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The Influence of the Creative Problem-Solving (CPS) Model on Students' Learning Motivation and Mathematical Problem-Solving Ability

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ABSTRACT

This study tries to find out if using the Creative Problem Solving (CPS) model can improve the learning motivation and math problem-solving skills of eighth-grade students at MTs Akbar Insan Cendikia during the 2024/2025 school year. The study used a Quasi-Experiment method with a pre-test and post-test design that included both an experimental group and a control group. A total of 60 students were chosen through a purposive sampling method, with class VIII-A serving as the experimental group and VIII-B as the control group, each having 30 students. The tools used to collect data were a questionnaire to measure learning motivation and a test to assess problem-solving abilities. The data was analyzed using a t-test after checking for pretest scores, normality, and homogeneity. The results showed that the CPS model had a strong impact on increasing students' learning motivation, as the t-value obtained was 2.473, which is higher than the t-value from the table (2.002). It also had a significant effect on improving students' math problem-solving skills, with a t-value of 2.250, again higher than the t-value from the table (2.002). These findings show that the Creative Problem Solving model can be a good and effective method to enhance math learning in secondary schools.

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1. INTRODUCTION

Education is a conscious effort to develop the potential of human resources through teaching activities, and it is a vital need for humans [1]. One of these areas is mathematics education. In the learning process, teachers must be able to provide or convey interesting, creative, innovative learning and choose learning models that are appropriate to the material to be given to students so that they can make students motivate and active students in learning [2].

Mathematics is a branch of science that plays a crucial role in the advancement of science and technology, both as a tool for applying other scientific fields and in the development of mathematics itself. Mathematics is a complex activity that involves various elements, such as teachers, students, mathematics itself, and the learning situation that takes place [3]. In implementing mathematics learning, students need to be motivated to be enthusiastic about learning so that better learning outcomes can be achieved [4].

Based on the results of the observation, which researchers conducted in MTs Akbar Insan Cendikia, found that the average score of students' daily tests in mathematics learning is still relatively low. This can be proven by the data on the average score of students' daily tests, which range from 65 to 75, meaning that many students still struggle to solve math problems. This shows that students' motivation to learn mathematics is still low; this also impacts their ability to solve mathematical problems, which is still not optimal.

One of factor reason problem the is the use of learning models used by mathematics teachers At MTs Akbar Insan Cendikia, the learning method is still not optimal learning with the following sequence: (1) explaining mathematical objects, (2) giving examples of mathematical objects that have just been explained, (3) asking students to solve problems similar to the examples, and (4) giving practice questions. This tends to make students feel bored, uninterested, less creative, and monotonous in their learning, as they are preoccupied with understanding the mathematical concepts presented by their teacher. These objects can be facts, concepts, or principles, and operations [5]. Therefore, teachers need to apply learning models to raise students' learning motivation and mathematical problem-solving abilities, encouraging them to be enthusiastic about participating in class and learning effectively.

Motivation is a mental drive that drives and directs human behavior, including learning behavior. The essence of learning motivation is "internal and external drive in students who are learning to make changes in behavior [6]. Factors that are important things that influence results include the student's motivation for learning, their own connection to positive performance in mathematics studies. Nurrawi et al. [7] find that motivation for high learning is compared to achievement results in a Study, whereas Diandaru [8] discloses that a significant number of big MTs students are still in the moderate category of motivation. This is in line with a study by Latifah [9], which proves that interactive media integration, such as Quizizz, can increase learning motivation, and a study by Grace [10] that confirms the media display is simple yet effective in growing a student's spirit of study.

Likewise, mathematical problem-solving ability refers to a student's ability to solve non-routine problems using their prior knowledge [11]. This is emphasized by the National Council of Teachers of Mathematics, which states that mathematical problem-solving should be the primary goal in mathematics learning in schools. Student success in learning mathematics can be seen from the mathematics learning activities they have participated in. This success will also be seen when students solve a problem. The more students are able to solve problems, the higher their problem-solving abilities in mathematics learning will be [12].

One of the learning models that can be used is the Creative Problem Solving (CPS) model. This model focuses on coming up with many different ideas to find the best possible solution to a problem. It uses two main thinking processes: divergent thinking and convergent thinking. Divergent thinking helps students come up with lots of creative ideas based on their intuition, which can make learning more interesting and motivating. Convergent thinking helps students evaluate and choose the best ideas from all the possibilities [13]. This approach not only encourages creative thinking but also helps students take charge of their own learning. They get to pick solutions either on their own or with a group, which supports their independence and motivation..

