THE EFFECT OF COLLABORATIVE PROBLEM SOLVING LEARNING MODELS ON MATHEMATICAL LEARNING RESULTS REVIEWED FROM THE ABILITY OF PROBLEM-SOLVING OF CLASS VII

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ABSTRACT

This research is motivated because, in learning mathematics, students' problem -solving abilities are still low. Students have not been able to understand the problem given. This is Indicated by many students who cannot determine what is known and what is asked in the problem. This study aims to determine the Collaborative Problem Solving Learning Model (CPS) effect on Mathematics Learning Outcomes in Students' Mathematical Problem Solving Ability. This research is an experimental study with a research design using a 2×2 factorial design. The population of the study was all VII grade students of Junior High School (SMP) Muhammadiyah 3 Depok in the even Semester of the 2019/2020 school year. The sample used in this study was to take two classes. Randomly, namely, class VII A as a control class and VII D as an experimental class. Data collection Two techniques using the test. The data analysis technique used two-way Anava with prerequisite test analysis of normality test and homogeneity test and continued with LSD test. The results of this study can be concluded: (i) Fobs(A) > F0,05;1;66, there is an influence of learning model factors on mathematics learning outcomes, (ii) $F_{obs(A)} < F_{0,05;1;66}$, there is no influence of students mathematical problem-solving ability factors on results students mathematics learning, (iii) $F_{obs(A)} < F_{0,05;1;66}$, there is no interaction between the factors of the learning model and students mathematical problem-solving abilities towards student mathematics learning outcomes.

Keywords: Collaborative Problem Solving (CPS), Problem Solving Ability, Learning Outcomes.

INTRODUCTION

Mathematics learning has a unique approach to order students can easily understand the mathematics subject matter. According to theory, the teacher has an important role in learning to teach to explain knowledge possessed to students through learning by applying the teaching model. The selection of learning models can increase students' interest in learning and increase their understanding of the material being studied. Mathematics learning objectives mentioned in Permendiknas No. 22 2006, namely: (1) Understand the concept, (2) Using reasoning on patterns and properties, perform mathematical manipulations in generalizing, composing evidence, or explain ideas and mathematical statements, (3) Solve a problem, (4) Communicating ideas with symbols, tables, diagrams, or media others, (5) Having an attitude of respect the use of mathematics in life. Based on the learning objectives, it is clear that one of the goals of learning mathematics is that a student must have proficiency in the solution to the problem. According to the National Council of Teachers of Mathematics or NCTM (2000), school mathematics standards consist of content standards and process standards, including problem-solving, reasoning and proof, linkage, and representation (Hasratuddin, 2013: 134). Based on educational process standards, teachers should be able to determine how the learning process goes well. Teachers have an essential role in the teaching and learning process.

Mathematical problem solving is very important to be taught to students. To solve problems, students must know to develop new understandings. Students are said to be able to solve problems if they fulfill four steps, namely according to Polya (in Amam, 2017: 41), namely: (1) Understanding the problem, (2) Planning solutions, (3) Solving problems according to plan, (4) Re-checking the results obtained. Sumarmo (in Amam, 2017: 41) states that Problem-solving can be seen from two different points of view, namely as a learning objective and as a learning approach.

The student's ability to solve and cooperate is still low. The low ability of students' problem solving can be seen from the students not understanding the problems given. This is indicated by many students who cannot determine what is known and what is being asked in the questions. Students tend to have to be directed in working on problems, which also triggers low problem-solving abilities. Students have not been able to identify the complete information that is known and asked, so this results in low mathematical problem-solving abilities.

The purpose of this study was to determine whether or not there were: 1) the significant influence of the learning model factor on student learning outcomes, 2) the significant influence of the problem-solving ability factor on student learning outcomes, 3) the significant influence of the interaction between the learning model and the problem-solving ability learning outcomes of class VII SMP Muhammadiyah 3 Depok Even Semester Academic Year 2019/2020.

METHODS

This type of research is quantitative research. This study used two × two factorial design experiment. This research design has two factors, and each factor has two levels. The two factors are the learning model (A) and problem-solving abilities (B). The learning model has two levels: a low level (1) and a high level (2). Meanwhile, the problem-solving ability has two levels: a low level (1) and a high level (2). This research was conducted at SMP Muhammadiyah 3 Depok class VII, even the 2019/2020 school year. This study's population were all grade VII students of SMP Muhammadiyah 3 Depok in the even semester of the 2019/2020 school year. The sample used in this study was to randomly take two classes from a population consisting of four classes. The class is class VII A as the control class and class VII D as the experimental class. Class VII A consists of 34 students, and class VII D consists of 36 students.

