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APPLICATION OF THE CREATIVE PROBLEM-SOLVING LEARNING MODEL TOWARDS STUDENTS' MATHEMATICS REPRESENTATION ABILITY

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Abstract

This research aims to find out what the learning process is like using the Problem based learning model. Hypothesis testing using the t test shows that there is a significant difference, namely significant (2-tailed) 0.004 < 0.05 so it can be concluded that H0 is rejected and H1 is accepted. This means that there is an average difference in students' mathematical representation abilities between the experimental class and the control class. Thus, the results of this hypothesis test show that there is an influence of the Creative Problem-Solving learning model on students' mathematical representation abilities.

Keywords: *creative problem solving,* representation ability, mathematical representation ability

Abstrak

Penelitian ini bertujuan untuk mengetahui bagaimana proses pembelajaran dengan model pembelajaran problem base learning. Pengujian hipotesis menggunakan uji t menunjukkan terdapat perbedaan signifikan yaitu signifikan (2-tailed) 0,004 < 0,05 sehingga dapat disimpulkan H0 ditolak dan H1 diterima. Artinya terdapat perbedaan rata-rata kemampuan representasi matematis siswa antara kelas eksperimen dan kelas kontrol. Dengan demikian, hasil uji hipotesis ini menunjukkan bahwa terdapat pengaruh model pembelajaran Creative Problem Solving terhadap kemampuan representasi matematis siswa..

Kata kunci: pemecahan masalah kreatif, kemampuan representasi, kemampuan representasi matematis

INTRODUCTION

Education is the most important thing in human life. In developing potential along with technological advances. This is in accordance with the goals of national education stated in Law of the Republic of Indonesia Number 20 of 2003 Chapter 2 article 3 concerning the National Education System. Based on these goals, it is necessary to have a learning process that can realize national education goals. One of the learning that can be done is learning mathematics. This is in line with Kalsum (2023) said how important the role of mathematics subjects is for life. By learning mathematics, students will basically get used to thinking systematically by using logic to improve their mathematical representation abilities.

The objectives of learning mathematics have their own goals. According to Rizka et al., (2014) in (Putri & Noer, 2019) , the aim of learning mathematics is so that students are able to: (1) understand mathematical concepts, explain the relationship between concepts, and apply concepts or algorithms in a flexible, accurate, efficient and precise way in solving problems, (2) use reasoning on patterns and properties, carry out manipulations mathematics in making generalizations, compiling evidence or explaining mathematical ideas and

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statements, (3) solving problems which includes the ability to understand problems, design mathematical models, complete models and interpret the solutions obtained, (4) Communicate ideas with symbols, tables, diagrams or media others to clarify a situation or problem.

Through the creative problem solving learning model, students can choose and develop their ideas and thoughts. The emergence of creative solutions as a problem solving effort will foster self-confidence, courage to express opinions, divergent thinking, and flexibility in problem solving efforts.

The Creative problem solving learning model has several basic principles, namely; persistence, problems and challenges. These components can be implemented systematically with various learning components. The creative problem solving learning model seeks to develop divergent thinking, trying to achieve various alternatives in solving a problem

Based on the TIMSS (2015) survey in (Sanjaya et al., 2018) shows that Indonesia is ranked 44th out of 49 countries with an average score of 397. This shows that the level of mathematical representation ability of Indonesian students is very low compared to the competitiveness of other countries. Hamsarudin (2016) in (Susanti & Sulastri, 2020) in the report entitled TIMSS 2011 international results in mathematics conducted research on samples in each country with the calculation that 1 sample represents 4000 students..

The low ability of students' mathematical representation is caused by several factors where students have not been able to present graphs of the equations given, have not been able to create equations or mathematical models from story problems, have not been able to solve problems from mathematical symbols and still feel confused in answering with words. This is in line with Susanti & Sulastri (2020) said that students' low representation skills still find it difficult to express mathematical ideas contained in story problems into symbols or mathematical methods, students still have difficulty identifying problems contained in problems, students are still confused in determining the right solution to solve problems. Students are only able to answer if the questions given match the examples that have been explained.