This matter aligns with research previously shown that the learning model of Creative Problem Solving (CPS) is effective in increasing motivation and ability to solve mathematical problems among students. This research aligns with the findings of Neni, Syaiful, and Maison [14], who discovered that Creative Problem Solving (CPS) is an effective learning model. This model can guide students in generating ideas, exploring solutions, and providing effective problem-solving strategies, particularly in mathematics. Likewise, research [15] states that the Creative Problem Solving (CPS) model possesses high creative thinking capabilities in supporting learning through concrete media. Found that the mathematics learning outcomes of students in the experimental class with CPS were significantly higher than those in the control class. Research by Yonisa et al. [16] also demonstrated that implementing E-LKPD-based CPS with the TPACK approach enhanced the creativity and problem-solving abilities of junior high school students. Meanwhile, Pasaribu [17] emphasizes the importance of integrating technology, such as GeoGebra, with CPS to strengthen the creative aspect of mathematical thinking. Likewise, Sudirpa's research [18] demonstrates the application of CPS outside of mathematics (in civics subjects) with positive results in learning achievement.

Based on several previous studies, the CPS model has been shown to be effective in enhancing motivation and mathematical problem-solving abilities. This study focuses on the use of the CPS model in secondary schools for the material of flat-sided geometric shapes, considering that this material is an inseparable component in mathematics, playing an important role in daily life. However, it is often considered difficult by students [19] because this study can have a positive impact on learning mathematics.

This study looks at how the Creative Problem Solving model affects students' interest in learning and their ability to solve math problems. The findings from this research should help teachers and leaders make better decisions about how to improve teaching methods.

2. METHOD

The study used a quantitative research method with a quasi-experimental design. The specific research design was a pretest–posttest control group setup to look at how the Creative Problem Solving model (CPS) affects students' motivation, study habits, and ability to solve math problems. The population included all eighth-grade students at MTs Akbar Insan Cendikia for the 2024/2025 school year, which had four classes totaling 120 students. To select the sample, the researcher used purposive sampling, choosing class

VIII-A as the experimental group with 30 students and class VIII-B as the control group with 30 students. In this study, the independent variable (X) was the Creative Problem Solving model. The dependent variables (Y) were learning motivation (Y1) and students' ability to solve math problems (Y2).

The study used a learning motivation questionnaire with 24 statements and a math problem-solving test with 10 descriptive questions. Five questions were given as a pretest before learning, and the other five were used as a post-test after learning. The questionnaire and test were administered both before and after the learning process. Before being used in the study, the research tools were tested on a group of students who were not part of the main study. The tests included checking the validity of the items, reliability, difficulty level, and how well each question could differentiate between students. The data was analyzed using a t-test, along with necessary preliminary tests like normality and homogeneity checks.

3. RESULTS AND DISCUSSION

3.1 . Results

This study took place at MTs Akbar Insan Cendikia. The research data was collected through questionnaires and essay exams. Before being used in the actual study, these questionnaires and exams were tested on a group of students who were not part of the research. The purpose of testing was to check the questions for validity, reliability, difficulty level, and how well they could differentiate between students.

The results of the validity test for the learning motivation questionnaire and the mathematical problem-solving ability test were obtained by comparing the r table and r calculation scores, where the r $r_{table\ score}$ is in accordance with the provisions of 0.361 and the questionnaire $r_{count\ score}$ of 0.795 and the test $r_{count\ score}$ of 0.862 obtained from each question item are greater than the r table, so all questions are included in the valid category.

Reliability is the accuracy of a test given to the same known person. The results of the reliability tests for the learning motivation questionnaire (0.930) and the mathematical problem-solving ability test (0.934) fall within the very high reliability category. This can be seen from the quality criteria of the instruments used. Based on the theory put forward by Basuki, the characteristics of questions that have adequate quality are at least in the valid and reliable categories [20].

The difficulty level of a question refers to the probability of successfully answering it at a certain ability level, typically represented by an index. The results of the difficulty level analysis (P) of the trial questions indicate that two questions fall into the easy category and eight questions into the medium category. This can be seen from the level of difficulty (P). The questions were not distributed ideally. Based on the theory put forward by Sudjana, the calculation of the level of difficulty of the questions used a ratio of 30% easy questions, 50% medium questions, and 20% difficult questions [21].

The discriminatory power of a question refers to its ability to differentiate between students with high and low talent. The results of the discriminatory power analysis (D) of the trial questions showed that 10 questions had good discriminatory power. As stated by

Arikunto, the questions that differentiated students with high and low ability were categorized as good and very good [22].

From the results of the analysis of the trials that have been carried out, including validity tests, reliability tests, difficulty level tests (P), and discriminatory power tests (D), it is known that the questionnaire and test meet the criteria for good questions and can be used as tests to measure students' learning motivation and mathematical problem-solving abilities.

