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COMPARISON OF STUDENT LEARNING OUTCOMES USING CLASS ACTION RESEARCH TO IMPROVE MATHEMATICS PROBLEM SOLVING ABILITY

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ABSTRACT
This study aims to determine the comparison of student learning outcomes using a scientific approach and learning model Problem Based Learning. This type of research uses the Classroom Action Research (CAR) method or can be referred to as (Classroom action research) and mix methods (Quantitative and Qualitative). The subject of this study was located at SMP Negeri 3 Cimahi in class VIII-I with a total of 34 students. Data collection techniques with pre-test and post-test. The results showed that there were differences in mathematical problem solving abilities between students who used a scientific approach and students who used the Problem Based Learning learning model. The results showed that the application of the Problem Based Learning model could improve students' mathematical problem solving abilities from cycle I to cycle 2 by 10%. The results of the research show that the Problem Based Learning (PBL) model can improve problem solving abilities in the material on the System of Two Variable Linear Equations (SPLDV). This research can be concluded that the ability to solve problems in SPLDV material can be increased by applying the problem based learning model.
Keywords: Problem Based Learning, Scientific, Mathematical Problem Solving Abilities

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PRELIMINARY

Mathematical problem solving ability is a skill that students must have in order to be able to use mathematical activities to solve problems in mathematics, problems in other sciences, and problems in everyday life. Problem solving is a very important part of the mathematics curriculum. This is because students will gain experience in using their knowledge and skills to solve non-routine questions. Mathematical abilities can be classified into five main competencies, namely: understanding mathematics, solving mathematical problems, making connections in mathematics, communicating mathematics, and reasoning (Hendriana & Soemarmo, 2014). Mathematics is a subject that contains various necessities of life, one of which is an educational tool. Mathematics as a means of education plays a role

in human activity which is obtained from thinking processes, and even that is not obtained from experimental results (Noprinda & Soleh, 2019). Low mathematics learning outcomes may reflect students' lack of interest and motivation in learning and the notion that mathematics is a difficult subject, less interesting, and less enjoyable. While in reality, mathematics is a universal science that can be applied in everyday life (Beladina & Suyitno, 2013).

One of the expected mathematical abilities in learning mathematics is problem solving ability. Problem solving is a strategic competence shown by students in understanding, selecting approaches and solving strategies, and solving problem models. Problem solving ability can be regarded as a basic skill that must be owned by someone, because every human being must be able to solve his own problems (Al Atiyah, 2014).This shows that mathematics can be viewed realistically. However, in reality in the field there are problems in learning mathematics, namely the lack of students' ability to solve mathematical problems.

Problems related to low student learning outcomes and low ability to solve math problems must be addressed immediately. The trick is to improve the learning process. One of the success factors of the learning process and the success of achieving the goals of learning mathematics is a learning tool. Learning devices are tools or components used in the learning process which consist of syllabus, lesson plans, teaching materials and learning achievement tests. One of the printed teaching materials used in learning in schools is LKPD (Zulfah et al., 2018).

Student Worksheets (LKPD) are sheets containing material, summaries, and assignments that must be done by students. One of the roles of LKPD in learning is as teaching materials which can minimize the role of education but activate students more(Anggraini et al., 2016). The prepared LKPD can be designed and developed according to the conditions and situations of the learning activities to be faced (Rohaeti et al., 2009). LKPD can make it easier for teachers to direct students to discover science concepts through experiments or investigations either individually or in groups (Firdaus & Wilujeng, 2018). The benefits obtained with using LKPD include: Facilitating educators in managing the learning process, Helping educators direct their students to be able to find concepts through their own activities or in work groups, Can be used to develop process skills and develop a scientific attitude, Help educators monitor the success of students to achieve learning goals (Firdaus & Wilujeng, 2018).

LKPD contains a collection of activitiesthe basis that students must do to maximize understanding in an effort to form basic abilities according to the indicators of pressure on learning outcomes that must be pursued. LKPD can be in the form of a guide for developing cognitive aspects as well as a guide for all aspects of learning in the form of an experimental guide. LKPD components include: (1) experimental title, (2) brief theory of material, (3) tools and materials, (4) experimental procedures, (5) observation data, (6) and conclusion questions for material discussion (Triantoro, 2018). Student Activity Sheet is a printed teaching material in the form of sheets containing material, summaries and instructions that students must implement. Based on some of the above understandings that the LKPD contains a guide which as a student facilitator developed there are sheets containing material, instructions and summaries done by students so that they can add to the abilities of the cognitive aspect as information provided by students. (Prastowo, 2015)

