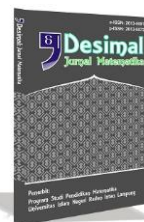




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The influence of the creative problem solving learning model on the mathematical problem solving ability of high school students on linear inequations

Sintya Lestari Sinulingga*, Amin Harahap, Lily Rohanita Hasibuan

Universitas Labuhanbatu, Indonesia

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*Correspondence: E-mail:

sintyasinulingga20@gmail.com

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ABSTRACT

A student's ability to solve math problems is very, very low because in solving math problems, the learning process does not accustom students to think more creatively. This is because the learning process in the teacher's class still applies conventional methods, and the students in the class have not yet achieved scores above the KKM. This study aims to see the Creative Problem Solving learning model as a series of learning in solving and solving problems systematically based on student creativity to produce effective solutions. This research is a quasi-experimental research using purposive sampling technique. The instrument used in this research is a test of the ability to solve mathematical problems in the form of a written test, a result test and an observation sheet on the implementation of the learning process. The data analysis techniques used are descriptive statistical analysis and inferential statistical analysis. The results of the study show that the mathematics learning of students using the CPS learning model on the ability to solve mathematical problems of students is better than the results of mathematical learning of students who have followed conventional learning which means that there is an influence of creative problem solving learning on the ability to solve mathematical problems of high school students regarding linear inequalities.

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INTRODUCTION

In the field of education, mathematics is one of the fields of science that plays an important role (Evaderika Ayu Artikasari & Saefudin, 2017). Because of the importance of mathematics, mathematics is made a compulsory subject at every level of education in

school. Mathematics standards in schools include content or material standards and process standards. Process standards consist of problem solving, reasoning, and communication (Izzah & Azizah, 2019). Mathematics is said to be a deductive science, meaning that mathematics is not a science of trial and error, therefore

mathematics is called an exact science (Ayu & Hasanudin, 2023). Mathematics is also called Ratu Sains, the queen of science. Mastery of mathematics requires interest and perseverance in learning it (Giwa, 2023). Studying mathematics can also help improve logical and critical thinking skills in solving problems. Recognizing the importance of mathematics, the Indonesian education curriculum provides a greater proportion of mathematics learning than other subjects (Fauzi & Abidin, 2019).

However, the ability of Indonesian students is still relatively low in solving story problems related to mathematics, especially non-routine questions, this is because students are still weak in understanding problems and planning their solutions (Partayasa et al., 2020). Based on the Program for International Student Assessment (PISA) 2018, Indonesia is ranked 72 out of 78 countries with a score of 379 in mathematics (Maharani et al., 2021). (Fauzi & Abidin, 2019) stating the level of mathematical ability tested in PISA includes identifying problems, being able to organize relevant information to solve problems, applying problem-solving strategies, generalizing problems. The indicator of this question is included in the indicator of students' critical thinking ability, so it can be concluded that the critical thinking ability of students in Indonesia is still low.

The low ability of students to solve mathematical problems is because the learning process does not accustom students to think more creatively (Partayasa et al., 2020). (Rostika & Junita, 2017) Stating that teachers usually give quick summaries so that students can solve conceptual problems, not problem solving questions.

From the results of previous studies it is known that the act of learning using the Creative Problem Solving method can increase the creative thinking of a student in mathematics subjects and there is an

increase in teacher activity, student activity, attitude and student skills in each cycle of using Creative Problem Solving model (Lucky & Julyanti, 2023). The learning model also has a positive and significant effect on students' thinking patterns.

Based on the results of the interviews of class X mathematics teachers and students of SMAN 2 Rantau Utara Class X in groups (classes) for the academic year 2022/2023, information was obtained that the average score is still low, this is because of the learning process. in the class the teacher still applies conventional methods, and makes the students in the class have not achieved a score above the KKM. In this case, a learning model and strategy is needed that can improve the ability to solve mathematical learning problems in the learning process, and make students more active and learning will achieve the desired goal.

To overcome the problems encountered in the learning process, there needs to be a change in the learning process from teacher-centered to student-centered (Rofiqoh et al., 2016). It is necessary to develop the learning experience through a learning model that relates the subject matter to the problems faced and the optimal use of learning resources. The direct involvement of students in the learning process is expected to improve learning outcomes and improve thinking in solving problems.

