dioramas also overcome the limitations of space, time, and distance by presenting objects or events in miniature form. The use of dioramas media helps

students understand the material concretely, while also overcoming the limitations of space, time, and distance by presenting objects or events in miniature form.

In this study, the researcher chose an open diorama medium because it has no dividing walls so that objects can be clearly observed from various sides. This condition makes it easier for students to understand the relationships between objects and supports a more effective learning process. Wulandari in [9] stated that the use of interactive visual media, such as dioramas, can improve students' critical thinking skills compared to conventional text-based methods. Based on the description above, diorama media will be more optimal when combined with learning models that focus on problem solving, such as Problem Based Learning (PBL).

The application of the PBL model assisted by diorama media is an effective learning alternative to improve students' critical thinking skills through problem-solving activities supported by concrete object presentations, so that learning objectives can be achieved optimally. In line with the opinion of Marlina et al. [2] that the PBL model assisted by diorama can be used as an alternative learning strategy that is able to encourage student involvement and develop critical thinking skills optimally. Therefore, the application of the PBL model assisted by diorama media helps improve students' critical thinking skills through active, meaningful, and contextual learning.

METHODS

This study used a quantitative approach with a quasi-experimental method that aims to determine the effect of the PBL model assisted by diorama media on the critical thinking skills of elementary school students. The research design used was a nonequivalent control group, this design involved two groups, namely the experimental class and the control class that were not selected randomly (non-random). This research design was conducted a pretest before the treatment and a posttest after the treatment. The treatment referred to in this study was the application of the PBL learning model assisted by diorama media in the experimental class, while the control class used a conventional learning model that includes lecture methods, questions and answers, and limited discussions, where the teacher plays a more dominant role as a conveyor of information and students as recipients of information. The description of the quasi-experimental research design according to Sugiyono [10] is presented in Table 1.

Table 1. Research Design

Class	Pretest	treatment (x)	Posttest
Experiment	O ₁	X _{Experiment}	O ₂
Control	O ₃	X _{Control}	O ₄

Information:

- O₁ : Pretest before learning with the PBL model assisted by diorama media
- O₂ : Posttest after learning with the PBL model assisted by diorama media
- O₃ : Pretest before learning with conventional methods
- O₄ : Posttest after learning with conventional methods
- X_{Experiment} : Learning using the PBL model assisted by dioramas
- X_{Control} : Conventional learning methods include lectures, questions and answers, and group discussions.

Both classes were first given a pretest to determine students' initial critical thinking skills. Next, the experimental class received instruction using the PBL model with the aid of dioramas,

while the control class underwent conventional learning involving lectures, question-and-answer sessions, and group discussions. After the entire learning process was completed, both classes were given a posttest to determine the improvement in students' critical thinking skills in each class. The population of this study was all 48 third-grade students at Pawenang Public Elementary School, Jatinunggal District, Sumedang Regency.

These two classes were designated as the experimental and control classes. The experimental class, Class III-A, with 24 students, received treatment using the problem-based learning model with the aid of dioramas. The control class, Class III-B, with 24 students, received conventional learning without any special treatment. The determination of the experimental and control classes was based on predetermined classroom conditions, involving two non-randomly selected classes.

In this study, the instruments used were pretest and posttest critical thinking ability question sheets. The pretest sheet was an instrument given to students before being given treatment, while the posttest sheet was an instrument given after students received treatment to determine the extent of improvement in students' critical thinking abilities after the implementation of the PBL model assisted by diorama media, in addition, the pretest and posttest were also given to the control class as a comparison. The pretest and posttest questions were arranged based on a grid that had been designed according to the indicators of critical thinking abilities according to Ennis in [6], namely providing simple explanations, building basic skills, and concluding. The questions given were 10 items in the form of Multiple Choice questions, each correct answer was given a score of 1 and an incorrect answer was given a score of 0. Thus, the maximum score that a student could obtain if they answered all correctly was 10.

RESULTS AND DISCUSSION

Results

In this study, data were obtained from the results of a pretest administered before the treatment and a posttest administered after the treatment in both classes to determine differences in students' critical thinking skills before and after the learning process. The experimental class used the PBL model assisted by dioramas, while the control class used conventional learning.

Based on data analysis, all students in the experimental class experienced an increase in their scores after the treatment. Each student's posttest score was higher than their pretest score, indicating an increase in critical thinking skills after participating in the PBL model assisted by dioramas. This improvement was also evident in the increase in the class' average score, indicating a positive impact of the treatment. This improvement can be seen in Figure 1 below.