Based on the results of interviews during observations at public schools in Tangerang Regency obtained from information from mathematics teachers who explained that students'

understanding of mathematics subjects, especially Systems of Linear Equations in Two Variables (SPLDV), students were not yet able to convert story problems into mathematical form and there were still few who met the Completeness Criteria. Minimum (KKM), there are only a few that meet the completeness criteria.One model that can increase students' creativity in solving problems and at the same time can grow students' representational abilities is the *Creative Problem Solving* (CPS) model, which is a systematic learning model that focuses on teaching and skills in solving problems followed by strengthening creativity. This is in line with(Susanti & Sulastri, 2020) said *Creative Problem Solving* (CPS) is a systematic learning model in solving problems that requires students to think creatively. This learning model is a problem-solving learning model that highlights students' creativity in solving problems.

There are several definitions of representation according to several experts (Fadillah in Dianti, 2015: 12), including the following.

1) Representation is a model or substitute form of a problem situation or aspect of a problem situation that is used to find a solution. For example, a problem can be represented with objects, pictures, words, or mathematical symbols.

2) Representation is a method used by someone to communicate the answer or mathematical idea in question.

3) Representation is a configuration that can present an object in a certain way.

4) In general psychology, representation means the process of creating concrete models in the real world into abstract concepts or symbols. In mathematical psychology, representation means a description of the relationship between objects and symbols.

It can be seen that the term representation refers to the process of transferring a representation to another form, how it is transferred and what the results of transferring the representation are. Apart from that, in this learning the representational abilities that are developed have a tendency in the form of translation from verbal descriptions which are usually in the form of story questions to be converted into other forms of representation such as: symbols, graphs or tables, and the reverse rarely happens (Hudiono, 2007:3). Mathematical representation conclusions are expressions of mathematical ideas and thoughts displayed by students or substitute forms of a problem they are facing as a result of the interpretation of their thoughts.

According to Jones (Hudiono, 2007) there are several important reasons for including representation process standards, namely: fluency in making translations between various different forms of representation, is a basic ability that students need to have to. According to NCTM (2000) representation has indicators that must be paid attention to, namely as follows. First, using various mathematical representations to explain mathematical ideas; Second, carry out translations between mathematical representations; Third, interpreting mathematical phenomena with various mathematical representations; and Fourth, mathematical representation consists of: visual (graphs, diagrams, tables or pictures), symbolic (mathematical statements/mathematical notation. In this research not all aspects of mathematical representation ability were measured, but only some of the indicators. The indicators used were in this research are 1) answering questions using words or written text 2) writing the solution steps using words 3) writing an interpretation of a representation, indicators 1-3 are included in the representation aspect written words or text and 4) restating the data or information from a representation to a diagram, graph or table representation, for the fourth indicator is in the visual representation aspect.

METHODS

This research uses quantitative descriptive research methods. This research will be carried out at SMPN 1 Kosambi for the 2022/2023 academic year. The subjects in this research were class VIII students at SMPN 1 Kosambi who were taken at random without paying attention to the strata in the population.

The population in this study were students in classes VIII A and VIII B, while sampling used saturated sampling with class A as the experimental class and the other classes as the control class. The data collection technique in this research is measurement, the tool used is a representation ability test. Technique and data analysis with the following calculation steps: (1) provide student test results scores based on scoring guidelines; (2) give a score to each question item; (3) determine the average score.

To test the hypothesis, the following calculations were carried out: (1) testing the normality of post-test scores for the experimental and control groups using the formula (chi square); (2) If it turns out that both have a normal distribution, proceed with the homogeneity of variance test, namely the F test; (3) if both are normally distributed and homogeneous,

then a t-test is carried out; (4) if both are normally distributed and the variance is not homogeneous, then analysis will be carried out using the separated variance t-test; (5) if it turns out that one or both groups are not normally distributed. The next step uses nonparametric statistics, namely the Mann-Whitney U test.

