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THE IMPLEMENTATION OF SCIENTIFIC APPROACH TO IMPROVE MATHEMATICAL UNDERSTANDING ABILITY ON SENIOR HIGH SCHOOL STUDENTS

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ABSTRACT

Mathematical understanding ability is a basic ability that must be possessed by every student in understanding the concept of material and applying it in a mathematical symbol and formula. However, the fact is that currently the failure in learning mathematics is due to students' lack of understanding of the concepts in mathematics material. The purpose of this study was to see the improvement of mathematical understanding ability of class VIII-B students on the material of Two-Variable Linear Equation System at SMPN 1 Margaasih. The research method used is the model of Kemmis and McTaggart with the subject studied, namely students of class VIII-B SMPN 1 Margaasih. The research conducted used Classroom Action Research (CAR). The research took place over 2 cycles, each cycle consisting of several stages starting from the plan, action, observation and reflection stages. In cycle I and cycle II the teacher gave a test, besides that in each cycle an observation sheet was provided. The results of this study showed that there was an increase in the completeness of learning scenarios for teachers by 51.92% and for students by 50.01%. In addition, the results of filling out the tests given each cycle showed good results with the number of students who scored above the KKM in cycle I by 69.44% and cycle II by 80.55%, meaning an increase of 11.11%. Thus, the mathematical understanding ability of class VIII students on Two-Variable Linear Equation System material at SMPN 1 Margaasih using a scientific approach has improved.

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INTRODUCTION

Math is the basis of learning. In most subjects, there must be math calculations. Moreover, human activities cannot be separated from calculations. According Meylinda & Surya (2017) mathematics must be taught at all school levels with certain characteristics and characteristics. Students have the assumption that math is a difficult lesson to understand with many concepts and formulas. which has an impact on students' lack of interest in learning math. This can be seen from when the teacher explains the material in class, it seems that students are not eager to learn, as a result students do not understand the mathematical concepts explained by the teacher as a result of which students' mathematical understanding becomes low.

Mathematical understanding ability is one of the important objectives of any material delivered by the teacher, because the teacher is a guide for students to achieve the expected concept (Umbara & Rahmawati, 2018). This is in accordance with the opinion of Hujodo in which states "the knowledge conveyed by the teacher can be understood by students, that is the purpose of teaching" (Anderha & Maskar, 2020).

Hendriana in Yanti et al. (2019), said that education is said to be good if the learning objectives can be achieved by students so that what the teacher says can be understood thoroughly by students. So it can be said that for teachers and students the ability to understand mathematics is very important. For a teacher, it is important because as an educator, of course, the material that the teacher conveys can be understood and understood by students because that is the purpose of teaching, while for students it is important to be able to understand what the teacher teaches about the material presented.

The current problem in the world of education is how the mathematics material delivered can be understood by students. Mathematical understanding is said to be successful not when learning objectives can be achieved, but when students can be helped to understand concept by concept as a whole and applied in their lives (Syaripuddin et al., 2020).

The fact is that failure in learning mathematics is partly due to students' lack of understanding of the concepts in mathematics. Errors in concepts that start at the basic level can lead to errors at higher levels of education. The results of the Trends in International Mathematics and Sciencs Study (TIMSS) survey in Diana et al. (2020) TIMSS as an international study in the field of mathematics and science conducted to find out and obtain information about the achievement of mathematics and science achievements in participating countries reported that in 2015, the average score of grade 8 mathematics achievement of Indonesian students was ranked 45 out of 50 participating countries. In addition, another study by the Programme Internationale for Student Assessment (PISA) in Diana et al. (2020) PISA which is a form of evaluation of ability and knowledge in the fields of mathematics, science, and language in 2015, Indonesia's ranking for mathematics was 64 out of 70 countries. The results of the TIMSS and PISA studies show the low ability of students in Indonesia in mastering concept knowledge and understanding of the material.

The low level of mathematical understanding, one of which is due to the teacher's lack of knowledge of learning approaches and methods as well as the media used in delivering material accordingly (Lisma et al., 2018). From the student factor, including the lack of student interest in learning mathematics, which results in less student learning focus and the concepts learned do not understand. In addition, students are only given memorization of formulas and concepts instead of understanding them. As a result, in different situations students cannot use the concept. The learning process of student learning is the next factor that can affect mathematical understanding ability. Before the teacher teaches the material, students do not study at home and only learn the material when taught by the teacher and when there is an assignment (Nurzaman et al., 2022).