Based on Figure 1, it can be seen that the average student score increased, from 41.25 in the pretest to 89.17 in the posttest. This increase indicates that after participating in learning using the PBL model assisted by diorama media, students' critical thinking skills improved compared to before being given the treatment. These results indicate that the application of the PBL model assisted by diorama media provided positive changes to students' critical thinking skills on the material of the layout of my residence.

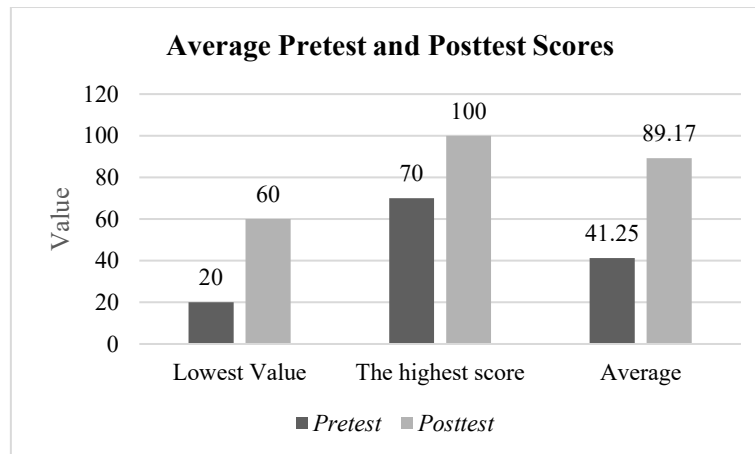


Figure 1. Average Pretest and Posttest Scores of the Experimental Class

Students in the control class were also given two types of tests with the same questions, but at different times. The pretest and posttest aimed to determine students' critical thinking skills before and after being given conventional learning, which included lectures, questions and answers, and limited discussions. The analysis results showed that students' critical thinking skills in the control class improved after the learning. However, the increase was not as large as the increase in the experimental class that received learning using the PBL model assisted by dioramas. The difference in the increase in average pretest and posttest scores in the control class can be seen in Figure 2.

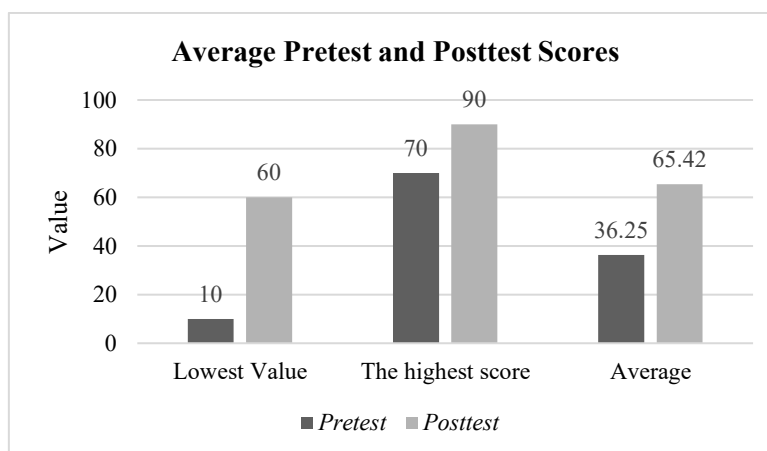


Figure 2. Average Pretest and Posttest Scores of the Control Class

Based on Figure 2, it can be seen that the average student score increased, from 36.25 in the pretest to 65.42 in the posttest. This increase indicates a change in students' critical thinking skills after participating in conventional learning methods that include lectures, question and answer, and limited discussions. However, the average posttest score for the control class was still lower than that of the experimental class, so the increase in critical thinking skills in the control class was not as large as the increase that occurred in the experimental class that used the Problem Based Learning (PBL) model assisted by dioramas.

After the pretest and posttest scores for the experimental and control classes were obtained, the data were analyzed. Data analysis began with a normality test to determine whether the pretest and posttest data were normally distributed. The normality test in this study used the Lilliefors test with a 5% significance level. Data processing and analysis were performed using

Microsoft Excel. The results of the normality test are presented in Table 2.

Table 2. Results of the Normality Test of Pretest and Posttest Data

Class	ValueData	Number Of Students	$\bar{x}$	SD	L_{count}	L_{table}	Conclusion	Information
Experiment	Pretest	24	41.25	15.13	0.1465	0.1798	H_0 accepted	Data is normally distributed
	Posttest		89.17	11.00	0.1710		H_0 accepted	
Control	Pretest	24	36.25	14.98	0.1617	0.1798	H_0 accepted	Data is normally distributed
	Posttest		65.42	11.03	0.1721		H_0 accepted	

Based on Table 2, the results of the normality test show that all data are normally distributed. This shows the normality criteria because $L_{hitung} < L_{table}$. This means that $L_{hitung} < L_{table}$ if H_0 (normally distributed sample) is accepted and H_a (non-normally distributed sample) is rejected. So based on the test results above, it can be concluded that the data from the experimental class and the control class come from normally distributed samples.

