



The Effect of Problem Based Learning Model on the Science Learning Outcomes Of Grade V Students of UPTD SD Negeri 122354 Pematangsiantar

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Abstract

This study was conducted based on the researcher's observation of class V of SD Negeri 122354 Pematangsiantar that teachers still use conventional learning models so that students are less involved in the learning process. This causes the learning process to be less than optimal and student learning outcomes do not meet the criteria for achieving learning objectives. From these problems, it is necessary to find a solution, including by implementing the Problem Based Learning learning model. This learning model can be applied to science subjects because it encourages students to work together and communicate with each other in completing their assignments. This learning model can improve the quality of science learning so that students are more active, creative, and learning is more meaningful so that learning outcomes increase. This study uses a quantitative method with a Pre-Experiment research type and a One Group Pretest-Posttest research design with a sample of 22 students. Based on the results of the hypothesis test with a significance level of 0.05 $t_{count} = 19.495$ with a significant level (2-tailed) of 0.000 significant probability <0.05 , $t_{count} > t_{table} = 19.495 > 1.717$ then H_0 is rejected and H_1 is accepted. This explanation indicates that the Problem-Based Learning model has an influence on the science learning outcomes of fifth-grade students at the UPTD of SD Negeri 122354 Pematangsiantar.

Keywords: Problem-Based Learning Model, Learning Outcomes, Science learning





INTRODUCTION

Education is a fundamental process aimed at developing individuals' potential, both physically and mentally, to become quality human resources. In Indonesia, this effort is formally regulated in Law Number 20 of 2003 concerning the National Education System, which emphasizes that education is a conscious and planned process to create learning conditions that enable students to actively develop their potential in terms of spirituality, personality, intelligence, and skills needed for society and the nation. The educational process is not merely about transferring knowledge but also about facilitating the holistic development of students. Learners should be viewed as individuals with unique potential that must be nurtured through meaningful learning experiences. Therefore, teachers play a crucial role in creating learning environments that encourage creativity, critical thinking, and active participation so that students can optimally develop their abilities.

In line with these goals, the implementation of the Independent Curriculum (Kurikulum Merdeka) introduces significant changes, including the integration of Natural Sciences (IPA) and Social Sciences (IPS) into Natural and Social Sciences (IPAS). This subject aims to foster students' curiosity, inquiry skills, and conceptual understanding through scientific approaches. Learning in IPAS emphasizes hands-on activities and real-life problem-solving to help students construct knowledge meaningfully. Learning outcomes are important indicators of the success of the educational process. They reflect students' achievements in cognitive, affective, and psychomotor domains after participating in learning activities. Good learning outcomes indicate that students have successfully understood the material and achieved the instructional objectives. Therefore, improving learning outcomes is one of the main priorities in educational practice.

However, achieving optimal learning outcomes requires the use of appropriate teaching strategies. Teachers need to master the material, utilize learning media effectively, and apply innovative learning models that engage students actively. Conventional teaching methods, such as lectures, often limit student participation and reduce opportunities for interaction, which can negatively impact learning outcomes. Previous studies have shown that the Problem Based Learning (PBL) model can significantly improve student learning outcomes. Research by Rina Wati et al. (2025) revealed that the implementation of PBL increased students' average scores from 57.7 to 77.43, with a significant statistical effect. Similarly, a study by Yudanty et al. (2025) found that students taught using the PBL model achieved higher learning outcomes compared to those taught using conventional methods. These findings indicate that PBL is effective in enhancing students' understanding and engagement in learning.



Based on observations conducted at UPTD SD Negeri 122354 Pematangsiantar, students' learning outcomes in IPAS were still relatively low. Of the 22 students, only 36.36% achieved the minimum learning criteria (KKTP), while 63.64% did not meet the standard. This condition is influenced by the dominance of lecture-based teaching methods, which limit student involvement and reduce opportunities for active learning.

To address this issue, it is necessary to implement an innovative learning model that can improve student engagement and understanding. Problem Based Learning (PBL) is considered an appropriate approach because it presents real-life problems that encourage students to think critically, collaborate, and actively construct knowledge. Therefore, this study aims to examine the effect of the Problem Based Learning model on the science learning outcomes of fifth-grade students at UPTD SD Negeri 122354 Pematangsiantar.