RESULTS AND DISCUSSION

The research data was taken from students of SMP Muhammadiyah 3 Depok class VII even semester of the 2019/2020 school year. Learning on the comparative material is carried out for four meetings according to a predetermined schedule. This research study is an experimental study consisting of 2 classes, namely the experimental class and the control class. The experimental class was given treatment using the Collaborative Problem Solving learning model, and the control class was given treatment using the Problem Based Learning learning model.

Student's mathematical problem-solving abilities were measured using instruments in descriptive questions consisting of one question.

Table 1. Summary of the Results of Student's Mathematical Problem Solving Ability

Class	Parameters			
	N	Highest	Lowest	$\bar{X}$
Experiment	36	88,9	0,0	58,7
Control	34	55,6	0,0	23,8

Based on table 1 above, the average score of the experimental class mathematical problem-solving ability is 58,7, with the highest score 88,9 and the lowest of 0,0. While the average value of the control class mathematical problem-solving ability results is 23,8, with the highest value. 55,6 and the lowest 0,0. From the test results, it can be seen that the average value of the experimental group is higher than the average value of the control group. The difference in the average reaches 34,9. The analysis can be continued with the normality test and the homogeneity test as a prerequisite before testing the hypothesis.

The value of student learning outcomes is measured using an instrument in the form of multiple-choice questions, amounting to 14 questions.

Table 2. Summary of Learning Outcomes Value

Class	Parameters			
	N	Highest	Lowest	$\bar{X}$
Experiment	36	78,57	0,0	57,5
Control	34	85,7	0,0	49,8

Based on Table 2 above, the average value of the experimental class learning outcomes is 57,5 with the highest score of 94,1, and the lowest is 58,9. Simultaneously, the average value of the control class learning outcomes is 49,8, with the highest score of 85,7 and the lowest 0,0. From the test results, it can be seen that the average value of the experimental group is higher than the average value of the control group with a difference of 7,7. The analysis can be continued with the normality test and the homogeneity test as a prerequisite before testing the hypothesis.

The normality test is carried out to find out whether the data that has been tested is normally distributed or not. Researchers used the normality test with Chi-Square. In this study, a normality test was carried out on the value of students' mathematical problem-solving abilities and mathematics learning outcomes. Based on the normality test of the mathematical problem-solving ability that has been carried out in the experimental class with a significant level of 5% and 5 degrees of freedom, it can be seen that χ^2_{count} = 6.058 and χ^2_{table} = 11.0705, consequently $\chi^2_{\text{count}} < \chi^2_{\text{table}}$ then H_0 accepted, which means that the experimental class has a normal distribution value of mathematical problem-solving abilities. Meanwhile, the normality test of the mathematical problem-solving ability was carried out in the control class with a significant 5% and 5 degrees of freedom. It can be seen that χ^2_{count}= 5.6247 and χ^2_{table} = 11.0705. As a result, $\chi^2_{\text{count}} < \chi^2_{\text{table}}$ then is H_0 accepted, which means that the control class has a normally distributed value of the mathematical problem-solving ability. Based on the normality test of the mathematics learning outcomes conducted in the experimental class with a significant level of 5% and 5 degrees of freedom, it can be seen that χ^2_{count} = 4.9433 and χ^2_{table}= 11.0705, consequently $\chi^2_{\text{count}} < \chi^2_{\text{table}}$, then H_0 is accepted, which means that the experimental class has a value of learning outcomes that is normally distributed. While the normality test of the mathematics learning outcomes was carried out in the experimental class with a significant level of 5% and 5 degrees of freedom, it can be seen that χ^2_{count}= 0.7979 and χ^2_{table}= 11.0705, consequently $\chi^2_{\text{count}} < \chi^2_{\text{table}}$, then $H_0$is accepted, which means that the control class has a value of learning outcomes that is normally distributed.

The homogeneity test is used to determine whether the variance of the results of mathematical problem-solving abilities and the value of learning outcomes in the experimental class and control class is homogeneous or not. For the homogeneity test, the F-test was used.