Descriptive Data Test Results

The results of the initial and final learning motivation questionnaires for students in the experimental and control classes were obtained by administering the questionnaires to students with the aim of determining their learning motivation. The summary of the learning motivation results is in the following table:

Table 1. Summary of the Results of the Experimental Class Learning Motivation Questionnaire

TEST	N	Total value	Average	Variance	Standard deviation	Min	Max
Initial MBS questionnaire	30	1794	61,862	33,695	5,805	50	75
Final MBS questionnaire	30	2354	84,071	31,254	5,591	73	93

Based on Table 1, the results from the questionnaire that measured students' initial and final learning motivation in the experimental class can be summarized as follows: the average initial learning motivation score was 61.862, with the lowest score being 50 and the highest 75, and a standard deviation of 5.805. The average final learning motivation score was 84.071, with the lowest score at 73 and the highest at 93, and a standard deviation of 5.591. Even though the final learning motivation scores are higher overall, the initial learning motivation scores show a larger variation among students after applying the Creative Problem Solving (CPS) model. This suggests that students in the experimental class had more varied initial learning potentials compared to those in the control class.

The results from the pretest and posttest were used to measure how well students in the experimental and control classes could solve math problems. These tests were given to the students to find out their math problem-solving skills. The summary of the results showing how well they did is shown in the table below.

Based on Table 2, the results of the measurement of mathematical problem solving ability obtained in the experimental class of pretest and posttest frequency data can be described as follows: the average pretest score is 53.167, the minimum score is 35, the maximum score is 70 and the standard deviation is 9.366 and the average posttest score is 84.828, the minimum score is 64, the maximum score is 100 and has a standard deviation of 10.36. The difference in scores shows a significant gap in test results between the two groups.

Table 2. Summary of Results of the Experimental Class Mathematical Problem-Solving Ability Test

TEST	N	Total value	Average	Variance	Standard deviation	Min	Max
Pretest	30	1595	53,167	87,730	9,366	35	70
Posttest	30	2460	84,828	107.50	10.36	64	100

Prerequisite Test Results

Normality Test Results

The results of the data normality test, using the Chi-Square statistical test, aim to determine whether the research data have a normal distribution. A sample is normally distributed if it meets the following criteria: $X^2_{count} < X^2_{table}$. The following is a description of the results of the normality analysis prerequisite test for each sub-group of questionnaire data and post-test data:

Table 3. Summary Test Normality Student Learning Motivation Questionnaire

No.	N	Data	Class	X^2_{count}	X^2_{table}	Information
1	30	MBS Questionnaire	Experiment	3,645	7,815	Normal
2			Control	4,751	7,815	Normal

Based on Table 3, the normality test data for the learning motivation questionnaire scores of the experimental class were analyzed using Microsoft Excel. The calculated X2 value was 3.645, while the X^2 table value was 7.815. Because the calculated $X^2 < X^2$ table, it can be concluded that Ho is accepted.

Table 4. Summary Test Normality Ability Solution Mathematical Problems

No.	N	Data	Class	X^2_{count}	X^2_{table}	Information
1	30	KPM *Post-test*	Experiment	5,949	7,815	**Normal**
2			Control	4,538	7,815	**Normal**

Based on Table 4, the normality test data for the experimental class's mathematical problem-solving ability scores, calculated using Microsoft Excel, yielded an X2 value of 5.949, which is less than the X^2 table value of 7.815. Because the calculated $X^2 < X^2$ table, it can be concluded that Ho is accepted.

Homogeneity Test Results

The results of this data homogeneity test aim to determine whether the sample in the study comes from a homogeneous population. This means that the selected sample can be considered representative of the entire population in the research process. This homogeneity test examines students' final learning motivation and post-test data on mathematical problem-solving skills, collected from both the experimental and control classes.

Table 5. Summary Test Homogeneity Students' Final Learning Motivation

Data	F_{count}	F_{table}	Information
Final MBS Questionnaire	1,029	1,861	Homogeneous

Based on Table 5, the homogeneity test comparing the variance between the final learning motivation questionnaire of the experimental class and the control class yielded an F count of 1.029. Through calculation interpolation, for the look-up mark F table, a comparison is made, and the F table is obtained as 1.861. Both values fall between the calculated F and the F table, so the calculation is carried out with the calculated F < F_{table} for the data to be declared homogeneous.

Table 6. Summary Test Homogeneity Ability Solution Mathematical Problems

Data	F_{count}	F_{table}	Information
Post-test	0.797	1,861	Homogeneous

Based on Table 6, the homogeneity test is carried out by comparing the variances between the ability tests. The solution to the mathematical class experiment and class control problem is then obtained, and the calculated F is 0.797. Through calculation interpolation, we look for mark F in the table. As a comparison, the F table is obtained, which equals 1.861. Both prices fall between the calculated F and the F table. Therefore, the calculation is done with F count < F table, indicating homogeneous data.