In order for students to be motivated to learn mathematics material that the teacher has not taught, of course, the approach to students must be appropriate when used so that it is accepted by students. The learning strategy that will be used later must be adjusted to the conditions of the students, this is because students are not all active and understand learning. So that the need for one approach when applied in learning can motivate students to be more active again and students' understanding of mathematics can increase, namely the use of a scientific approach. The scientific approach can be the right approach so that students can be stimulated to learn to be more active, because the scientific approach in its application is student-centered, allowing students to construct what they find, then explore what they learn and then make conclusions. As a result, students can be stimulated to be more active in improving their mathematical understanding skills (Sofianti & Afrilianto, 2021).

Suparsawan (2020) stated that the scientific approach is an approach designed for students to be more active in constructing concepts through the stages of observation, problem formulation, hypothesis formulation, data collection through data analysis techniques, and then conclusions. In line with that Mustika et al. (2020) stated that the scientific approach can be given to students to provide an understanding of various materials through a scientific approach. Therefore, it is hoped that learning conditions can encourage students to be able to learn through various sources so that they are not only fixated on the teacher's explanation. From this description, it can be said that the scientific approach is learning used in learning which is designed with the hope that students can be more active in carrying out a series of activities and exploration of learning materials, so that student character can be more developed and get high learning outcomes.

The goal in the scientific approach is that students can be more guided to solve a problem through the stages of activities that require them to be creative, critical in thinking to improve students' mathematical understanding. Nursanti & Hartoyo (2015) expressed the concept of mathematical understanding, one of which is in two-variable linear equation system material. In line with the scientific approach makes students more helpful in understanding two-variable linear equation system material, especially solving math problems. Azzahro (2021) states that the scientific approach makes it easier for students to understand solving math problems, especially the concept of two-variable linear equation system.In two-variable linear equation system material, students must be able to solve problems that exist in the real world into the form of mathematical models. students are still wrong in solving these problems. This is due to students' lack of understanding to solve problems related to two-variable linear equation system material (Oktaria et al., 2016).

From the description presented, it is necessary to conduct Classroom Action Research or classroom action research which aims to apply a scientific approach in a lesson that is useful for teachers as a learning experience to improve students' mathematical understanding and the development of student character, namely student curiosity of material that has not been taught, both independent learning and working together in groups which is expected that students can be more communicative, interact, and sensitive to their surroundings.

METHOD

The research used, namely Classroom Action Research is research that aims to find out how the right treatment during learning practices. The research model from Kemmis and McTaggart is suitable for use in research (Syamsudin et al., 2018). The stages of each cycle consist of planning, action, observation and reflection. The research was stopped when the objectives of the research were achieved. The data analysis technique used is a qualitative descriptive method, for the use of instruments including tests, interviews, and observation sheets for

teachers and students during the learning process. SPSS and Microsoft excel were used to process the data. The research was conducted in November 2022.

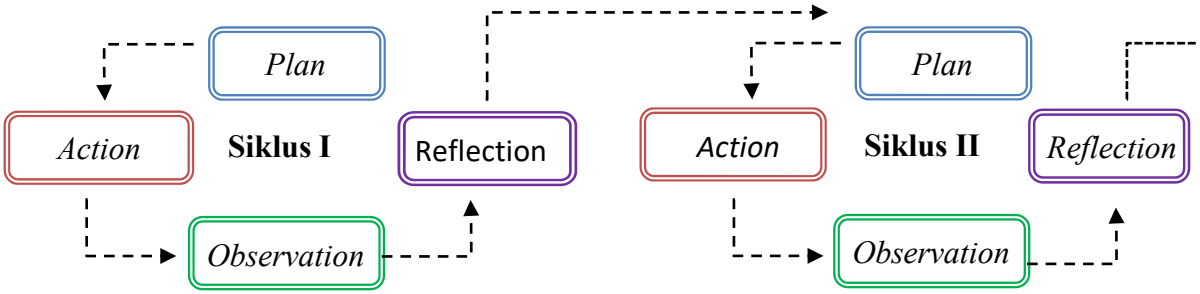

Figure 1. Model Kemmis dan Mc. Taggart

The subjects in the study consisted of 36 students of class VIII-B SMPN 1 Margaasih students. The study has success indicators, namely (1) The implementation of learning for teachers and students in accordance with the lesson plan is at least 85%, (2) Individual KKM scores are said to be successful if at least 75% of students score above KKM.

RESULTS AND DISCUSSION

Results

Cycle I

Planning

Learning in cycle I has 2 meetings, namely learning and cycle I tests, besides that previously made two-variable linear equation system material lesson plans using a scientific approach, also prepared for teachers and students, namely learning observation sheets, then discussed using a scientific approach during learning implementation.