After conducting the normality test, a homogeneity test was performed using the F test. To find the F value, the largest and smallest variance values of the variance values of the two classes were determined. The hypothesis formulation used in the homogeneity test is as follows. H_0 : variance 1 is the same as variance 2 or homogeneous. H_a : variance 1 is not the same as variance 2 or is not homogeneous. Test criteria if $F_{hitung} \leq F_{table}$ then the variance is homogeneous, if $F_{hitung} > F_{table}$ then the variance is not homogeneous. Based on the calculation results, the value obtained is F_{hitung} and F_{table} in the experimental class and the control class. The results of the homogeneity test are presented in Table 3 below.

Table 3. Homogeneity Test of Critical Thinking Pretest and Posttest Data

Value Data	Class	N	$\bar{x}$	S ²	F _{count}	F _{table}	Conclusion
Pretest	Experiment	24	41.25	114.293	1.01	2.014	Homogen
	Control		36.25	112.957			
Posttest	Experiment	24	89.17	57.712	1.49		Homogen
	Control		65.42	38.366			

Based on the homogeneity test, the pretest data obtained a value of $1.01 < 2.014$, so H_0 is accepted, and the variances of both groups are declared homogeneous. It can be concluded that the variances of the pretest data in both sample groups are homogeneous. The posttest data obtained a value of $1.49 < 2.014$, so H_0 is also accepted, and the variances of both groups are declared homogeneous. It can be concluded that the variances of both sample groups in the posttest data are homogeneous. Therefore, hypothesis testing continued using a t-test.

The t-test was conducted to determine whether there were differences in students' critical thinking skills between the class using the PBL model with the aid of dioramas and the class using conventional learning. The results of the hypothesis testing are presented in Table 4.

Table 4. t-Test Calculation Results ($\alpha=0,05$)

Value Data	Class	T _{count}	T _{table}	Conclusion	Information
Pretest	Experiment	1.953	2.013	H _α Rejected	There is no significant difference
	Control			H ₀ Accepted	
Posttest	Experiment	11.917		H ₀ Rejected	There is a significant difference
	Control			H _α Accepted	

Based on Table 4. the pretest data obtained $t_{hitung} = 1.953$ and $t_{table} = 2.013$ at the significance level $\alpha=0.05$. because $1.953 < 2.013$ so H₀ then accepted and H_α rejected. This shows that there is no difference in critical thinking ability between the experimental and control classes in the pretest. Meanwhile. the posttest data obtained $t_{hitung} = 11.917$ and $t_{table} = 2.013$. Because $11.917 > 2.013$ so H_α accepted and H₀ rejected. Thus. there is a difference in students' critical thinking skills between learning using the PBL model assisted by dioramas and learning using conventional methods. This indicates that the implementation of the PBL model assisted by dioramas is effective in improving third-grade students' critical thinking skills on the topic "My Housing Plan" at Pawenang Public Elementary School, Jatinunggal District, Sumedang Regency, in the 2025/2026 academic year.

The next data analysis in this study was the N-Gain test. The N-Gain test aims to determine the effectiveness of using a method or treatment. The results of the N-Gain test are presented in Table 5 below.

Table 5. N-Gain Test Calculation Results

Class	Number of Students	Highest Pretest Score	Lowest Posttest Score	Average	N-Gain Score	N-Gain Percent	Category
Experiment	24	70	20	Pretest 41.25	0.84	83.78%	Effective
				Posttest 89.17			
Control	24	90	10	Pretest 36.25	0.47	47.02%	Less Effective
				Posttest 65.42			

Thus, the implementation of the PBL model with the aid of dioramas effectively improved students' critical thinking skills, categorized as effective. Meanwhile, conventional learning was categorized as less effective in improving students' critical thinking skills.

Discussion

Based on the analysis of pretest and posttest data from the experimental and control classes, differences in students' critical thinking skills were identified on the topic of "My House Plan." A comparison of the pretest and posttest scores for each class revealed a difference in critical thinking skills between the experimental and control classes.

In the experimental class, critical thinking skills were still relatively low before the instruction. This was demonstrated by the pretest results, with an average score of 41.25, with the highest score being 70 and the lowest being 20. This indicates that students' critical thinking skills were still low before the instruction. The low pretest results indicate that most students still experienced difficulty analyzing problems.

To determine students' critical thinking skills after being treated with the PBL model assisted by dioramas. Posttest results showed an increase in students' critical thinking skills after participating in learning using the PBL model assisted by dioramas. Students' average score increased from 41.25 in the pretest to 89.17 in the posttest, with the highest score being 100 and the lowest being 60. Thus, the average posttest score increased to 47.92. This increase indicates that the implementation of the PBL model assisted by dioramas can improve students' critical thinking skills.

