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## THE IMPLEMENTATION OF SCIENTIFIC APPROACH TO INCREASE MATHEMATICAL UNDERSTANDING ABILITY ON JUNIOR HIGH SCHOOL STUDENTS

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This research is motivated by the ability of mathematical understanding of students in Indonesia is still relatively low, students find it difficult to understand abstract mathematical concepts and mathematical understanding is not fully optimized and can be said to be still lacking, this condition is caused by a tendency to memorize and a little introduction to what is useful from the mathematical material studied. The purpose of this study is to implement a scientific approach to students' mathematical comprehension abilities. This research is a Classroom Action Research (PTK) using a spiral model from Kemmis and McTaggart with the stages being plan, action, observation or observation, and reflection for each cycle. The subjects in this study were grade VII students of Nur Al Rahman IT Junior High School for the 2022/2023 academic year with a total of 20 students. The material used is algebraic. The instrument used is a test instrument consisting of 7 mathematical understanding questions. The results of this study stated that students' mathematical understanding increased as evidenced by the increase in the percentage of question achievement indicators after 2 learning cycles. The percentage of cycle I results is low at 49%, while the percentage for cycle II is 81%. Based on the results of the study, the author concludes that implementing a scientific approach is an effort that can be done in the learning process to see or improve students' mathematical understanding.

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### INTRODUCTION

Mathematics is an important aspect of life in the world of education. To make the importance of this knowledge must be learned at every school level to improve the quality of education. However, it is undeniable that mathematics can be said to be a scourge for learners, mathematics

is considered a complicated field of study, and it is difficult to understand. In line with the results of research from Akbar et al., (2023) most students think mathematics is a difficult subject, they think if they want to be good at mathematics must be good at memorizing and using related formulas, it triggers students' mathematical comprehension ability to be incomplete or weak.

Mathematical understanding is a very important basic skill. According to Rizqiyah, (2022), The ability to understand mathematics is important, because mathematical understanding is a support that supports other mathematical abilities. Mastery of mathematical understanding should be possessed by students so that they can construct or form students mathematical understanding. As stated by Sarwoedi et al., (2018) that the ability to understand mathematics is a basic ability that every student must have to be able to solve a problem in the form of a symbol or mathematical formula ranging from a simple to complicated problem to get the right solution. Learning mathematics in schools has a goal or achievement so that students can (1) repeat concepts, (2) classify objects, (3) propose ideas, (4) apply concepts with various kinds of mathematical representations, (5) develop sufficient concepts, (6) utilize procedures according to operations, (7) apply ideas in solving problems.

Based on the results of TIMSS and PISA, it shows that the ability of Indonesian students in learning mathematics is still very far from the international average. The results of the TIMSS survey in 2011 achieved by Indonesian students for the low category (400) have not been achieved, and are very far from the advanced category (625), the low learning achievement of Indonesian students is one of them due to the low understanding of students' mathematical concepts (Ariyanti & Setiawan, 2019). Similarly, various studies reveal that comprehension skills in Indonesia are still low. According to Putra et al., (2018), even 41.67% of students' mathematical understanding in some secondary schools is low. Mulyani et al., (2018) stated that students find it difficult to understand abstract mathematical concepts, so the ability to understand the mathematics of junior high school students still needs to be improved. Mathematical understanding is not fully optimal, it can be said that it is still lacking, this condition is caused by a tendency to memorize and little recognition of what is useful from the mathematical material studied (Rajab et al., 2023).

Based on the results of interviews conducted by researchers with SMP IT subject teacher Nur Al Rahman, it was found that students' mathematical comprehension skills were still relatively low. In the learning process, students are not enthusiastic and active enough, this is supported by the results of students' daily tests on Algebraic form operation material. The number of students who do not pass KKM is more than the complete KKM. Only 15% of the 20 students complete their studies. This is due to students' lack of understanding of the concept of algebraic forms.

