

# The Effect of Application of Creative Problem Solving Learning Methods on Students' Mathematics Learning Outcomes

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## Article Info

### Keywords:

Creative Problem Solving  
Mathematics learning outcomes  
Experimental

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## ABSTRACT

This study aims to determine: 1) Student responses after the application of the Creative Problem Solving learning method; 2) Students' mathematics learning outcomes after using the Creative Problem Solving learning method; 3) Whether or not there are differences and the influence of the application of the Creative Problem Solving learning method on students' mathematics learning outcomes. This research is an experimental type of research, namely research that is used to find the effect of specific treatments on others under controlled conditions. The experiment was carried out with the object of research consisting of the experimental and control classes. The researcher used class X IPS 1 as the experimental class, which consisted of 30 students, and class X IPS 2 as the control class, which consisted of 32 students. Sampling was done by random cluster sampling. The results showed that the student's response to applying the Creative Problem Solving learning method was reasonable based on the results of the questionnaire data recapitulation, which showed an average number of 77.39% and was in solid criteria. Student learning outcomes by applying the Creative Problem Solving learning method are included in the excellent category, with the average score obtained by the experimental class students of 88.50. There were 29 students out of 30 who scored above the KKM set by the school, which was 67. Meanwhile, the average score for the control class only reached 76.75. The results of the t-test show differences in student learning outcomes using the Creative Problem Solving learning method with those using ordinary or conventional learning methods with a correlation value of 0.404, which can be said to have a moderate effect.

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## 1. INTRODUCTION

Education is an interactive process between educators and students to help students master educational goals [1]. Quality human resources are needed for educational goals to be achieved and implemented optimally. One of the problems facing the world of

education today is the weakness of the learning process [2]–[6], which results in the low quality of education in Indonesia. So to improve the quality of education, it is necessary to improve the quality of human intellectual resources, and a learning process is needed. The purpose of learning and gaining knowledge is to make changes that will later be beneficial and improve learning outcomes. The purpose of mathematics, in general, is to prepare students to face changing circumstances and mindsets in life and an ever-evolving world, as well as to use mathematics and mathematical mindsets in everyday life and in studying various sciences [7]–[11].

According to Purwanto [12], the low acquisition of student learning outcomes is generally caused by the learning methods used by the teacher. In addition, the characteristics of mathematics are rational, contain valid ways of proving, formulas or rules that are general, and reasoning in nature, and mathematics is also objective, related to events that occur in everyday life. Deductive, a theory or statement in mathematics, is accepted as accurate. Suppose it has been proven deductively [13]. In connection with this, a learning method is needed to encourage the learning process with optimal learning outcomes.

The learning method significantly increases student learning outcomes [14], [15]. In conventional learning, students as objects in learning activities still have weaknesses. They tend to memorize or remember subject matter, even though memorizing or remembering something does not necessarily mean understanding and is easy to forget [16]. For mathematics learning outcomes to increase optimally, the teacher can choose one of the learning methods given to students. One of the learning methods that can affect students' mathematics learning outcomes is Creative Problem Solving learning because this method stimulates students to be active, think creatively and follow the characteristics of objective mathematics related to problem solving in everyday life.

The creative Problem Solving learning method is a method for solving problems creatively [17]. Problem-solving methods are essential to the mathematics curriculum [18]–[21]. Because in the learning process and its completion, students are expected to gain experience using the knowledge and skills they already have to be applied to non-routine problem-solving. By using this learning method, it is expected that students can get the maximum benefit from both the process and the learning outcomes. Especially in learning mathematics, creativity is needed in solving problems. So that students can easily understand the material and solve the problem correctly and without any difficulties.

Solving the problem requires the ability to solve the problem. Learning mathematics and its completion allow students to gain experience using the knowledge and skills they already have to apply to problem solving. Through this activity, aspects of critical mathematical abilities such as applying rules to pattern-finding problems, generalizing, and others can be well developed.

## **2. METHOD**

The method used by the researcher is a quantitative experimental method. In this study, researchers wanted to examine the effect of applying the Creative Problem Solving learning method on mathematics learning outcomes by taking three classes: trial,

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experimental, and control. The experimental class will be given a trial test of research instruments, the experimental class will be given treatment when learning mathematics takes place in the form of the Creative Problem Solving method, and for the control class, no treatment will be given.

The design used in this study was adjusted to the variables studied. The variable is the application of the Creative Problem Solving Learning Method as the independent variable and students' mathematics learning outcomes as the dependent variable. This study used one group of students as the experimental group by applying the Creative Problem Solving method.

To determine the effect of applying the Creative Problem Solving Learning Method using questionnaires and tests. The design used in this research is Posttest-Only Control Group Design. In this research design, the object under study will be given a final test after the experimental class gets treatment. The experimental class was given treatment in the form of using the Creative Problem Solving learning method. In the implementation process, researchers are directly involved in collecting, processing, analyzing, and concluding the data obtained. In this study, the researcher taught the material using the Creative Problem Solving learning method in the experimental class. After learning this method, the experimental and control classes were given tests and filled out a questionnaire given by the researcher.

