
IMPROVING STUDENT'S MATHEMATICS UNDERSTANDING ABILITY ON TWO VARIABLE LINEAR EQUATION SYSTEM MATERIAL BY USING PROBLEM BASED LEARNING

Adelia Tasya A¹, Usman Aripin²

¹Mathematical education, IKIP Siliwangi, Jl. Terusan Jend. Sudirman, Cimahi, Jawa Barat, Indonesia
adeliatasya0405@gmail.com

²Mathematical education, IKIP Siliwangi, Jl. Terusan Jend. Sudirman, Cimahi, Jawa Barat, Indonesia
usman.aripin@ikipsiliwangi.ac.id

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ABSTRACT

This study aims to find out the improvement of students' mathematics understanding ability on the material of the Two Variable Linear Equation System (SPLDV) with the application of problem-based learning (PBL). This type of research is classroom action research. This research was conducted on students of class X Multimedia in one of the Vocational High Schools in Cimahi City. At the beginning and end of learning students are given test questions. The subjects of this study were 15 students. In this study, the instrument used was 8 questions in the material for the Two Variable Linear Equation System (SPLDV) which focused more on the students' mathematical understanding ability regarding the material for the two-variable linear equation system. The results of this study indicate that the aspects of students' mathematical understanding abilities have increased as seen from the questions tested in each test. Based on the results of the study, the authors concluded that the mathematical understanding ability of class X multimedia students of one of the Vocational High Schools in Cimahi City could be improved through problem-based learning.

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Corresponding Author:

Usman Aripin,
Department of Mathematics Education,
Institut Keguruan dan Ilmu Pendidikan Siliwangi,
Jl. Terusan Jend. Sudirman, Cimahi, Indonesia
Email: usman.aripin@ikipsiliwangi.ac.id

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INTRODUCTION

The world of education is something dynamic, so we must always be prepared to face any changes that occur in this era of globalization. We are here to have the ability to compete, work, be agile, intelligent, disciplined, honest and so on. Characters like this will be embedded in students as the next generation of the nation through learning mathematics, because learning mathematics will be able to form reasoning abilities in students which can be seen through the ability to think critically, logically, systematically, have character, and be disciplined in solving a problem both in the field of science and technology. mathematics or in everyday life. But in reality there are always obstacles in learning mathematics, mathematics is often considered by students as the most difficult subject to reach (Gardenia, 2016).

Mathematics has 2 different versions of learning, namely; (1) Can direct mathematics learning to be able to understand a concept and be able to solve problems and other sciences. (2) Can lead to a wider future, namely mathematics can provide problem solving skills, systematic, critical, objective and open. Because having this ability can help humans to face a future that always changes from time to time (Bani, 2011).

According to Hidayat, with mathematics learning students are able to: (1) mathematics is able to train students how to understand a problem through thinking and reasoning to determine a conclusion. (2) being able to develop students' creativity by involving intuition, imagination and a discovery from a curiosity so that they can make predictions or conjectures to solve a problem at hand. (3) can develop problem solving skills in students, and (4) students can develop or convey information or ideas that they have gotten from a problem (Dini, M., Muraeni, & Anita, 2018).

Learning activities carried out by teachers in schools emphasize memorization and here the teacher plays a full role in determining the answers from students whether the answers are right or wrong. Students' lack of understanding ability can make it difficult for students to be able to solve math problems given by the teacher. Therefore, the existence of this mathematical understanding ability will help students develop their ability to think and make decisions.

The ability to understand students' mathematical understanding is one of the important goals of any material presented by the teacher, because here the teacher plays an important role for students to be able to achieve the expected mathematical concepts. In addition, there are other opinions which state that every lesson given by the teacher must be understood by students because this activity is a teaching and learning activity. This statement is also supported by the opinions of other experts, he argues that a good education can lead students to achieve a goal to be achieved so that the material presented by the teacher can be fully understood by students (Yanti et al., 2019).

Another opinion suggests that the ability to understand mathematics is one of the important mathematical abilities in learning, giving an understanding of things that need to be seen carefully in learning, giving an understanding that the material given to students is not only

memorizing. Understanding is also not just understanding information, but students can interpret and transform the information in their minds into other, more meaningful forms, so that they can help students in solving more difficult mathematical problems. As a result, the ability to understand mathematics is very important in learning mathematics (Subroto & Sholihah, 2018).

In the process of learning mathematics, mathematical understanding is a very important part, by providing an understanding that the materials taught to students are not only memorised, but more so so that students' understanding can better understand the concepts of the subject matter presented.

According to several expert opinions stated in (Alan & Afriansyah, 2017) a student is said to already have the ability to understand mathematically if he is able to do the following things:

1. Explaining mathematical concepts and facts in terms of mathematical concepts and facts that he already has.
2. Can easily make logical connections between these different concepts and facts.
3. Using existing relationships into something new (either inside or outside mathematics) based on what he knows.
4. Identify the principles that exist in mathematics so as to make all the work run well.
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The first goal in learning mathematics according to the Ministry of National Education (Permendiknas no. 22 of 2006) includes the importance of understanding mathematical concepts, namely first to be able to understand mathematical concepts, explain the relationship between the application of algorithms or concepts. accurate, flexible, precise, and efficient in problem solving. In accordance with the objectives, in the learning process here students are expected to be able to understand a concept in mathematics in order to help students solve problems related to mathematics (Khoirunnisa & Soro, 2021).