Departing from the above problems, one of the efforts to improve students' math problem solving skills is to use the right learning model. (Tambunan, 2021) states that the CPS model is a learning model that focuses on teaching and problem solving skills followed by strengthening skills. Meanwhile, (Laili Octadianti et al., 2023) according to CPS is a variation of learning with problem solving through systematic techniques in organizing creative ideas to solve a

problem. This is confirmed by (Helen & Kusdiwelirawan, 2022) that the CPS learning model is a learning model that can train the level of students' creative thinking abilities because this learning model uses their thinking skills to be able to solve a problem after going through maturity. think, look at different points of view and think of the best solution.

The advantages of the CPS model for problem solving (Novitasari, 2015) are as follows: Train students to create, think and act creatively, solve problems faced realistically, identify and conduct investigations, interpret and evaluate the results of observations. According to Retnawati, the advantage of the Creative Problem Solving (CPS) learning model is that it triggers an active learning process and encourages teachers to be more creative in managing learning in the classroom (Rahma & Wicaksono, 2023). This is in line with opinion (Wasiran & Andinasari, 2019) which states that the CPS model can train students to convey ideas and provide many alternative answers to a question (fluency), resulting in various solutions to a concept from different angles. views with different presentations (flexibility).

Based on the description above, it can be concluded that the purpose of this study is to see the CPS learning model as a series of learning in solving and solving problems systematically based on student creativity to produce effective solutions.

This study aims to see the Creative Problem Solving learning model as a series of learning in solving and solving problems systematically based on student creativity to produce effective solutions. Therefore, the author analyzes and further examines the learning outcomes and students' ability to solve mathematical problems using the CPS learning model. So the author is interested in conducting a study entitled "The Effect of CPS Learning Model on the Ability to Solve Mathematical

Problems in Class X Students of SMAN 2 Rantau Utara".

METHOD

The research method used in this research is a quantitative method using a quasi-experimental design used by the researcher, which is a non-equivalent control group design. The research was carried out by SMAN 2 Rantau Utara in class X with the study time being the odd semester of the academic year 2022/2023 on the subject of linear inequalities. The research data was obtained from the Pre-Test Post Test given to the students of the control class and the experimental class. The instruments used in this study are 4 questions and a validated Pre-Test Post-Test. The data analysis used in the study is a descriptive statistical analysis presented in the form of tables and diagrams from the results of the Post-Pre-Test.

This type of research is quasi-experimental. In this study, 2 classes were used in one school, one class as an experimental class and one class as a control class. Where the experimental class is given treatment using the CPS learning model while in the control class the learning that is applied is conventional learning or learning that is usually done by the teacher. The quasi-experimental design used by the researchers is a non-equivalent control group design (Abraham & Supriyati, 2022).

The method in this study is to conduct interviews with teachers in the field of mathematics studies and conduct initial tests (pre-test) and final tests (post-test). The form of the test is a description test consisting of 4 points of mathematical problem solving ability on linear inequality material.

The data analysis technique used in this study is descriptive statistical analysis and inferential analysis (Nurlaela & Imami, 2022). At the level of descriptive statistical analysis, the analysis is carried out based on observation sheets and

calculations about the average learning outcomes of experimental and control class students on pre- and post-test data (Syahmita et al., 2020). In the inferential analysis stage, it is used to analyze the results of student mathematics learning between the experimental class and the control class (Hasanah et al., 2019). The data used for this inference analysis is pre-test and post-test data which is divided into three steps namely: the first normality test, the second homogeneity test and the third independent sample t-test.

The following is a summary of the hypothesis testing the normality of the population distribution.

H_0 : The sample comes from a normally distributed population.

H_1 : The sample comes from a population that is not normally distributed.

The normality test was performed with the Kolmogorov-Smirnov test using the help of IBM SPSS Statistics software

version 20 (Permana, 2023). The test criteria using the significance level of 5% ($\alpha = 0.05$) are as follows:

1. If the significance value (Sig.) ≥ 0.05 then H_0 is accepted.
2. If the significance value (Sig.) < 0.05 then H_0 is rejected.

This research was conducted at SMAN 2 Rantau Utara in class X with the study time being the odd semester of the 2022/2023 academic year on linear inequality material. The population in this study is all grade X students totaling 310 students consisting of 9 classes which are 6 science classes and 3 social studies classes. This study used a purposive sampling technique. (Sugiono, 2016) Purposive sampling is a sampling technique with certain considerations. The sample in this study is class XIPA-2 as a control class of 36 students and class XIPA-3 as an experimental class of 38 students.