Hypothesis Test Results

After it was discovered that the data on mathematical problem-solving ability and student learning motivation in the experimental and control classes were normally and homogeneously distributed, hypothesis testing was conducted. Hypothesis testing was conducted on *post-test* and final questionnaire data using the t-test at the $\alpha = 0.05$ level, where this test is used to determine whether the truth can be accepted or rejected.

Table 7. Summary of Learning Motivation Hypothesis Test Results

No	Statistical Value	Average		t_{count}	t_{table}	Conclusion
		Experiment	Control			
1	Final questionnaire (MBS)	84,071	79,517	2,472	2,002	H_a Accepted

Based on Table 7, it is evident that the results of hypothesis testing on the learning motivation questionnaire data yield a t-count greater than the t-table value, specifically 2.472 > 2.002. With H_0 rejected and H_1 accepted, this means that there is an influence of the Creative Problem Solving (CPS) learning model on the learning motivation of class VIII students at MTs Akbar Insan Cendikia.

Based on Table 8 below, it is shown that the results of hypothesis testing on the post-test data obtained a t-count greater than the t-table value, namely 2.250 > 2.002. With H_0 rejected and H_1 accepted, this means that there is an influence of the Creative Problem Solving (CPS) learning model on the mathematical problem-solving abilities of class VIII students at MTs Akbar Insan Cendikia.

Table 8. Summary of Results of Hypothesis Testing of Mathematical Problem-Solving Ability

No	Statistical Value	Average		t_{count}	t_{table}	Conclusion
		Experiment	Control			
1	Post-test	84,828	75,333	2,250	2,002	H_a Accepted

3.2. Discussion

The data analysis results show that using the Creative Problem Solving (CPS) learning model has a big positive impact on students' interest in learning and their ability to solve math problems. Students in the experimental group had an average final learning motivation score of 84.071, which is much higher than the 79.517 score of the control group. Also, the average posttest score for the experimental group was 84.828, compared to 75.333 for the control group. This shows that students who used the CPS model improved a lot in their math problem-solving skills.

The rise in scores can be explained by using the Creative Problem Solving (CPS) model, which focuses on students' thinking skills and potential. When math lessons were taught using the CPS model in the experimental class, there were noticeable differences in students' interest in learning and their ability to solve math problems compared to the control class. These differences happened because students got used to sharing their thoughts and talking about them with friends and teachers in front of the class. This can help improve their interest in learning. This supports the idea from Sardiman [23], who said that learning isn't meaningful if students aren't motivated. So, students need motivation during learning to help them develop their thinking abilities.

Overall, the results of this study have a positive impact on the *Creative Problem Solving* (CPS) model, which not only emphasizes the final result but also the thinking process in learning. This is in line with the research of Dahliana Rangkuti [24], which shows that the learning model for mathematical problem-solving abilities and learning motivation has a significant influence on learning. Research conducted by Zhang [25] also shows a significant impact on learning motivation and students' mathematical problem-solving capacity. The results of this study are also supported by Muhammad's research [26], which states that Maple 11-assisted CPS learning has a positive influence on students' problem-solving abilities. These results are based on the ANOVA test calculation, with an F-statistic of 10.54. Suppose the F-observation value is compared with the F-table value of 3.07. So it can be said that the CPS model has a positive effect on problem solving abilities and is in line with Purwati's research [27], which states that students' mathematical problem solving abilities with *the Creative Problem Solving* (CPS) model are better than students' mathematical problem solving abilities who follow conventional learning. In this case, learning is allowed to exchange ideas and examine one's own ideas to optimize student activity and creativity, so that learning that uses the learning model is more active and creative.

Based on these findings, the *Creative Problem Solving* (CPS) learning model can encourage students to be more active and creative in solving problems, as students are required to identify and understand problems in order to determine effective problem-solving strategies. This can make students think by maximizing their abilities. This finding aligns with research conducted by Hidayat [28], which demonstrates that the experimental class with CPS achieved significantly higher learning outcomes than the control class.

4. CONCLUSION

According to the research findings, using the Creative Problem Solving (CPS) learning model has a good impact on the students' interest in learning and their ability to solve math problems in class VIII at MTs Akbar Insan Cendikia. With CPS, students become more involved, think creatively, and get better at finding problems and coming up with solutions. This shows that teachers can use CPS as a useful and effective way to improve math lessons. However, this study only looked at one school and focused on shapes with flat surfaces, so the results can't be applied to all situations.

For further research, it is recommended that the CPS model be tested at different levels, with different materials, and in different school contexts, and combined with relevant learning media or technologies. Thus, this research's contribution will not only enrich mathematics learning strategies but also provide practical insights for educators and policymakers in improving students' motivation and problem-solving skills in the wider community.

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