Implementation of Action

In conducting classroom learning, researchers and teachers exchange positions, where the math teacher will be the observer while the researcher will be the teacher. The first meeting learning activities began on November 22, 2022 using a scientific approach in learning for the material is the System of Linear Equations of Two Variables (two-variable linear equation system) with the focus of the concepts taught is about two-variable linear equation.

Starting the implementation of learning with students saying greetings reciprocated by the teacher, checking student attendance and providing motivation to students, followed by the teacher informing about the objectives and benefits of learning, students' attention during learning is still focused on the teacher who explains in front of the class. In the core activities, the teacher starts the learning by first explaining the difference between two-variable linear equation and two-variable linear equation system to students, in order to make it easier for students to understand the material, the teacher gives examples of two-variable linear equation and two-variable linear equation system in everyday life in front of the class. The teacher then begins to explain to students about the substitution and elimination methods.

The teacher then gives practice problems to see the students' ability to solve two-variable linear equation system using the substitution and elimination methods. Then the teacher while checking and going around the students to see and guide students to work on the exercise questions if there are difficulties, in this activity it appears that students do not hesitate to ask when there are parts of the work that are not understood.

After the work on the exercise problem is complete, the results of the work are collected to the teacher to be assessed after that the work on the problem is discussed while correcting if there

are still student answers that are not correct. At the next meeting to see students' ability to work on two-variable linear equation system, a cycle I test was given. After the cycle I test was completed, the results of the work were collected to the teacher to be assessed.

Observation and Evaluation

After carrying out the learning implementation, the teacher together with the researcher discussed what was still lacking during the learning activities, namely students still paid less attention to the teacher's explanation in class and were more busy chatting with their friends. In addition, time management is still not optimal. The following presents the results of observations and the percentage of learning completeness during cycle I:

Table 1. Observation results of learning implementation during cycle I

Teacher Observation	Score		Student Observation
The teacher first conveys the learning objectives and benefits	3	3	Students focus on the teacher when conveying learning objectives and benefits
The teacher gives students a motivation to learn	4	4	Students are excited when the teacher motivation
The teacher conducts apperception	3	2	Students respond to what the teacher says
The teacher instructs students to work on the LKPD in groups	0	3	Students pay attention to the explanation from the teacher
The teacher explains the material to be learned	4	3	Students are active when the teacher asks questions about the material provided.
The teacher motivates students to actively work on the LPKD with their groups.	3	0	Students actively discuss with their respective groups
The teacher directs students to actively discuss with their group members	0	2	Students are confident to ask questions when there are difficulties
The teacher goes around to the group tables and provides guidance to students if there are difficulties	0	0	Students present the LKPD work that has been done
The teacher invites each group representative to present the results of the LKPD work in front of the class	0	0	Students in different groups respond to their friends' group presentations.
The teacher gives students the opportunity to comment on other groups' presentations	0	0	Students with the teacher summarize the group presentation discussion
The teacher comments on the	0	0	Students summarize today's

Teacher Observation	Score		Student Observation
discussion work of all groups			learning activities
The teacher reflects on the lesson	0	0	Students do reflection
Teacher gives independent assignment	4	-	-
Total score	**21**	**16**	**Total score**
Learning Completion Percentage	**40,38%**	**35,41%**	**Learning Completion Percentage**

From Table 1, the completeness of the teacher during the implementation of learning is 40.38%. While student completeness has a percentage of 35.41% so that the completeness of learning in teachers and students is still low. Even so, overall the implementation of learning in cycle I began to see students begin to actively ask questions to ask for a better understanding of the material.

Furthermore, the average score of students whose scores were above the KKM in the cycle I test was still low. The results of the cycle I test scores are as in the following table:

Table 2. Cycle I test results

TES SIKLUS I		
N	Valid	36
Rata-rata		74.28
Median		79.00
Modus		81[a]
Jangkauan		75

Based on Table 2, the results of the cycle 1 test many students only answered 4 questions out of 5 available questions. There are even those who can only answer 1 question so that the average score in this cycle I test is 74.28.

Reflection

In the reflection stage, researchers and teachers analyze what are the shortcomings of using a scientific approach during learning, it can be seen from the completeness of the lesson plan of 40.38% only. This can happen because researchers are lacking in learning management of the time of teaching and learning activities in cycle I, another factor is students who are still lacking enthusiasm for learning and chatting during learning. Given that there are still shortcomings from the implementation of learning in Cycle I, finally the researchers and teachers agreed to continue to Cycle II actions, in this cycle II researchers and teachers try to make learning more improved compared to cycle I activities.