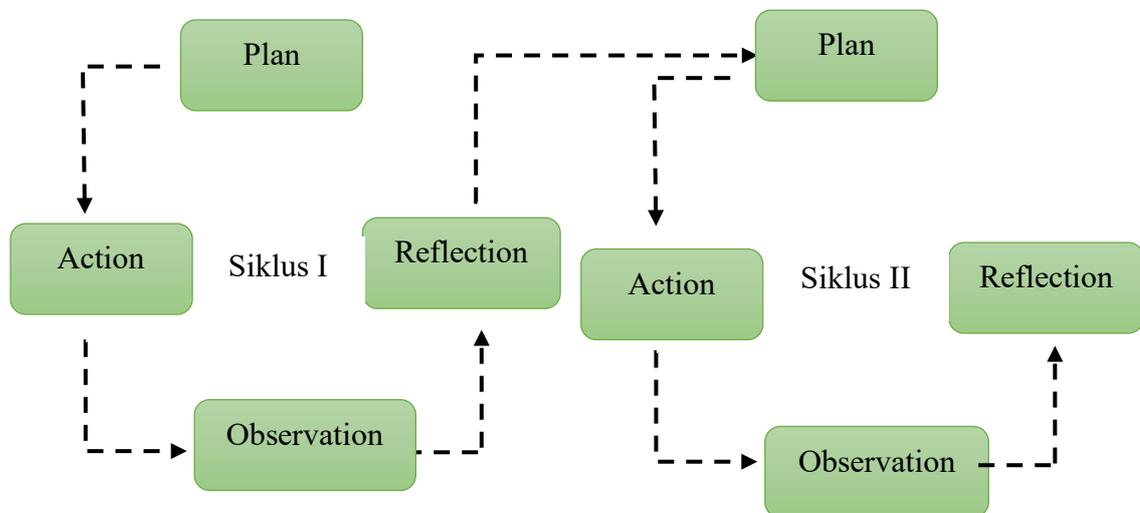
To bridge students' mathematical understanding skills by applying an approach, namely a scientific approach. This approach can help students to better understand a learning material. Rathomi, (2019), stated that the scientific approach is student-centered learning by emphasizing students to actively participate. Through active participation, students are expected to be able to recognize and understand concepts through the process of concluding. The learning process by providing observations will make it easier for students to understand the learning material. The material listed in mathematics is very much, one of the materials included in the junior high school mathematics curriculum is Algebra material. Researchers consider this material very important because according to Amin et al., (2022) algebra material has an important role in everyday life. Algebra material explains the understanding of basic concepts of knowing algebra, algebraic elements, algebraic operations, and examples of algebra in everyday life. However, some students still do not understand the basic concepts of Algebra. This statement is supported by previous research by Fitria et al., (2022) on algebra material, the ability to

understand is still lacking, especially in the concept of algebraic operations, interpreting problems well, modeling a problem into algebraic form, and dissolving problems.

Several previous studies have examined the application and excellence of scientific approaches to the ability to understand, but each region or school certainly has different characteristics. Both from the causes of occurrence, obstacles passed and the focus of the problem studied. Research conducted by Nurzaman et al., (2022), the findings of this researcher are an increase in mathematical understanding using science. These findings can be attributed by researchers to implement a scientific approach to improve the mathematical comprehension ability of grade VII students at SMP IT Nur Al Rahman Algebra material. Research by Yanti et al., (2019) explains that increasing the mathematical understanding of students who apply a scientific approach assisted by Geogebra and who use ordinary learning. These findings can be attributed by researchers to implement a scientific approach to the mathematical understanding of grade VII students of SMP IT Nur Al Rahman with individual learning. In line with that, the research of Fauziah et al., (2021) explained that learning with a scientific approach to mathematical understanding by giving open-ended question types had no effect or did not increase. From these findings, researchers provide questions with answer solutions following the understanding of the concept of the material. Based on this background, the purpose of this study is to determine the Implementation of a Scientific Approach to the Mathematical Understanding Ability of Class VII Students of SMP IT Nur Al Rahman algebra material.

