# THE EFFECT OF PROBLEM SOLVING METHODS ON STUDENTS' LEARNING OUTCOMES

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## ABSTRAK

This study aims to determine the effect of the Problem Solving method on the learning outcomes of students at SMP Negeri 1 Bilah Barat. The Problem Solving method is a learning approach that emphasizes critical thinking skills and problem solving in the learning process. This study uses an experimental method with a pretest-posttest control group design. The research sample consisted of two groups, namely the experimental class, namely VII D which uses the Problem Solving method and the control class, namely VII B which uses the conventional method. Data collection was carried out through a test in the form of a total of 30 questions on learning outcomes and observations during the learning process. Data analysis used a t-test statistical test to determine the differences in learning outcomes between the two groups. The results showed that there was a significant difference between the learning outcomes of students taught using the Problem Solving method compared to the conventional method. Students in the experimental class showed an increase in conceptual understanding and better critical thinking skills. Thus, the Problem Solving method has proven effective in improving the learning outcomes of students at SMP Negeri 1 Bilah Barat. The average pretest score of the Experimental class was 59.96 and increased to 80.36 and in the posttest, showed an increase of 20.40. Meanwhile, the control class that did not use the problem solving method only increased from 57.72 to 64.72 or 7.00. The results of the hypothesis t-count 14.96> t table 2.01 then H0 is rejected and H1 is accepted. The rejection of H0 indicates that there is a significant difference between the post-test scores of students in the experimental class and the control class.

***Keywords: Problem Solving, learning outcomes, problem solving, active learning.***

## INTRODUCTION

Education is the main foundation in forming superior human resources. The success of education can be seen from the ability of students to understand, master, and apply knowledge in various life contexts. OECD (2023a) emphasizes that learning outcomes not only reflect academic performance, but also describe critical thinking skills, problem solving, and the ability to adapt to the challenges of the 21st century. In addition, the PISA report shows that mathematics, reading, and science literacy remain important indicators in assessing the effectiveness of education systems in various countries (OECD, 2023b). Although education has made various advances, the reality is that many students still face difficulties in understanding the material, especially those that require critical thinking and problem-solving skills. One of the causes is the use of conventional learning methods that have not been able to facilitate active student involvement in the process of thinking and finding solutions. Less innovative learning approaches tend to hinder the development of high-level thinking skills that are essential in 21st-

century learning (Slavin, 2021).

Education is a complex and dynamic process, involving various elements such as curriculum, learning strategies, and interactions between educators and students. The constructivist approach to learning emphasizes the importance of active student involvement in building knowledge through experience and social interaction. A study by Putra Renninger (2024) shows that the constructivist approach can improve students' problem-solving abilities by encouraging them to think critically and creatively. In this context, problem-solving-based learning methods are relevant because they allow students to identify, analyze, and find solutions to real problems, thus creating a more meaningful learning experience. Research by Çibukçiu (2025) confirms that the constructivist method has a significant impact on improving students' mathematical problem-solving abilities, compared to traditional teaching methods that focus on memorization. Thus, the integration of the constructivist approach and problem-solving methods in learning can improve learning outcomes by developing critical, creative, and reflective thinking skills in students.

The Problem Solving method has several significant advantages in learning. First, this method can improve students' critical and creative thinking skills, because they are encouraged to think analytically and find innovative solutions to the problems they face. Almulla (2023) in his research stated that the constructivist approach in learning can improve students' critical thinking skills and creativity. Second, this method can also increase learning motivation, because students are more interested and actively involved in solving the problems given. Research by Chen et al. (2024) shows that innovation in educational management has an important role in increasing student motivation and engagement. In addition, the Problem Solving method helps students to apply the knowledge they learn in real life.

Hidayati et al. (2022) emphasized that problem-solving and critical thinking skills are very important in the context of 21st-century education. Fourth, this method also develops collaboration skills, because it is often applied in groups, which allows students to improve communication and teamwork skills. Research by Cao (2025) shows that collaborative problem solving in the classroom can improve students' collaboration skills. Therefore, the application of the Problem Solving method in learning can be a solution to improve the quality of education and prepare students to face global challenges. SMP Negeri 1 Bilah Barat is one of the schools that continues to strive to improve the quality of learning. Based on initial observations, it was found that most students still had difficulty understanding the material, especially in subjects that require analysis and problem solving. Therefore, a more effective learning strategy is needed, such as the Problem Solving method, to improve student learning outcomes and encourage them to become active learners. According to Trianto (2023), the application of the Problem Solving method challenges students to think independently, but also requires teachers to have the right strategy in guiding discussions and providing problems that are appropriate to the level of student understanding. This is in accordance with the findings in this study, where some students initially had difficulty following learning with this method, but after being given proper guidance, they were able to adapt and show a significant increase in understanding. Another advantage of this method is its ability to increase student learning motivation. As stated by Hamdani (2022).