Cycle II

Planning

From the implementation of learning during cycle I, then the researcher together with the math teacher began to make plans to improve the shortcomings to achieve appropriate results. In this stage the teacher gave more tips on how to solve the problem step by step well and was more

encouraging to students who were passive in the previous cycle and how to manage time well in the implementation of cycle II.

The stages in cycle II are the same as the previous cycle which of course makes the lesson plan that will be used in learning. Do not forget also the observation sheet in learning both observation of teachers and students.

Implementation of Action

The implementation of learning in cycle II began on November 29, 2022 with the activities carried out working on LKPD mixed method two-variable linear equation system material. Here, the researcher becomes a teacher while the math teacher becomes an observer.

Implementation in teaching and learning activities begins with the opening of the Al-Quran tadarus then the students greet the teacher in return, followed by the teacher checking the students' attendance then given learning motivation to be more enthusiastic in learning. After that the teacher informs the learning objectives and benefits. The next activity the teacher asks students to sit in groups to work on LKPD. In the group discussion activities, the teacher asks students to actively discuss with their group mates and guides students in working on LKPD if there are difficulties. It can be seen that active students in each group do not hesitate to ask questions, especially in parts of the work that are not understood. After the LKPD work is complete, the teacher invites representatives of each group to make presentations of the completed LKPD work.

Figure 2. Group Presentation

After the presentation is complete, the teacher with students to summarize the learning that has been done. Then the teacher gave the cycle II test to all students to see the students abilities after learning. The results of the cycle I test scores are as in the following table:

Table 3. Analysis of Cycle II test scores

TES SIKLUS 2		
N	Valid	36
Rata-rata		80.30
Median		75.00
Modus		75
Jangkauan		50

From the following table, in the cycle II test, it was obtained that the average student score in the cycle II test was 80.30, which means it was more improved than the cycle I test score.

Observation and Evaluation

After carrying out teaching and learning activities in cycle I, teachers and researchers discussed and analyzed that cycle II learning was in accordance with the plan and had been carried out well, especially proper time management. As a result, in cycle II, the results of learning implementation were very good compared to the previous cycle.

Table 4. Observation results of teacher and student activities during Cycle II

Teacher Observation	Score		Student Observation
The teacher first conveys the learning objectives and benefits	4	3	Students focus on the teacher when conveying learning objectives and benefits
The teacher gives students a motivation to learn	4	4	Students are excited when the teacher motivation
The teacher conducts apperception	4	4	Students respond to what the teacher says
The teacher instructs students to work on the LKPD in groups	4	3	Students pay attention to the explanation from the teacher
The teacher explains the material to be learned	4	3	Students are active when the teacher asks questions about the material provided.
The teacher motivates students to actively work on the LPKD with their groups.	4	4	Students actively discuss with their respective groups
The teacher directs students to actively discuss with their group members	4	3	Students are confident to ask questions when there are difficulties
The teacher goes around to the group tables and provides guidance to students if there are difficulties	4	4	Students present the LKPD work that has been done
The teacher invites each group representative to present the results of the LKPD work in front of the class	3	3	Students in different groups respond to their friends' group presentations.
The teacher gives students the opportunity to comment on other groups' presentations	3	3	Students with the teacher summarize the group presentation discussion
The teacher comments on the discussion work of all groups	3	3	Students summarize today's learning activities
The teacher reflects on the lesson	3	4	Students do reflection
Teacher gives independent assignment	4	-	-
Total score	**48**	**41**	**Total score**
Learning Completion Percentage	**92,30%**	**85,42%**	**Learning Completion Percentage**

From the table, it can be seen that the implementation of learning has been done very well. It can be seen based on the observation results for teacher activities, the learning steps have been according to the scenario, for student activities seen during cycle II activities have been good too because many students are more eager to learn and are more active during learning, communication between students during discussions and group cooperation has also gone well. The average value of the cycle II test work has also increased more than the previous cycle test work, many have better understood the learning material.

Reflection

In cycle II after reflection, it shows that the scientific approach applied by teachers to learning in class VIII-B SMPN 1 Margaasih has shown satisfactory results, this can be seen from the increase in students' mathematical understanding ability, even so there are still shortcomings that occur students are noisy when working on group discussions.