RESULTS AND DISCUSSION

Table 1. Statistical Analysis of Mathematical Problem Solving Ability

	Min value	Max value	Average	Hours Deviasi
Pre-Test Experiment	57	77	68.70	6.383
Post-Test Experiment	60	89	74.39	6.055
Pre-Test control	57	78	69.00	6.685
Post-Test control	62	83	69.44	5.983

Based on Table 1 and the average chart presented in Figure 1 above, it can be seen that there are different results between the average value of the learning outcomes of the experimental class and the control class. From these results, the pretest mean in the experimental class was 68.77 and the control class was 65.22. However, after being treated with the experimental class, it was seen that the post test of the experimental class improved compared to the control class.

This can be seen from the average post-test of the control class is 65.22, while the average math learning result of

experimental class students is better than the control class which is 68.77. With descriptive statistical analysis, it cannot be concluded that there is an influence of the CPS learning model on solving mathematical problems. the ability of grade X students of SMAN 2 Rantau Utara, Then the normality test is conducted so that the results obtained are really accurate. The normality test is performed to find out whether the two classes belong to a normally distributed population or not (Septian, 2017).

The normality test results of pre-test and post-test data are presented in Table 3.

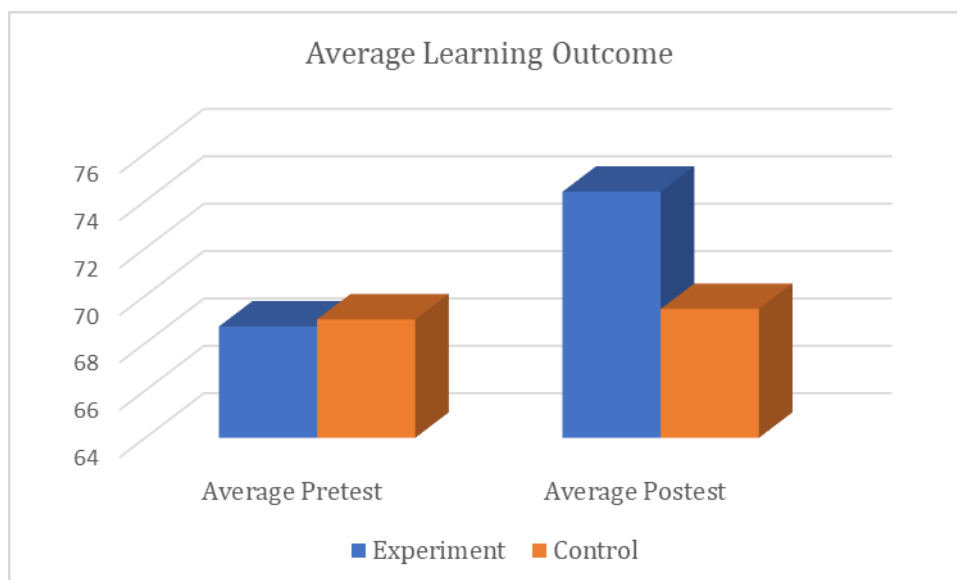


Figure 1. Average Student Learning Outcomes

Table 2. Normality Test

Class	Kolmogorov-Smirnov ^a Sign.		Information
	Pre-Test	Post-Tes	
Experiment	0.210	0.211	Normal Distributed
Control	0,200	0,117	Normal Distributed

Based on Table 2 regarding the results of calculating the normality test using Kolmogorov-Smirnova, it can be seen that there is significant pre-test score data for the experimental class and the control class. In the experimental class 0.210 and 0.200 in the control class. The data is normally distributed data with a significant level above 0.05. The same thing is also shown in the table above at the significance level of the post-test of both classes which is 0.211 for the

experimental class and 0.117 for the control class.

Based on the results of the data, it can be seen that the data has a significant effect. So it can be concluded that in both classes and pre-test and post-test data are normally distributed. Once it is known that the sample is in the normal distribution table, then proceed with the homogeneity test.

Table 3. Homogeneity Test

	Levene Statistic	df1	df2	Sig.
Experiment	0.125	1	70	0.700
Control				

Based on the calculation results in table 3 of the homogeneity test, the data obtained is that the significant value in the average of the pre-test and post-test data is 0.700, provided that the significance level or probability value is above 0.05, then with the result of the significance

value it can be concluded that the population in the experimental class and the control class has the same or homogeneous variance. The next step is an independent sample t-test, this aims to find out if there is a difference in student learning outcomes in the subject of linear

inequality between students who use the CPS learning model and students who use the conventional learning model. (Darsono, 2022).

For the analysis of hypothesis test data using Independent Sample T-Test assisted by SPSS 25, the test results are obtained in Table 5.