To overcome the problems above, it is necessary to have a learning approach that is easily understood by students and encourages students to be active in achieving the expected competencies. There are so many relevant mathematics learning methods to be used, one of which is to apply a problem-based approach in learning mathematics.

Problem-based learning is a learning model that involves students in solving problems, with the beginning of learning presenting real problems for students then being solved through investigation and applied using a problem-solving approach (Prayoga & Setyaningtyas, 2021).

According to other experts, problem-based learning is a strategy or approach designed to assist the learning process in accordance with the steps contained in the problem-solving pattern, starting from analysis, planning, solving, and assessment attached to each stage. Problem-based learning is not structured to assist teachers in conveying a lot of information but the teacher as a presenter of problems, asking questions, and facilitators (Magdalena, 2016).

In addition, problem-based learning is a learning approach where students can solve an authentic problem with the aim of being able to construct their own knowledge, be able to develop inquiry, and higher-order thinking skills or often referred to as critical thinking skills, and can develop independence. and self-confidence for students

Problem-based learning has three characteristics, namely (1) problem-based learning does not expect students to only listen, take notes, then memorize the subject matter, but with problem-based learning students actively think, communicate, search and process data, and finally conclude. (2) learning activities are directed at solving problems. Problem-based learning places problems as keywords in the learning process, meaning that without problems there is no learning process. (3) problem solving is done by using a natural thinking approach. Thinking with the scientific method is a deductive and inductive thinking process. The thinking process in the learning process will be honed in the cognitive realm. This thinking process is carried out systematically and empirically (Yelvalinda et al., 2019).

So, based on the background we stated the purpose of this study is to find out improvement of student's mathematics understanding ability on two variable linear equation system material with problem based learning.

METHOD

The method I use is the classroom action research method. Classroom action research is a real step taken by teachers in improving the quality of learning that is carried out. This is based on the problems faced by teachers who are very diverse in teaching and learning activities. Problems must be identified and formulated to find solutions in classroom action research forums so that teaching and learning activities can run effectively (Ani Widayati, 2008).

The overall subject of this classroom action research was taken by 50% of one class X multimedia in one of the Vocational High Schools in Cimahi City. Subjects consisted of 15 students, namely: 7 male students and 8 female students. This classroom action research was conducted by giving pretest and posttest questions to students in cycle I and cycle II to find out how to improve students' understanding skills using a problem-based approach. Then after testing the students, the authors conducted an analysis to determine the results of the increase.

According to Raka Joni in (Robandi, 2008) the implementation of this classroom action research has five activities, the stages include:

1. Development of a research problem focus, here the problem analysis process must be carried out carefully and carefully because the success of this analytical problem will determine the success of the entire classroom action research process. Therefore it is necessary to solve the problem, by looking for several alternative solutions that are easy to understand.
2. Action planning, meaning that we must be able to find the right way to be able to overcome the problem. In classroom action research, it is called the action hypothesis, that is, if there is a change that will occur if an action is taken.

3. The subject under study, in explaining the subject of research or sources of information/data, it is necessary to explain who is the source of the data, depending on the content of the theory or concept used.
4. Implementation of the action of observation, if all the data has been prepared then the next step that must be done is to carry out the cycle, which is followed by observation and reflection activities. Observation is an act of observing and documenting things that will happen during the action. In observing things that must be considered include planning, focus, determining criteria, skills in conducting observations and feedback. In conducting observations there are three phases of activities, including planning, class observation, and discussion. Observations can also be made by uploading videos, photos or student work.
5. Analysis and reflection, this action is an activity in developing thinking activities. While reflective is an ability to re-examine in detail all the activities that have been carried out.

In classroom action research, if these 5 stages have been successfully carried out, then proceed with further actions, including:

1. Follow-up action planning, the results of the analysis and reflection of the activities that have been carried out can be concluded whether the actions that have been implemented have been able to overcome the problem or not. If the results are not satisfactory or the problem has not been resolved, further activities must be carried out until the problem can be resolved.
2. Data processing and data analysis techniques, data processing techniques and data analysis to be carried out are qualitatively, categorizing and clarifying based on the results of the analysis and then interpreted in the entire context of the research problem.
3. Validation stage, this stage is an action that can prove whether a process/method can provide consistent results or not.

For more details, these activities can be described in the following figure 1:



Figure 1. Elliot model cycle

At this stage the implementation of the research carried out, from planning activities to reflection, these activities were carried out during the second cycle, and those who helped in the implementation of this activity were senior teachers as observers and students from one of the X Multimedia classes at SMK TI Garuda Nusantara. The instrument used is the teacher and student observation sheet in addition to the other instruments, namely 8 questions for

students regarding the material of a two-variable system of linear equations. The technique used for data processing and so on is done qualitatively.