In order to achieve the goals of learning mathematics, one of which is the ability to solve mathematical problems, it is necessary to provide new innovations to LKPD which aim to construct students' knowledge. The innovation made in the LKPD is in the form of using a learning model or strategy which is used as the basis for developing LKPD. LKPD will be more optimal if it is based on one of the learning models or strategies that have the aim of increasing students' problem-solving abilities and teaching how to solve a problem.One model or learning strategy that can be used to achieve this goal is through PBL(Zulfah, 2017). According to Polya(Lisma, 2019), the model that is used in learning mathematics and is very important in developing mathematical abilities is the PBL model.

Problem based learning (PBL) is a learning strategy or model or learning approach that uses real-world problems as a context or problem for students to learn about critical thinking and problem-solving skills, and can gain essential knowledge and concepts from subject matter. According to Fariroh & Anggraito (2015) revealed that learning tools or teaching materials are problem-based learning developed can improve classical mastery, because of problem based learning fully direct activities to students such as making observations on real objects to be able to answer questions that have been expressed at the beginning of learning activities. This is supported by statements (Paidi, 2011) that the complex problems in LKPD have the potential to train students' ability to solve authentic problems and find alternative solutions. problem based learning based on assumptionsthat problematic situations that are confusing or unclear will arouse the curiosity of students so that they are interested in investigating. Utrifani (2014) PBL is a learning model that involves students to solve a problem through the scientific method stage so that students can learn

knowledge related to the problem and have the skills to solve problems (Aini & Yekti, 2018). The PBL approach is able to connect material that is considered abstract with real life. In addition, by connecting the real world it is hoped that it can increase students' understanding and motivation to learn.

Based on the opinions above, it can be concluded that the problem based learning model is a learning model that presents real world problems so that it stimulates students to learn to think critically. One of the materials that makes students still have difficulty in the process is the material of a system of two-variable linear equations. Two Variable Linear Equation System (SPLDV) material is one of the competencies that must be mastered by junior high school (SMP) class VIII students in the 2013 Curriculum. Two Variable Linear Equation System (SPLDV) is a collection of two or more Two Variable Linear Equations (PLDV) which has the same solution. This material is material that is very closely related to everyday life because there are many things that we encounter using the SPLDV principle, such as calculating the price of an item when shopping.

Based on the description above, it is necessary to conduct a study on "Comparison of Student Learning Outcomes Using a Scientific Approach and Problem Based Learning Models to Improve Mathematical Problem Solving Ability in the Material of Two-Variable Linear Equation Systems".

METHODS

The method used in this research is using the class action research method (CAR) or can be called by the term (classroom action research). This is because classroom action research is intended to provide information on appropriate actions to improve teacher abilities and student activity in managing the learning process in class.

This classroom action research was conducted from November 14 2022 to November 30 2022 at SMP Negeri 3 Cimahi. The time required for learning the material for the System of Two Variable Linear Equations (SPLDV) is 4x40 minutes. The subject of this study was class VIII-I with a total of 34 students with 14 female students and 20 male students. The flow of classroom action research is as follows:

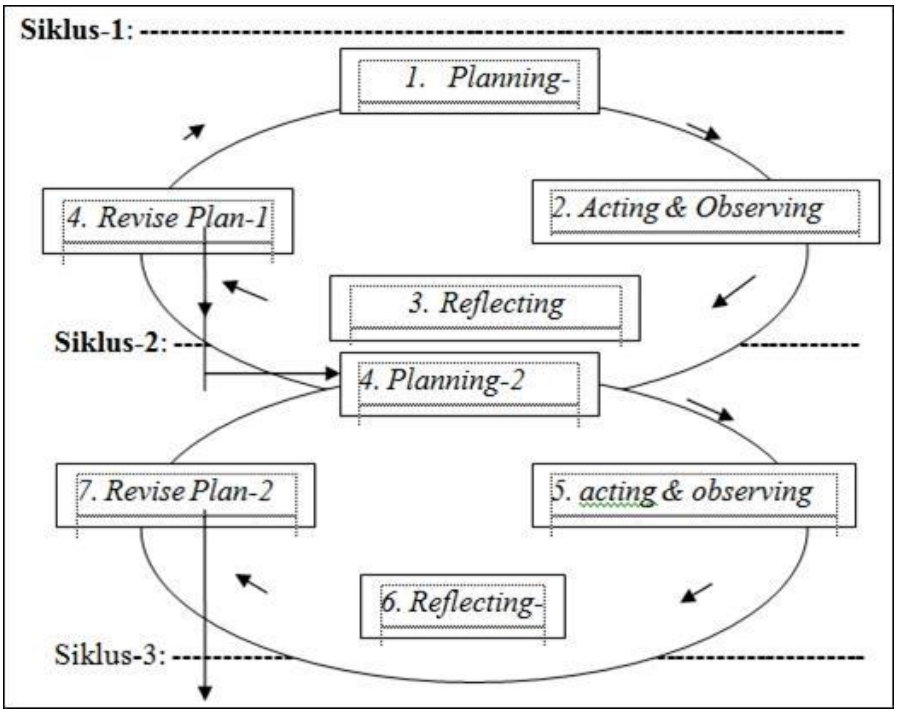

Figure 1. Class Action Research Flow

RESULT AND DISCUSSION

Results

The results of the classroom action research in cycle one were completed on November 16 to 23, 2022. Based on the research results from cycle one, after the researcher made a Learning Implementation Plan (RPP) then submitted it to the school (subject teacher and school principal). In general, the RPP that has been made is good and suitable for use in learning activities (Riyani et al., 2017). In this first cycle, quantitative data was obtained, namely the value of student learning outcomes (pre-test) obtained through a written test in the form of short entries. Data on student learning outcomes in table 1. The research results were obtained using the mixed method (quantitative and qualitative). Presented in the form of table 1 pre-test values and table 2 post-test values.

Table 1. Students' Pre-Test Scores For Cycle 1

	Completeness Criteria
Amount	2300
Average	67.64706
The highest score	88
Lowest Value	35
Number of Completed Students	14
Number of Incomplete Students	21

Based on the data above, it is known that the number of students is 34 students with a total score of 2300, an average of 67.64706, the highest score is 88, and the lowest score is 35 with the number of students who complete is 14 students and the number of students who do not complete is 21 students.

Table 2. Post-Test Value of Cycle II Students

	Completeness Criteria
Amount	2716
Average	79.88235
The highest score	93
Lowest Value	70
Number of Completed Students	34
Number of Incomplete Students	0

Based on the data above, it is known that the number of students is 34 students with a total score of 2716, an average of 79.88235, the highest score is 93, and the lowest score is 70 with the number of students who complete is 34 students and the number of students who do not complete is 0 students. Because, calculated using the quantitative method, it is obtained:

Table 3.Calculation of Data Normality Test

Tests of Normality

	Kolmogorov-Smirnova Statistics			**Shapiro-Wilk**		
	s	**df**	**Sig.**	**Statistics**	**df**	**Sig.**
Post-test	.125	34	.196	.952	34	.138
Pre-test	.139	34	094	.953	34	.155

a. Lilliefors Significance Correction

Table 4.Calculation of Data Homogeneity Test

Test of Homogeneity of Variances

		Levene Statistics	**df1**	**df2**	**Sig.**
Post-test	**Based on Means**	**2043**	**9**	**15**	**.106**
	Based on Median	.663	9	15	.729
	Based on Median and with adjusted df	.663	9	5,835	.722
	Based on trimmed mean	1923	9	15	.126

Based on the table 4 above shows that the test decision states that Ho accepted so that it can be concluded that the post-test and pre-test results come from a normally distributed population. After the data normality test is fulfilled, it is continued with the data homogeneity test. Based on the calculation of the data homogeneity test with the results based on the mean of 0.106 and based on the median of 0.729, it can be concluded that the two samples have the same (homogeneous) variance. Because the two basic assumptions are met, namely all data is normally distributed and homogeneous, the hypothesis testing can be continued by using a two-party t-test. The calculation results of the analysis and calculation of the two-party t-test are shown in the following table:

Table 5. Calculation of T-Test Analysis Results

Paired Samples Statistics

		Means	N	std. Deviation	std. Error Means
Pair 1	Post-test	79.8824	34	6.33779	1.08692
	Pre-test	67.2941	34	13.36329	2.29179

Paired Samples Test

		Paired Differences							
					95% Confidence interval of the difference				
		Means	std. Deviation	std. Error Means	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Post-test – Pre-test	–12.58824	12.47086	2.13873	8.23695	16.93952	5,886	33	.000

Based on the test criteria, the two parties stated that Ho rejected so it can be concluded that there is a difference in the average student mathematics learning outcomes. Based on table 5 above states that Ho rejected and it was concluded that the average student learning outcomes in post-test scores was greater than the average student learning outcomes in the pre-test scores.