RESEARCH METHODS

1. Type of Research

Sugiyono (2018:110) states that the experimental method is a quantitative research method used to understand the impact of independent variables (treatments) on dependent variables (outcomes) under observed conditions. Each type of research methodology has its own characteristics or differences from other research methods. These differences can be understood from the specific characteristics of this experimental analysis method.

This research will use a One-Group Pretest-Posttest design, which will be completed in three stages. In the first stage, the researcher will conduct a pretest to determine students' abilities after receiving the pretest results; in the second stage, they will engage in the learning process using the Problem-Based Learning model; and in the final stage, they will conduct a posttest to determine the results or effects of Problem-Based Learning. The image below shows the research design used with the one-group pretest-posttest design.

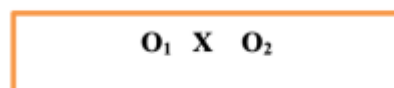


Figure 1. One-Group Pretest-Posttest Design

Note:

O₁: Pretest (initial test before treatment)

X: Implementation of the problem-based learning model

O₂: Posttest results (after treatment)

In the initial stage, a pretest (O1) was conducted, followed by treatment using the problem-based learning model. A posttest (O2) was then administered. The results of the treatment's effects can be seen from the differences obtained through O1 and O2.

2. Research Location and Timeline

This research was conducted at SDN 122354 Pematangsiantar, Tambun Timur Street, Tambun Nabolon Subdistrict, Siantar Martoba District, Pematangsiantar City, North Sumatra Province. This research will be conducted in the even semester of the 2025/2026 academic year.

3. Research Population and Sample

1) Research Population

A population is the entirety of subjects or objects that possess certain characteristics and are the target of generalization of research results. Sugiyono (2019) defines a population as a generalization area consisting of objects/subjects possessing certain qualities and characteristics determined by the researcher to be studied and then conclusions drawn. In the context of educational research, a population can be students, teachers, schools, educational policies, or specific learning practices.

The population of this research was fifth-grade students of the UPTD SDN 122354 Pematangsiantar in the 2025/2026 academic year. The number of students in fifth grade was 22.

Tabel 1. Population of the research

No	Class	Total number of students		Total
		Males	Females	
1	V	17	5	22

(Source: Form-teacher of class V UPTD SDN 122354 Pematangsiantar)

2) Research Sample

The sample in this study was all 22 fifth-grade students, consisting of 17 males and 5 females. The sampling technique used in this study was saturated sampling. This technique is typically used when the population is relatively small, i.e., less than 30 students.

4. Data Collection Techniques

According to Sugiyono (2018:296), data collection techniques are the most important

step in research, because the primary goal of research is to obtain data. Without understanding data collection techniques, researchers will not obtain data that meets established data standards. Data collection techniques refer to the methods or approaches used by researchers to collect information, facts, or data relevant to their research objectives. In this study, the following techniques were used:

1) Observation

Observation techniques are a method of data collection carried out by systematically observing and recording the objects being studied, both in specific laboratory situations and in natural settings. To determine initial field conditions, these observations are conducted to directly observe the learning conditions occurring in the classroom, both before and after the use of the Problem-Based Learning model.

2) Tests

To determine whether learning objectives have been achieved, evaluation or correction of learning outcomes is necessary. Tests are the tools used to measure this evaluation. Tests are used to assess and evaluate student learning outcomes using teaching materials in accordance with educational objectives. Tests are used to understand students' learning success in their studies. The technique used in this study was to administer performance tests and final tests to students before and after learning using a Problem-Based Learning model.

In this study, the tests were administered twice: once at the beginning of the learning process (pre-test) and once at the end of the learning process (post-test). The pre-test was administered at the beginning of the learning process to assess students' initial abilities. Conversely, the post-test was administered at the end of the learning process to determine student learning outcomes after using problem-based learning. If the post-test results were higher than the initial pre-test results, it could be concluded that the Problem-Based Learning Model had an impact on student learning outcomes.