RESULTS AND DISCUSSION

Results

At this stage, the first thing to do is to make a Learning Implementation Plan based on the syllabus which is used as a reference in the implementation of this classroom action research. Then the researcher made an observation sheet that was shown to the teacher and students, and made an evaluation tool for the first cycle test (cycle I). Another preparation is to further strengthen the knowledge and understanding of researchers regarding the implementation of learning with a problem-based approach.

Cycle 1 was carried out in 1 meeting attended by 15 students consisting of 7 male students and 8 female students. The author here only takes half a sample of all students in one class, in one class X Multimedia there are 30 students, but because the school is currently only carrying out face-to-face learning which is only 50% in one class, the sample in this study is only 50% of the students. one class, that is, only 15 students were taken as subjects in this study. In one class divided into 2 groups, namely group A and group B, each - each number of students from each group is 15 people. Therefore, the sample for this study was group A.

Teaching and learning activities in the first cycle were carried out by the author as a teaching teacher who was assisted by an experienced math teacher, here he was an observer with one of my friends who was an observer. Learning in cycle I was carried out for 2 x 30 minutes. The teacher carries out learning activities with a problem-based approach to the material for the Two-variable Linear Equation System. The design of cycle 1 is carried out by the teacher with steps arranged in the form of a Learning Implementation Plan which as a whole describes the activities of teachers and students during the learning process. Data on learning outcomes from 15 students obtained results which can be seen in table 1.

Tabel 1. Student Learning Outcomes Test Score on the Material of One Variable Linear Equation System (SPLDV) Cycle I

Description	The number of students	Percentage
Finished	3	20 %
Not Finished	12	80 %
Total	15	100 %

It can be seen in table 1 that the success of implementing a problem-based approach that scores that do not meet the criteria for success is still more than those who have met the criteria. The achievement of student learning outcomes test scores only reached 20%.

Tabel 2. Student Learning Outcomes Test Score on the Material of Single Variable Linear Equation System (SPLDV) Cycle II

Keterangan	Jumlah Siswa	Presentase
finished	11	73 %
Not finished	4	27%
Total	15	100%

It can be seen in table 2 that the results of the successful application of the problem-based approach indicate that there is an increase in scores that meet the success criteria. The presentation of test scores resulting from the increase in student learning outcomes reached 73% while the other 4 students still did not meet the criteria or had not completed.

Discussion

This classroom action research consists of two cycles. Each cycle consists of two meetings which are carried out according to research procedures. The number of meetings in each cycle is based on the density of the material that has been discussed. Learning is done using a problem-based approach with more emphasis on group discussion, and students are directed to be able to find and solve a problem that has been given by the teacher. Before conducting this research, the researcher first conducted an interview with the mathematics teacher in one of the class X multimedia in one of the Vocational High Schools in Cimahi City to find out the extent of the students' mathematical understanding ability. In the first cycle, there were still many shortcomings in the learning process with a problem-based approach, because students had just received this kind of learning treatment, it seemed that students seemed unfamiliar with this learning process.

In cycle II, there was an increase in cycle II, as seen from the results of the presentation of student activity in answering questions and daring to come forward to answer the questions that had been given. This is also reinforced by the results of the student's final test which shows the average value is increasing closer to the maximum value, in other words, students' understanding of concepts has increased. Of course this is very satisfying for researchers and teachers because learning with a problem-based approach can improve students' mathematical understanding abilities.

In a previous study conducted by Minarni, the findings stated that problem-based learning had a better effect on students' mathematical understanding abilities. From the results obtained during the study, data were obtained that problem-based learning could develop students' mathematical understanding abilities, although the increase was less significant. However, if problem-based learning can be carried out consistently and for appropriate materials, students' mathematical understanding abilities will develop optimally (Yelvalinda et al., 2019b).

The mathematical understanding ability of students who received learning using problem-based learning models was better than students who received learning using other models. Understanding of mathematical concepts can be built with practice and practice, by training students to use the concepts, rules and procedures that have been taught. Through a series of examples of the concepts and knowledge learned, students are given the opportunity to practice in order to understand and skillfully apply these concepts and knowledge (Maryani, 2021).

The ability to understand mathematical concepts of students who received a problem-based learning model reached the minimum completeness criteria. This is in line with research conducted by other opinions, namely students who get problem-based learning models achieve mastery learning. The research shows that learning has reached the complete criteria, so it can be said that it has reached the minimum completeness criteria. In practice the problem-based learning model class is better than conventional learning, because during the learning process students are required to be more active in learning. The activeness of students can be seen when students present the results of discussions in front of the class and when they express their opinions enthusiastically. The activity of these students makes understanding concepts and student learning outcomes reach the maximum value (Belladina et al., 2019).

Another finding, learning is proven to give a good contribution in developing students' mathematical understanding abilities. So it can be concluded that PBL learning is more instrumental in developing students' mathematical understanding abilities (Yelvalinda et al., 2019a).

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that the mathematical understanding ability of class X Multimedia SMK students on the material "Two Variable Linear Equations System" can be improved by using a problem-based approach. This is known by the increasing value of each question that has been given and the more students who show their understanding by being able to conclude and explain what they have learned.

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