DISCUSSION

Based on the results of the initial reflection data analysis or cycle 1, it is known that the problem solving abilities of class VIII students are still low. Almost all students are not accustomed to finding relationships from various representations of mathematical concepts

and procedures and are not yet able to use mathematics in solving contextual problems in everyday life. After applying the problem based learning model, students' problem-solving abilities and learning motivation have increased.

In cycle I, the average value of students' problem-solving abilities did not increase. The average value of problem-solving abilities in cycle I was 67.64706, which was still relatively low. This fact is caused by the implementation of learning in cycle I which still experiences some deficiencies. Based on the conditions that occurred in cycle I, in cycle II several improvements were made. Through discussions with PTK groups, solutions or alternative solutions to problems that arise from the deficiencies that arise are obtained. The solutions obtained are as follows: Students are given an explanation regarding the material to be delivered, students are given problems as group assignments, time for working on LKS is limited so students will be more focused on working in groups, students are always given equal opportunities in.,

Improved actions taken in cycle II turned out to be able to improve students' problem solving abilities. This is indicated by the average value of students' problem solving abilities increased to 79.88235. Based on the results of the implementation of the actions in cycle II, it can be seen that students' problem solving abilities have improved, and on average student scores are in the very good category. Problem Based Learning (PBL) is a learning approach that uses real world problems as a context for students to learn about problem solving skills(Arends, 2007)PBL provides challenges to students, working together in a group to solve a problem. PBL is designed to help teachers provide as much information as possible to students through a problem. PBL helps students to develop thinking skills and problem solving skills, and become independent learners(Simarmata et al., 2018).

The syntax or stages of the problem based learning model includes 5 stages, namely orienting students to problems, organizing students to learn, developing individual or group investigations, developing and presenting work and presenting it, analysis and evaluation of problem-solving processes. With the stages of the Problem Based Learning model, students are involved in learning activities so that their knowledge is really well absorbed, students are trained to be able to work together with other students, learning focuses on problems so that material that has nothing to do with it does not need to be studied by students at that time. This Problem Based Learning approach will be maximized if it is supported by strategies, teaching materials, interactions, and learning experiences that can make students feel safe, interesting, and challenging.

The success of the Problem based learning approach that has been implemented can also be seen from the following: Students look enthusiastic when starting teaching and learning activities and in the learning process students are enthusiastic and actively participate, learning activities are no longer teacher-centered, but student-centered. This can be seen both in group discussions, presentations, and question and answer students play an active role so as to foster togetherness in study groups, students are able to use mathematics in solving problems related to everyday life, students are more responsive to the problems given, more skilled and critical in solving problems, and students are more confident in expressing opinions and presentations in front of the class.

From the explanation above, this research is generally able to answer the formulation of the problem as well as solve problems in the problem-solving ability of students in class VIII SMP Negeri 3 Cimahi which is still under the KKM. In other words, classroom action research by implementing the Problem Based Learning approach has met the established success criteria. The implementation of this learning model shows efforts to improve the quality of teacher learning to improve student learning outcomes. This is in line with what was said(Andriyani & Fahmi, 2020) that the quality of teacher learning is shown by the effectiveness of student success and the selection of appropriate learning designs, including learning models that are adapted to the characteristics and needs of students.

Sumartini (2016) says that problem-solving abilities are very important in mathematics, not only for those who will later study or study mathematics, but for those who will apply them in other fields of study in everyday life. In line with that, Holmes said that people who are skilled in solving problems will be able to keep pace with their daily needs, become more productive workers, and understand complex issues related to global society. Therefore the implementation of problem solving abilities is very important for humans both in learning and in everyday life.

CONCLUSION

In general, this study can be concluded that the ability to solve problems in SPLDV material can be increased by applying the problem based learning model. Applying the Problem Based Learning (PBL) model to SPLDV material in class VIII-I, researchers have carried out learning steps in accordance with the RPP has been made and adapted to the steps of the PBL. These steps were compiled and carried out in two cycles. Learning on SPLDV material by applying the Problem Based Learning model has progressed from cycle I to cycle II. The improvements made in cycle II turned out to be effective so that in cycle II all stages

of Problem Based Learning could be carried out properly. In addition, the application of the Problem Based Learning (PBL) model to SPLDV material could improve students' ability to solve problems while attending mathematics lessons at class VIII-I. This can be seen from the increase in the number of scores and the value of problem solving abilities obtained by students in each cycle. Classical learning completeness has increased from the moderate category to the very high category.

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