RESULTS AND DISCUSSION

This research was conducted to determine students' mathematical representation abilities in the System of Linear Equations in Two Variables (SPLDV) material which has been delivered by applying the *Creative Problem Solving* (CPS) learning model. This research discusses research variables including the independent variable *Creative Problem Solving* (CPS) and the dependent variable of students' mathematical representation abilities, then data that can measure students' mathematical representation abilities using essay questions.

Creative Problem Solving (CPS) is a learning model used to improve students' mathematical representation abilities in solving a problem or finding a solution. The *Creative Problem Solving* (CPS) learning model is a design pattern and emphasizes students' representational abilities in finding and determining solutions based on students' creative thinking activities in the learning process well. Other research that has almost the same results is Muhammad (2018) with the title "Using *the Creative Problem Solving* (CPS) Learning Model to Improve Students' Mathematical Problem Solving" based on the results and discussion it can be concluded that the mathematical problem solving abilities of students who use the learning model increase. *Creative Problem Solving* (CPS) is better than students who use conventional learning.

Based on the results of data collection during the data collection process, it was obtained that from two classes VIII A as the experimental class there were 18 students and class VIII B as the control class there were 20 students. Data was obtained from the post test results after being given treatment, namely by using the CPS model and conventional model on SPLDV material. The average data obtained from the experimental class was 71.4 while the control class was 58.8. Based on these data, it can be concluded that the average value of the mathematical representation ability results of students taught using the CPS model is classified as good, while the learning outcomes of students who use the conventional learning model are sufficient.

The results of the post test data normality test for the experimental class using the chi square formula obtained a value of X2count <X2table or -0.60 <5.78, so it can be concluded that the data is normally distributed. The results of the control class post test data normality test using the chi square formula obtained a value of X2count <X2table or 5.10 <5.99, so it can be concluded that the data is normally distributed. The homogeneity test used the F test, the samples in this study were two classes. Based on the calculation results, it was found that F2count < F2table or 1.29 < 2.53 so it can be stated that the two variances are homogeneous.

Based on these data, the results obtained show that the data for both classes are normally distributed, so we can continue with hypothesis testing using parametric statistics with the t test. The data obtained is presented in table 1.

Table 1 T-test results

Statistics	**Results of Mathematical Representation Ability**
Significant (2-tailed)	0.004

In this research, the influence of students' mathematical representation abilities in the experimental class which had been given the *Creative Problem Solving* (CPS) learning model was obtained compared to the control class which was given conventional learning. This can be seen from the hypothesis results which were significant (2-tailed) 0.004 < 0.05, so it can be concluded that H_0 is rejected and H_1 is accepted.

The average post test score for experimental class students was 71.4 with good criteria. Researchers found that students in this class had difficulty with the indicator of writing an interpretation of a representation, namely that most students had difficulty explaining the calculation process of the problems they were working on. It can be seen from the results of the students' answers that they are still not very good at expressing ideas in mathematical communication in written form.

The average post test score for control class students was 58.8 with sufficient criteria. Students in this class experienced difficulty with the first indicator, namely writing the steps for solving, similar events as in the experimental class. Most students still have difficulty expressing ideas in mathematical communication in written form. The second difficulty in this class is students' difficulty in re-expressing data or information from a representation into a

graphic representation. It can be seen from the results of the students' answers that there are still many errors, and even the inability of some students to make linear graphs of two variables or interpret linear graphs of two variables in the form of equations.

CONCLUSION

Based on the research that has been carried out, the conclusion is that there is an influence on the mathematical representation abilities of students who use the *Creative Problem Solving* (CPS) learning model with students who use conventional learning.

Based on the results of research data processing, it can generally be concluded that students' mathematical representation abilities after being taught using the CPS model on SPLDV material are better than students taught using the conventional model. This incident can be seen from the results of the average post test score and has been proven using inferential statistics. Every student in the control class and in the experimental class experienced problems on each question indicator, this is what differentiated their average scores.

When delivering a lesson, especially mathematics, it is hoped that a teacher can choose an effective and appropriate learning model. The model chosen must be able to motivate students and be more active in the learning process activities. Choosing the right learning model greatly influences success in the learning process, so that it can increase students' learning concentration during the learning process.

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