3) Documentation

According to Sugiyono (2018:314), "documentation is a method used to obtain data and information in the form of books, archives, documents, written figures, and images in the form of reports and explanations that can support research." Through documentation studies, the author collected data through documents and images to complement written data obtained through interviews. The documentation used in this study is in the form of photos related to the

UPTD SD Negeri 122354 Pematangsiantar school and student notebooks.

5. Data Analysis Techniques

The data analysis techniques used are clear, with data analysis directed at answering the problem statement and/or testing the hypotheses formulated in the proposal.

1) Normality Test

The normality test is a step to determine whether data is normally distributed or not. If an analysis uses a parametric method, the data must meet the normality requirements. Data that are not normally distributed should use non-parametric statistical tests (Nuryadi et al., 2017:79). To test for normality, this study used the Shapiro-Wilk test. This test, with a significance level of 0.05 or 5%, is considered normally distributed. The normality test criteria are: if Sig <0.05, the data is considered non-normally distributed; if Sig >0.05, the data is considered normally distributed (Widana and Muliani, 2020).

2) Hypothesis Testing

To determine a hypothesis test, the data can be assessed for normality using the Shapiro-Wilk test. If the data is normally distributed, the paired sample test is used. If the data is not normally distributed, the Wilcoxon Signed Rank Test is used. According to Widana and Muliani (2020:71), the Shapiro-Wilk test is used to determine whether data originates from a normal distribution or not. According to Rudianto (2020:10), the Wilcoxon test is used to examine conditions (variables) in paired samples or for pre- and post-test research. This test utilizes the SPSS software application.

T-Test Formula:

$$t = \frac{r\sqrt{N-2}}{1-r^2}$$

(Sugiyono, 2017: 248)

Where:

t = t-test value

r = r-correlation value

N = Number of samples

Hypothesis testing was conducted with a 95% confidence level and a significance level of 0.05 (5%). If the calculated t value is greater than the calculated t value, then H_0 is accepted.





This decision is based on a comparison of the calculated t value with the calculated t value. As follows:

- If the calculated t value is greater than the calculated t value, then H_1 is rejected, and H_0 is accepted. This means that there is an effect of using the problem-based learning model on the social studies learning outcomes of fifth-grade students at the UPTD SDN 122354 Pematangsiantar.
- If the calculated t value is less than the calculated t value, then H_1 is accepted, meaning there is no effect of using the problem-based learning model on the social studies learning outcomes of fifth-grade students at the UPTD SDN 122354 Pematangsiantar.

RESULTS

This research was conducted at SD Negeri 122354 Pematangsiantar on the topic "Parts of the Earth" in grade V. Before conducting the research, the researcher conducted an Instrument Test at another school, namely SD Negeri 094155 Rambung Merah in grade V to prove the questions were suitable for use. The questions distributed were 40 items to 31 students, then the results of the questions would be tested on the instrument, the tests that would be carried out were validity test, reliability test, difficulty level test and test of question discrimination. After the data was valid and reliable, the number of questions were declared valid and tested to the research class at SD Negeri 122354 Pematangsiantar. Research at Public Elementary School 122354 Pematangsiantar conducted a Pretest, Before being given treatment of the Problem Based Learning learning model and Posttest after being given treatment at the research school. The Pretest was conducted to see the initial abilities of students before being given treatment to students, after the Pretest was conducted, the results of low scores were obtained at the time after the Pretest, the researcher provided material on "Parts of the Earth" using the Problem Based Learning learning model then the researcher gave treatment. The Posttest is the final test to see the abilities of students after being given treatment with the Problem Based Learning learning model.

Based on descriptive data that has been done by researchers through SPSS 24 Test, it can be concluded that the average score of 22 students in the pretest and posttest results is 37.09 and 83.45 based on the value data before and after the treatment has increased from 37.09 to 83.45. After conducting the descriptive test, the researcher conducted a Normality Test and Hypothesis Test (T-Test). The normality test was calculated using SPSS 24 with Shapiro-Wilk significance where if the significance value (sig) for all data > 0.05 is normal and if $\text{sig} < 0.05$ is not normally distributed. Based on the data obtained, the significance of the posttest normality





test $0.15 > 0.05$, where the results are greater and normal. The t-test obtained t count of 19.495 with a significance level of 0.000. Because the probability of significance is much smaller than 0.05, namely 0.000 and t count $>$ t table ($19.495 > 1.717$), then H_0 is rejected and H_1 is accepted. This indicates a significant influence between the Problem Based Learning learning model on the science learning outcomes of fifth-grade students of SD Negeri 122354 Pematangsiantar.