Table 5. Recapitulation of Learning Scenario Completeness

Observation	Results		Improved
	Cycle I	Cycle II	
Σ Completeness of Learning Scenario (Teacher)	40,38%	92,30%	51,92%
Σ Completeness of Learning Scenario (Students)	35,41%	85,42%	50,01%

From the recapitulation table of learning scenarios, there was an increase in cycle II compared to cycle I. The percentage increase was very large. While the recapitulation of the results of the test instrument of cycle I and II is available in the following diagram:

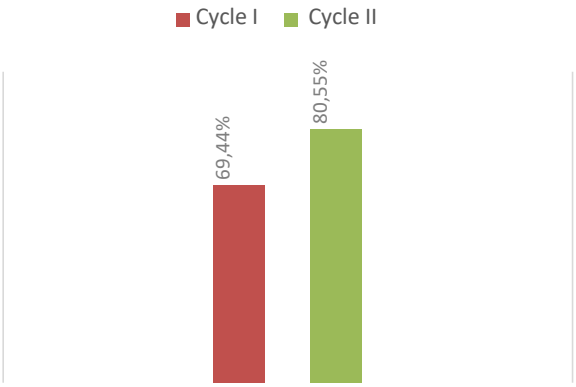

Figure 3. Recapitulation of Student Learning Outcomes Students

Based on this diagram, the results of working on test instruments have improved from cycle I to cycle II, this can be seen that more and more students score above the KKM, seeing from this percentage it can be concluded that the research conducted has been successful. Therefore, the researchers and teachers agreed that the implementation of learning was recorded until cycle II because the research target had been achieved.

Discussions

Discussion From the research that has been conducted during classroom learning on two-variable linear equation system material in cycle I, the implementation of learning when using

a scientific approach has not been in accordance with the expectations of the prepared learning scenario. The application of learning using a scientific approach is first felt by students, from the analysis that has been done, the researcher argues that the purpose and benefits of learning are less conveyed by the teacher, especially motivating students.

Furthermore, the researcher noted that in this first cycle the teacher was lacking in time management, as a result the learning scenario had not been fulfilled. Therefore, the improvement of comprehension skills in students has not been felt. This research also looks at the development and character of students, Cycle I there are some shortcomings, namely students who are still less active in learning and do not pay attention to the teacher's explanation, and lack the courage to come forward.

The results of the implementation of the first cycle test showed that students who got scores beyond the KKM were still lacking. In addition, in cycle I, the completeness of the learning scenario in teacher and student activities is still far from optimal, because the percentage of learning achievement of student learning outcomes is not optimal, so the research must be continued to cycle II.

From the results of observations in the implementation of cycle II, researchers continued to try to analyze what was lacking in cycle I, namely when in cycle II the teacher was able to condition the class properly and control every student activity in the classroom. Students have participated actively in learning, especially in doing forward questions. Student activeness is important to motivate learning math from what is obtained. Student activeness is an important issue for every teacher that must be understood, realized and developed (Ramlah et al., 2014).

The core learning activity, namely group discussions, has run optimally by first forming groups with students in each group having different levels of ability. Here students have discussed the group well and work together to complete the worksheet, not forgetting also the teacher motivates and directs if there are difficulties in the process. This group discussion encourages students to work together and actively argue in their groups. After the time for working on LKPD in groups is complete, the teacher invites each group representative to take turns presenting in front of the class regarding the results of their work, here students are active and enthusiastic about presenting because they already understand what they have done. After the presentation is complete, the teacher does not forget to reward the active efforts of students during learning activities. Rewarding students can be done by commenting with positive words. Then when students have done a task, the teacher can comment positively, for example "Good Job" or "Increase your efforts" or something else. These positive comments can make students more motivated to learn (Suprihatin, 2015).

In cycle II, the implementation of learning in accordance with the prepared lesson plan has a high achievement, it can also be seen that in cycle II the implementation of learning has gone very well, especially when the scientific approach has been used. Activeness, cooperation and communication between students were very visible in cycle II. This is in accordance with the research of Kamelia & Halmuniati (2017) which states that if most students are active in learning then learning is said to be successful.

In addition, cycle II students who have scores above KKM continue to increase so that there is an increase. Because the indicators of the success of research in the implementation of learning have been achieved, therefore researchers and teachers agree that research is stopped in cycle II. From the description above, the implementation of learning has been completed in accordance with the lesson plan and the success indicators of the research, therefore the conclusion is that the ability to understand mathematics can be improved in class VIII-B students of SMPN 1 Margaasih when learning mathematics using a scientific approach.

CONCLUSION

Based on the results of the discussion and analysis that has been carried out, in conclusion, the mathematical understanding ability of class VIII students on two-variable linear equation system material at SMPN 1 Margaasih using a scientific approach has increased, this can be seen from the increasing number of students who have understood the material based on their existing knowledge and students have been active in group discussions where each student has different abilities.

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