The population in this study were all X-grade students of SMAN 1 Susukan, Susukan District, Cirebon Regency, which consisted of 8 classes with a total of 302 students. The sampling technique in this study used a cluster random sampling technique, namely by randomizing the group, not on individual subjects. Therefore, the researcher took a sample of 3 classes: a test class, an experimental class, and a control class. From the sampling, selected class X IPS 1 with 35 students, class X IPS 2 with 40 students, and class X IPS 3 with 38 students as samples of this study. Class X IPS 1 received treatment with the CPS method (experimental class), class X IPS 2 received ordinary learning (control class), and class X IPS 3 was the instrument trial class. The three classes were given the same subject, namely statistical material.

### 3. RESULTS AND DISCUSSION

#### 3.1. Results

##### a. Description of variable X

Based on the details of each of the indicators above, a recapitulation of the average student response answers on the application of the Creative Problem Solving learning method can be made, namely

Table 1. Recapitulation of Questionnaire Answer Scores

No	Indicator	Average value (%)
1	Students' attitudes towards learning mathematics	77,62%
2	Understanding math subject	76,67%
3	Active in learning	71,67%
4	Active collaboration in groups for solve the problem	81,46%
5	Students can express opinions	80%

No	Indicator	Average value (%)
6	Able to apply methods in solving a problem	76,39%
7	Think creatively in finding a solution to a problem	77,92%
	Average	77,39 %

Based on the table above, it can be seen that the questionnaire results on applying the Creative Problem Solving method in learning mathematics show an average number of 77.39% and are in solid criteria.

b. Description of variable Y

The researchers obtained the data regarding the learning outcomes test from the essay test data on the subject of statistics. This test consists of 10 questions with different weights. Based on the calculation of learning outcomes above, it shows that the average value obtained by the experimental class is 88.57, with a maximum score of 100 and a minimum score of 64. At the same time, the average value obtained by the control class is 76.75, with a maximum value of 88 and a minimum score of 33. So from the data, it is clear that the acquisition of students' mathematics learning outcomes in the experimental class is greater than the acquisition of students' mathematics learning outcomes in the control class.

c. t-test

The t-test was carried out using the Independent Samples T-Test aimed to determine whether or not there were differences in the mathematics learning outcomes of the experimental class and control class students. From the results of the homogeneity test of variance of 2 groups of population data, it was obtained that the data variance was homogeneous, then the t-test calculation was carried out using the t-test formula for homogeneous variance. The results of the calculation of the t-test using SPSS are as follows:

Table 2. Test Results of Independent Samples T-Test

		Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Nilai	Equal variances assumed	.035	.852	4.850	60	.000	11.81667	2.43653	6.94288	16.69045
	Equal variances not assumed			4.881	58.945	.000	11.81667	2.42074	6.97267	16.66066

Based on table 2 above, it can be concluded that the difference in students' mathematics learning outcomes using Creative Problem-Solving learning methods and those using conventional learning methods.

### 3.2. Discussion

The creative Problem Solving learning method presents subject matter that exposes students to problems that must be solved creatively to achieve learning objectives [22], [23]. Students are divided into several heterogeneous groups, and each group is given a student worksheet [24]–[29], in this case, a problem sheet or questions that must be discussed together. Then students are free to express their opinions about how to solve the problem in the worksheet. Afterward, each group discusses which opinions or strategies are suitable to solve the problem. If it has been determined, then the strategy is applied to the problem until it finds a solution to the problem or problem.

This method makes students foreign to their learning because it is their first time doing the Creative Problem Solving method. At the first meeting, many students were still passive in group discussions or expressing opinions, so they needed material encouragement and explanations to solve research problems. For the second and subsequent meetings, the students have begun to understand what is expected from this learning so that the learning process becomes more conducive and organized.

Data collection techniques in this study were in the form of a questionnaire for variable X (students' responses to the application of the Creative Problem Solving learning method) and a test for the Y variable (mathematical learning outcomes). Questionnaires were distributed as many as 21 statement items, and the tests given in the form of descriptions amounted to 10 question items.

Student response questionnaires distributed by researchers have been processed; based on the recapitulation of 7 indicators, the average result is 77.39%. With these numbers, it can be concluded that the student's response to applying the Creative Problem Solving learning method is included in the solid criteria. Alternatively, in other words, most students respond well to applying the Creative Problem Solving learning method. The percentage is directly proportional to the reality when the author conducted research; for example, students were enthusiastic about studying in groups, dared to express opinions and creative ideas in group discussions, and worked together to solve problems or assignments given by the researcher.

This is reinforced by the analysis of student responses per indicator. The first indicator is students' attitudes toward learning mathematics which shows an average result of 77.62%. With these numbers, students' attitudes towards learning mathematics can be said to be good. The percentage is directly proportional to the reality when the author conducted research; for example, students looked enthusiastic and enthusiastic in learning mathematics, especially with applying the Creative Problem Solving learning method, and only a tiny portion of them looked bored during the learning process.