Table 3. Summary of Homogeneity Test Results Value of Mathematical Problem Solving Ability

F_{count}	$F_{0,025(35,33)}$	Significant Level	Information
1,7632	1,9886	5%	Homogenous

Based on table 3, the value of F_{count} = 1.7632. At the F distribution's critical value with a significant level of 5% and degrees of freedom for large samples 35 and small samples 33. It turns out that $F_{\left(\frac{\alpha}{2}\right)(n_1-1,\ n_2-1)} = F_{0,025(35,33)} = 1{,}9886$, consequently $F_{\text{count}} < F_{0,025(35,33)}$ then H_0 is accepted, which means that the two classes have the same variance in the results of mathematical problem-solving abilities (having homogeneous variance).

Table 4. Summary of Two Way Analysis of Variance

Source of Variation	JK	DF	RK	F_{obs}	F_a
Learning Model (A)	24095,62	1	24095,62	55,59	3,986
Problem-Solving (B)	18,66	1	18,66	0,043	3,986
Interaction (AB)	377,72	1	377,72	0,871	3,986
Error	28605,72	66	433,42		
Total	53097,72	69			

Because F_{obs}(A) = 55.59 and $F_{0,05;1;66} = 3,986$ then $F_{obs} > F_{0,05;1;66}$ so that $H_{0,1}$ is rejected, which means that there is an influence of the learning model factor on the outcome learning mathematics for seventh-grade students of SMP Muhammadiyah 3 Depok even semester of the 2019/2020 academic year.

Because F_{obs}(B) = 0.043 and $F_{0,05;1;66} = 3,986$ then $F_{obs} < F_{0,05;1;66} = 3,986$ so that $H_{0,2}$ is accepted, which means that there is no influence on student's mathematical problem solving ability factors. Mathematics learning outcomes of class VII SMP Muhammadiyah 3 Depok even Semester Academic Year 2019/2020.

Because F_{obs}(AB) = 0.871 and $F_{0,05;1;66} = 3,986$ then $F_{obs} < F_{0,05;1;66} = 3,986$ so that $H_{0,3}$ is accepted, which means there is no influence on the interaction of learning model factors and solving ability Student's mathematical problems with the mathematics learning outcomes of seventh-grade students of SMP Muhammadiyah 3 Depok even semester of the 2019/2020 academic year.

The LSD test is carried out to overcome which one negatively affects student mathematics learning outcomes using learning model factors and problem-solving abilities.

Table 6. Summary of Calculations and LSD Test Results

Cases	$\lvert\bar{y}_i - \bar{y}_j\rvert$	LSD	Results	Information
$\mu_1 - \mu_2$	3,76	14,21	$\mu_1 < \mu_2$	Not Influence
$\mu_1 - \mu_3$	33,03	14,481	$\mu_1 > \mu_3$	Significant Influence
$\mu_1 - \mu_4$	38,91	15,705	$\mu_1 > \mu_4$	Significant Influence
$\mu_2 - \mu_3$	36,79	12,844	$\mu_2 > \mu_3$	Significant Influence
$\mu_2 - \mu_4$	42,67	14,21	$\mu_2 > \mu_4$	Significant Influence
$\mu_3 - \mu_4$	5,88	14,481	$\mu_3 < \mu_4$	Not Influence

Information:
μ_1: MPCPS High KPM
μ_4: MPCPS KPM low
μ_3: MPPBL KPM high
μ_4: MPPBL KPM is low
MPCPS: Collaborative Problem-Solving Learning Model
MPPBL: Problem-Based Learning Learning Model
KPM: Problem-Solving Ability

CONCLUSION

This study concludes that first, there is a significant influence on the learning model factor on the mathematics learning outcomes of grade VII students of SMP Muhammadiyah 3 Depok even semester of the 2019/2020 academic year. When learning progresses, students are more enthusiastic about discussing and exchanging opinions in groups than learning alone. They are directly involved in learning to know what material to study to find the core concepts they are learning.

Secondly, there is no significant effect of the student's mathematical problem-solving ability factor on the mathematics learning outcomes of seventh-grade students of SMP Muhammadiyah 3 Depok even semester of the 2019/2020 academic year. Student's mathematical problem-solving abilities have not been seen. This can be seen from students who cannot determine what is known and what is asked when given the questions.

Thirdly, there is no significant influence on the interaction of learning model factors and students' mathematical problem-solving abilities on the mathematics learning outcomes of grade VII students of SMP Muhammadiyah 3 Depok even semester of the 2019/2020 academic year. This happens because some students are not happy with mathematics and do not pay attention to the teacher with the given learning model.

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