## RESEARCH METHODS

This study applies a quasi-experimental approach with a pretest-posttest control group design, which aims to evaluate the effect of an intervention on student learning outcomes. In this design, two groups are formed: an experimental group that receives a certain treatment and a control group that does not receive treatment. Both groups are given a pretest to measure initial abilities and a posttest to assess changes after the intervention. Although it does not involve full randomization as in a pure experiment, this design still allows researchers to identify the effects of the treatment given. According to Abraham and Supriyati (2022), the pretest-posttest control group design is effective in evaluating educational interventions because it is able to show differences in learning outcomes between groups that are treated and those that are not.

In addition, Sugiyono (2022) emphasized that this method is relevant for research in the field of education that has limitations in subject randomization but still requires strong empirical evidence of the impact of treatment. The quasi-experimental method with a pretest-posttest control group design was chosen to determine the effect of the Problem Solving approach on student learning outcomes. This design allows researchers to compare learning outcomes between the experimental group that received treatment and the control group that did not receive treatment. The population in this study were all grade VII students at SMP Negeri 1 Bilah Barat. The research sample was selected using a purposive sampling technique, namely a sample selection method based on certain criteria that have been set by the researcher according to the research objectives. According to Sijabat et al. (2024), learning outcome tests are instruments used to assess students' learning achievement after participating in the learning process. The learning outcome test used is a written test in the form of 25 multiple-choice questions. The data obtained were analyzed using a t-test to test the differences in learning outcomes between the experimental and control groups. The t-test is used to test one or two populations, and the t-test for one sample compares two means to determine whether the difference in means is a fact or a coincidence. This analysis process is carried out with the help of statistical software such as Mixcrosoft Excel to ensure the validity and reliability of the test. For example, research by Waluyo, T (2022) applied the t-test to compare the average ability scores and found significant differences between the experimental and control groups.

| **Total Score of All Students** | | | | |
|---|---|---|---|---|
| EKS PRETEST | | | Control PRETEST | |
| Total Value | 1499 | | Total Value | 1443 |
| average value | 59,96 | | Average Value | 57,72 |
| highest value | 63 | | Highest Value | 60 |
| lowest value | 57 | | Lowest Value | 55 |

| EKS POSTTEST |
|---|

| | |
|---|---|
| Total value | 2009 |
| Average value | 80,36 |
| Highest value | 84 |
| Lowest value | 78 |

| Control POSTTEST | |
|---|---|
| Total Value | 1618 |
| Average Value | 64,72 |
| Highest Value | 68 |
| Lowest Value | 62 |

**RESULTS AND DISCUSSION**

This study aims to analyze the effect of the Problem Solving method on the learning outcomes of class VII students at SMP Negeri 1 Bilah Barat. The research method used is a quasi-experimental with a pretest-posttest control group design. The subjects of the study consisted of two classes, namely class VII D as an experimental class that was given treatment using the Problem Solving method, and class VII B as a control class that used conventional methods. Before being given treatment, both classes were given an initial test (pretest) to determine students' initial abilities in understanding the material to be taught. The results of the Pretest can be seen in Table 1.1 below.

Table 1.1 Results of the Pretest and Posttest of Class VII students' learning at SMP Negeri 1 Bilah Barat

| CLASS | PRETEST | POSTTEST |
|---|---|---|
| EXPERIMENTAL | 59,96 | 80.36 |
| CONTROL | 57,72 | 64,72 |

Based on table 1.1, the pretest results show that the average score of the experimental class is 59.96, while the average score of the control class is 57.72. This shows that before being given treatment, the initial abilities of the two classes were relatively equal. After being given treatment, students in the experimental class were given learning with the Problem Solving method. This method actively involves students in solving problems related to the subject matter, encouraging them to think critically, analyze problems, and find the right solution. Meanwhile, the control class was still given learning with the conventional method which focuses more on lectures and assignments. After the treatment lasted for several meetings, both classes were given a final test (posttest) to determine the improvement in learning outcomes. The posttest results showed that the average score of the experimental class increased to 80.36, while the average score of the control class only increased to 64.72. This difference in average scores shows that the use of the Problem Solving method has a more significant impact on improving student learning outcomes than the conventional method.