The second indicator is the understanding of mathematics subject matter which shows an average result of 76.67%. With these numbers, it can be concluded that most students understand the material taught using the Creative Problem Solving learning method. The percentage is directly proportional to the reality when the author conducted the research; for example, most of the students could answer the questions posed by the researcher during the discussion, and only a small number of students could not answer the questions.

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The third indicator, activeness in learning, shows an average result of 71.67%. With these numbers, it can be concluded that students are quite active in learning with the Creative Problem Solving method. The amount of the percentage is directly proportional to the reality when the author conducted research; for example, students were actively working on the questions given by the researcher on the blackboard, and only a small number of students were not active or did not dare to come forward to work on the questions.

For the fourth indicator, namely active collaboration in groups to solve problems, the average result is 81.46%. With these numbers, it can be concluded that students are very active in group collaboration to solve problems. The percentage is directly proportional to the reality when the author conducts research; for example, students are enthusiastic about discussing with each group and looking for solutions to the research problems.

For the fifth indicator, students can express opinions, showing an average result of 80%. With these numbers, it can be concluded that students actively express their opinions and ideas in Creative Problem Solving learning. The percentage is directly proportional to the reality when the author conducts research; for example, students are confident and do not hesitate to express opinions or ideas in group discussions.

For the sixth indicator, namely being able to apply the method in solving a problem or question, the average result is 76.39%. With these numbers, it can be concluded that students can apply the method to solve problems or questions. The percentage is directly proportional to the reality when the author conducted research; for example, students understood and solved problems faster with the Creative Problem Solving method steps, and only a small number of students felt confused by the application.

For the seventh indicator, namely creative thinking in finding solutions to a problem or problem, the average result is 77.92%. With these numbers, it can be concluded that most students think creatively in solving problems by applying the Creative Problem Solving method. The percentage is directly proportional to the reality when the author conducts research; for example, most students can express their creative ideas to solve problems or problems, and only a tiny part is passive in expressing ideas.

Researchers conducted data analysis on the post-test results in the experimental class, which then obtained an average test score of 88.50, which was included in the high category, the highest score obtained by students was 100, and the lowest score obtained by students was 64. So it can be interpreted that the average value of mathematics learning outcomes for students of class X IPS 1 SMAN 1 Susukan, Cirebon Regency is relatively high after the learning treatment using the Creative Problem Solving method.

This is evidenced by the number of students scoring above the Minimum Completeness Criteria (KKM 67) in mathematics subjects set by SMAN 1 Susukan, Cirebon Regency, 96.67%. A total of 29 students out of a total of 30 students scored above the KKM; there were even students who got a score of 100. Compared to the average score of the control class, which only reached 76.75, it is clear that the learning outcomes of the experimental class students who received treatment with the application of the Creative

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method of Problem Solving are higher. So it can be concluded that applying the Creative Problem Solving method affects students' mathematics learning outcomes.

Researchers conducted statistical tests which found that variable X (application of Creative Problem-Solving learning methods) and variable Y (students' mathematics learning outcomes) were both normally distributed with a significance value of ( $0.198 > 0.05$ ), and the sample group data came from the same variance. In other words, it is called homogeneous with a significance value of ( $0.296 > 0.05$ ), so the researcher uses a parametric test, namely the t-test. Based on the results of the t-test, it is obtained that the t-count is 4.850, and the t-table is known to be 2.000. Because t count  $>$  t table, it can be interpreted that  $h_0$  is rejected and  $h_a$  is accepted, meaning that there is a difference in student learning outcomes between the experimental and control classes. In addition, researchers also analyzed the relationship or correlation between student responses and learning outcomes, and the results showed that there was a significant relationship or correlation between the two variables with a significant value of  $0.027 < 0.05$  with a correlation value of 0.404, which can be said to have a moderate effect.

Based on the results of the analysis of the research data above, it can be seen that the application of the Creative Problem Solving learning method has a positive influence on students' mathematics learning outcomes from the results of the average comparison between the experimental and control classes with the acquisition of the experimental class scores higher than the control class and from the results recapitulation of student response questionnaire scores which show that most students respond well to the application of the Creative Problem Solving learning method.

#### 4. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that the student's response to the application of the Creative Problem Solving learning method is said to be reasonable based on the results of the questionnaire data recapitulation of the application of the Creative Problem Solving method in learning mathematics shows an average number of 77.39% and is in solid criteria. In addition, based on the data obtained, it shows that the average value of the mathematics learning outcomes of experimental class students is 88.50, with the highest score achieved being 100 and the lowest score being 64, with the acquisition of 96.67% (29 people) of 30 students. as a respondent passed the KKM score (67). While the average value of the control class students' mathematics learning outcomes was 76.75, with the highest score achieved being 88, and the lowest score is 33, with the acquisition of 90.62% (29 people) of the 32 students as respondents who passed the KKM score. So there is a difference between the experimental and control classes' learning outcomes. Moreover, finally, the study results showed a positive influence on applying the Creative Problem Solving learning method and students' mathematics learning outcomes.

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