Furthermore, in the control class, the average pretest score was 36.25. The highest score obtained by students was 70, while the lowest score was 10. The posttest data indicated an increase in students' critical thinking skills after participating in the learning. The average student score increased from 36.25 in the pretest to 65.42 in the posttest, with the highest score being 90 and the lowest score being 50. Thus, the average posttest score increased by 29.17.

Based on the normality test, the pretest value of the experimental class was obtained $L_{hitung} = 0,1465 < L_{table} = 0.1798$, in the posttest of the experimental class $L_{hitung} = 0,1710 < L_{table} = 0.1798$. In the pretest of the control class, it was obtained $L_{hitung} = 0,1617 < L_{table} = 0.1798$ and posttest of control class $L_{hitung} = 0,1721 < L_{table} = 0.1798$. That is, if $L_{hitung} < L_{table}$ so H_0 (the sample is normally distributed) accepted and H_a (the sample is not normally distributed) rejected. So, based on the test results above, it can be concluded that the data from the experimental class and the control class come from normally distributed samples.

The data is declared homogeneous at the significance level $\alpha = 0,05$, the F_{hitung} of the pretest data of both classes is 1.01, based on this data, the value of $F_{hitung} < F_{table}$ is $1.01 < 2.014$, then F_{hitung} for the posttest data of both classes is 1.49, with a value of $1.49 < 2.014$, then H_0 is accepted. Thus, the variance of the pretest and posttest data in both sample groups is homogeneous, so hypothesis testing can be continued using the t-test.

To determine whether there is a significant difference between the class using the PBL model assisted by diorama media and the class using conventional learning, a t-test was conducted. The results of the t-test on the pretest data showed a value of $t_{count} = 1.953$ and $t_{table} = 2.013$ at a significance level of $\alpha = 0.05$. Because $t_{hitung} < t_{table}$, so H_0 accepted and H_a rejected. This shows that there is no significant difference in students' critical thinking skills between the experimental class and the control class before being given the treatment. Furthermore, the t-test results on the posttest data show a value of $t_{hitung} = 11.917$ and $t_{table} = 2.013$. Because $t_{hitung} > t_{table}$, so H_a accepted and H_0 rejected. These results indicate a significant difference in students' critical thinking skills between the class using the PBL model with dioramas and the class using conventional learning after the treatment.

To determine the level of improvement and effectiveness of learning, an N-Gain test was conducted. In the experimental class, the average N-Gain was 0.84, with an effectiveness level of 83.78%, categorized as effective. These results indicate that the implementation of the PBL model with dioramas effectively improved students' critical thinking skills. In the control class, the average N-Gain was 0.47, with an effectiveness level of 47.02%, categorized as less effective. These results indicate that conventional learning is less effective in improving students' critical thinking skills.

Based on the data analysis, the PBL model, supported by dioramas, proved effective in improving the critical thinking skills of third-grade students on the topic of "My Residence

Plan." Thus, there was a significant effect of the implementation of the PBL model, supported by dioramas, on students' critical thinking skills. This finding is supported by Sani's [11] opinion, which states, "PBL can improve critical thinking skills, foster initiative in learning or working, foster internal motivation for learning, and foster interpersonal relationships in group work." The implementation of the PBL model, supported by dioramas, helped students understand the material on "My Residence Plan" more concretely because the objects and environments studied could be visualized in three dimensions.

Based on this discussion, the PBL model, supported by dioramas, can be used as an alternative learning method to improve the critical thinking skills of elementary school students. Therefore, educators need to implement innovative learning models that are appropriate to student characteristics to optimally develop critical thinking skills and achieve learning objectives.

CONCLUSION

Based on the formulation of the problem and the results of data processing, the researcher concluded that the application of the Problem Based Learning (PBL) model assisted by diorama media had a significant effect on students' critical thinking skills in the material of my residence plan for grade III at Pawenang State Elementary School, Jatinunggal District, Sumedang Regency, 2025/2026 Academic Year.

This is evidenced by the results of the N-Gain test. In the experimental class, the N-Gain value was in the high category. These results indicate an increase in students' critical thinking skills after implementing the PBL model with dioramas. Meanwhile, in the control class, the average N-Gain was in the medium category. These results indicate that the increase in students' critical thinking skills in the control class was lower than that in the experimental class.

Thus, the implementation of the PBL model with dioramas was more effective in improving students' critical thinking skills compared to conventional learning. This is because the PBL model encourages students to actively solve problems, while the dioramas facilitate concrete understanding of the material, thereby significantly developing students' critical thinking skills.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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