GAIN FORMULA = Post test – Pretest

- Eksperimen : 80,36 – 59 96 = 20,40
- control : 64,72 -57,72 = 7,00

Number of Students (n) In each class: 25 students

SHAPIRO-WILK NORMALITY TEST

1. Class Eksperimen

Pretest

- Mean: 59.96
- Standard Deviation: 1.77
- Shapiro-Wilk Statistic: 0.949
- p-value: 0.236
- Data is normally distributed (p > 0.05)

Posttest

- Rata-rata (Mean): 80,36
- Standar Deviasi: 1,63
- Shapiro-Wilk Statistic: 0,940
- p-value: 0,151
- Data is normally

2. Class control

Pretest

- (Mean): 57,72
- Standar Deviasi: 1,70
- Shapiro-Wilk Statistic: 0,916
- p-value: 0,041
- Data is not normally (p < 0,05)

Posttest

- (Mean): 64,72
- Standar Deviasi: 1,90
- Shapiro-Wilk Statistic: 0,935
- p-value: 0,115
- Data Is normally

UJI HOMEGENITAS LEVENE

| Group | Time | Varians |
|---|---|---|
| Class Eksperimen | Pretest | Homogeneous |
| Class Eksperimen | Posttest | Homogeneous |
| Class Control | Pretest | Not homogeneous |
| Class Control | Posttest | Homogeneous |

Calculating SD Class Experiment

$SD = \frac{-\sqrt{3,3}}{25-1} = \frac{-\sqrt{3,3}}{24} = \sqrt{27,3}$ = -5,22

Menghitung SD Class Control

$SD = \frac{-\sqrt{73,3}}{25-1} = \frac{-\sqrt{73,3}}{24} = \sqrt{0,11}$ = -0,33

T-Count Formula

$$t = \frac{X_1 - X_2}{\frac{\sqrt{SD_1{}^2 + SD_2{}^2}}{n_1 + n_2}}$$

$t = \frac{80,36 - 64,72}{\frac{\sqrt{5,22^2 + 0,33^2}}{25 + 25}} = t = \frac{15,64}{\frac{\sqrt{27,2 + 0,11}}{25 \quad 25}}$ $t = \frac{15,64}{\sqrt{1,088 + 0,0044}} = \frac{15,64}{\sqrt{1,0924}} = \frac{15,64}{1,045}$ = 14,96

t-table formula

df = $n_1 + n_2$ - 2 =

25 + 25 – 2 = 48

a = 0,05 (signifikansi 5%)

t-tabel (df = 48) = 2,01

Statistical analysis was conducted to determine the significance of the differences in learning outcomes between the experimental class and the control class. The t-test results showed that there was a significant difference between the learning outcomes of students using the Problem Solving method and those using the conventional method. This shows that the Problem Solving method is more effective in improving students' understanding and skills in solving problems. The advantages of the Problem Solving method in this study can be seen from the increased involvement of students in learning. Students in the experimental class were more active in discussing, asking questions, and finding solutions to problems given by the teacher. This is in contrast to the control class which tends to be passive and only receives information from the teacher without participating much in the learning process. In addition, the Problem Solving method also helps students develop critical and analytical thinking skills. Students who are accustomed to facing and solving problems tend to have better problem-solving skills than students who only receive material passively.

Problem-Solving-based learning has been proven to improve students' learning outcomes, as stated by Rusman (2021). This is in line with the results of the study which showed that the experimental class was more active in discussing, asking questions, and finding solutions compared to the more passive control class. In addition, this study also supports the opinion of Suprijono (2022) who stated that the problem-solving-based learning approach not only improves learning outcomes but also helps students develop analytical and systematic thinking skills. In this study, students in the experimental class showed a better understanding of the concepts taught, compared to students in the control class who relied more on memorization. That one of the factors that influences the learning process is an appropriate, innovative and creative learning model that is in accordance with the needs of students.

## CONCLUSION AND SUGGESTIONS

This study aims to determine the differences in learning outcomes between the Experimental class and the Control class. Based on the results of the analysis and pre-test and post-test data, the average data obtained for the pre-test value of the experimental class is 59.96 and the average post-test value is 80.36 with a standard deviation of 5.22. The average pre-test value of the control class is 57.72 and the average post-test value is 64.72 with a standard deviation of 0.33 with the number of students in each class being 25 people. To determine the differences in learning outcomes between the two classes, an independent two-sample t-test was used. The calculation results show that the calculated t value = 14.96, the table t value = 2.01 at a significance level of $\alpha = 0.05$ and degrees of freedom (df) = 48, then the results of the hypothesis t-count 14.96> t table 2.01 then H0 is rejected and H1 is accepted. The rejection of H0 indicates that there is a difference between the two classes. significant between the post-test scores of

students in the experimental class and the control class. Thus, the treatment given to the experimental class was proven to be more effective in improving student learning outcomes compared to the control class which was not given the treatment

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