Table 4. Test the hypothesis

Class	t_{hitung}	t_{tabel}	Criterion	Hipotesis
Experiment Control	4,950	1,789	$t_{hitung} > t_{tabel}$	H_0 ditolak

From the Independent sample test results, the calculated value = $4,950 > t_{tabel} = 1,789$, so H_0 is rejected. then it can be said that there is a positive influence between the Creative Problem Solving (CPS) learning model on the Mathematical Problem Solving Ability of grade X SMAN 2 Rantau Utara students. So it can be concluded that using the CPS learning model is better than students who have followed conventional learning.

1. Discussion

The Effect of Creative Problem Solving Learning Model

From the results of the research that has been done and from the results of statistical data processing, it can be seen that the CPS learning model has a positive effect on the way students think in solving existing problems.

From these results, the pretest mean in the experimental class was 68.77 and the control class was 65.22. Nevertheless, after being treated with the experimental class, it was seen that the post test of the experimental class improved compared to the control class with 74.39 (experimental) $>$ 69.44 (control).

In this study, two different treatments were used for both classes, where in the experimental class the CPS learning model was applied, while in the control class the conventional learning model was applied.

Based on the description of the results of the study conducted by the researcher during the learning in the experimental class using the CPS learning model, students were given student worksheets (LKS) and students were

asked to solve problems in the LKS by discussing in small groups that had been set. by the teacher. Based on observations during the learning activities taking place in the experimental class, students are generally more active in understanding the material and solving problems. The activity in the experimental class is better when compared to the activity of students in the control class that uses conventional learning.

In learning using the CPS learning model, students are more active in discussions with group members, so students are not just spectators. In contrast to the implementation of conventional learning applied in the control class, where learning activities are dominated by the teacher, starting from the delivery of learning materials, the preparation of sample questions, and the preparation of practice questions that resemble the sample questions that have been given. This actually makes students an audience that only accepts what the teacher gives, students don't interact much with other friends making it difficult for students to express ideas.

Mathematical Problem Solving Skills

Based on the results of the study on the experimental class and the control class that were tested at the level of variants and homogenous classes, it is known that the experimental class and the control class have the same variant. This is shown from the statistical results of the homogeneity test obtaining data that the significant value in the average of the pre-test and post-test data is 0.700, provided that the significance level or probability value exceeds 0.05.

The ability to solve mathematical problems can also be proven by the statistical results of the hypothesis test obtained t_{count} value = 4,950 > t_{table} = 1,789 then H_0 is rejected. then it can be said that there is a positive influence between the Creative Problem Solving (CPS) learning model on the Mathematical Problem Solving Ability of grade X SMAN 2 Rantau Utara students. So it can be concluded that using the CPS learning model is better than students who have followed conventional learning.

From the results, it can be seen that students can solve math problems by applying the CPS learning model. With the CPS learning model, students can interact with each other, exchange ideas, and help each other without being monotonous as an audience.

The explanation above is reinforced through a study which concluded that learning using CPS can improve students' problem solving skills, student activities, and teachers' ability to manage learning (Lucky & Julyanti, 2023). The above explanation is clarified through research (Lubis et al., 2018) which shows that there is a difference in the ability of students to solve mathematical problems using the CPS learning model using the conventional model. Furthermore, it is reinforced through research conducted by (Widodo & Kartikasari, 2017) which shows the description of learning outcomes in the experimental class is higher than the control class. Based on the results of the study, the experimental group that was given CPS treatment had a higher average final score compared to the average score of the control group that applied conventional learning.

CONCLUSIONS AND SUGGESTIONS

Based on the formulation of the problem and the research results as well

as the discussion of the research results, it can be concluded that: first, the influence of the creative problem solving learning model (CPS) affects the mathematical problem solving ability of SMA N 2 North Rantau students. This can be seen from the average post-test score of the experimental class using the CPS learning model of 74.39 with a standard deviation of 6.055, while for the control class with a conventional learning model, an average of 69.44 was obtained with a standard deviation of 5.983. Thus, the CPS learning model is better than the conventional learning model in terms of solving mathematical problems. Second, the mathematics learning outcomes of students using the CPS learning model in relation to students' ability to solve mathematical problems are better than the mathematics learning outcomes of students who have followed conventional learning. This means that there is an influence of the use of the CPS learning model on the ability to solve mathematical problems of grade X students of SMAN 2 Rantau Utara.

Based on research on the ability to solve mathematical problems using the CPS learning model, the researcher can give suggestions to students to solve more non-routine problems and always give a positive attitude towards the process of learning mathematics, teachers should use a new atmosphere during learning and the CPS learning model should be a reference to the use of mathematical learning models, and other researchers should be able to conduct research related to problem-solving abilities or related to the CPS learning model.

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