DISCUSSION

The findings of this study indicate that the application of the Problem Based Learning (PBL) model has a significant effect on students' science learning outcomes. This is evident from the substantial increase in the average score from the pretest (37.09) to the posttest (83.45). The improvement suggests that students experienced meaningful learning after being exposed to the PBL model, particularly in understanding the topic "Parts of the Earth." The low pretest scores reflect students' limited prior knowledge, while the high posttest scores demonstrate that the instructional intervention was effective.

The effectiveness of the PBL model can be attributed to its student-centered approach, which encourages learners to actively engage in problem-solving activities. In this study, students were not merely passive recipients of information but were involved in exploring, analyzing, and discussing real-world problems. This active participation likely contributed to deeper conceptual understanding and better retention of scientific concepts, which is reflected in the improved posttest scores. Furthermore, the significant difference confirmed by the t-test results (t-count = 19.495 $>$ t-table = 1.717, sig $<$ 0.05) strengthens the conclusion that the PBL model positively influences learning outcomes. The statistical evidence indicates that the observed improvement is not due to chance but is a direct result of the treatment applied. This aligns with the theoretical foundation of PBL, which emphasizes critical thinking, collaboration, and independent learning as key drivers of academic success.

The results of the normality test also support the validity of the analysis, as the data were normally distributed (sig = 0.15 $>$ 0.05). This means that the assumptions required for conducting the t-test were met, thereby increasing the reliability of the findings. With properly distributed data and significant hypothesis testing results, the study provides strong empirical support for the effectiveness of the PBL model in elementary science education. In addition, the use of PBL in teaching the "Parts of the Earth" topic appears to help students connect abstract concepts with real-life contexts. Science topics often require conceptual understanding rather than rote memorization, and PBL facilitates this by presenting problems that are relevant to students'





experiences. As a result, students are more motivated to learn and are able to construct their own understanding, which leads to improved academic performance.

These findings are consistent with previous studies that highlight the benefits of Problem Based Learning in enhancing students' cognitive abilities and learning outcomes. Many researchers have reported that PBL improves not only knowledge acquisition but also skills such as critical thinking, communication, and collaboration. Therefore, the results of this study reinforce the idea that PBL is an effective instructional model, particularly for science subjects at the elementary school level.

However, despite the positive results, this study has some limitations. The sample size was relatively small, consisting of only 22 students from one school, which may limit the generalizability of the findings. Additionally, the study focused on a single topic within science, so further research is needed to determine whether similar results would be obtained across different subjects or grade levels. Future studies could involve larger samples, longer intervention periods, and comparisons with other learning models to provide a more comprehensive understanding of the effectiveness of PBL.

CONCLUSION

Based on the results presented, it can be concluded that students' learning outcomes before the implementation of the Problem Based Learning (PBL) model were still low, with all 22 students not achieving the Minimum Learning Mastery Criteria (KKTP). After the implementation of the PBL model, there was a significant improvement, where 21 out of 22 students successfully achieved scores above the KKTP. This indicates that the use of the PBL model contributes positively to improving students' learning outcomes in IPAS. Furthermore, the results of the hypothesis test showed that the calculated t-value ($t_{hitung} = 19.495$) was greater than the t-table value ($t_{table} = 1.717$) with a significance level of 0.000, which is smaller than 0.05. Therefore, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. This means that there is a statistically significant effect of the Problem Based Learning model on students' learning outcomes.

In conclusion, the Problem Based Learning (PBL) model is an effective instructional approach for improving science learning outcomes among fifth-grade students at UPTD SD Negeri 122354 Pematangsiantar. Its application is recommended as an innovative learning strategy to enhance student engagement, understanding, and academic achievement.



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