**METHOD**

The type of research is Classroom Action Research (PTK), which uses Kemmis and McTaggart's spiral model action research. PTK is research designed to improve the quality of learning in the classroom (Rahmawati et al., 2022). Classroom Action Research (PTK) is a form of research that improves the learning process in the classroom. The subjects of this study were 20 class VII students of SMP IT Nur Al Rahman. This study used 7 pretest and post-test questions for students' mathematical understanding in cycles I and II. The goal is to find out how to implement a scientific approach to the ability to understand mathematics using the Kemmis spiral model. and McTaggart, the stages are plan, action, observation or observation, and reflection for each cycle (Rowiyah & Fitrianna, 2022). For more details, these activities can be described in Figure 1 below:



**Figure 1. Kemmis and McTaggart cycle model (Rowiyah & Fitrianna, 2022)**

Researchers conducted mathematical understanding tests with validated questions sourced from (Meliana, 2019). Then after testing students, researchers analyzed to determine the results of the implementation of a scientific approach to students' mathematical understanding abilities. The results of student assessment are converted into a percentage scale and then analyzed according to classical completeness criteria guidelines. According to the Ministry of Education and Culture in Fauzan et al., (2019) it is said that the learning is complete if the classical completeness is 85%. The data analysis technique is by assessing the answers from the tests that have been done, using the formula (Firmansyah et al., 2023) :

$$S = \frac{\text{Student score}}{\text{Max score}} \times 100$$

## RESULTS AND DISCUSSION

### *Results*

his research was carried out in class VII of Nur Al Rahman IT Junior High School for the 2022/2023 academic year. The subjects were 20 students. In this study, classroom action research was used consisting of 2 cycles, where each cycle consisted of stages of planning, implementing activities, observing the results of activities, and reflection.

In the planning stage of cycle 1, field studies were carried out, where the material being studied was explained, namely algebraic material. Before conducting the study, researchers first interviewed one of the mathematics teachers of SMP IT Nur Al Rahman to find out the level of mathematical understanding of grade VII students of SMP IT Nur Al Rahman. Another thing is to make a Learning Implementation Plan (RPP) for Algebra material. Then to carry out group activities in cycle 1, teaching and learning activities are carried out by researchers as teaching teachers assisted by a mathematics teacher as an observer.

In cycle 1, 2 meetings with a duration of 2 x 40 minutes were held. Teachers conduct learning with a scientific approach to algebra material. After learning, making observations, and reviewing students' answers, from the observation stage reflecting as a result of activities. Based on the results of the first cycle of reflection, it can be seen that students are not enthusiastic and interactive enough in learning and still do not understand the concept of algebraic forms. So far, they are accustomed to the teacher's teaching method as a learning center or commonly called the conventional method in the learning process, so the success indicators have not been achieved, in other words, not satisfactory. Therefore, in cycle II it is necessary to take corrective actions so that student learning outcomes increase. Data on the results of the first cycle learning test obtained results that can be seen in the table.

**Table 1.** Test Scores of Learning Outcomes of Cycle I Algebra Material

Category	Multiple students	Persentase
Complete	3	15%
Incomplete	17	85%
Total	20	100%

From Table 1 it can be seen that in the first cycle, there are students who have not completed the classical completeness criterion, which is 15%. This shows that the success rate of Cycle I has not been achieved because it is still below the minimum standards set. Because new students get this kind of learning treatment, it seems that students seem unfamiliar and unfamiliar with

this learning process and also have errors in the mathematical operations they do. Thus, the value obtained is not satisfactory. Taking into account the data from cycle 1, the study continued in cycle 2 by looking at the shortcomings in cycle 1.

In the second cycle, class action activities are the same as in the first cycle. The purpose of planning the second Cycle is to correct any gaps or obstacles encountered in Cycle I to improve mathematical understanding. The teaching and learning process cycle II is where the researcher is a teaching teacher, assisted by an experienced mathematics teacher who becomes an observer. Stage II was carried out 2 x 40 minutes in two meetings. The teacher carries out learning activities using a scientific approach to algebra material, then at the last meeting of the whole class series of research activities, students receive the last test question. After the lesson, make observations, review student answers, and review student responses. At the observation stage, reflection is carried out on the results of activities.

Based on reflection, it can be seen that in the second cycle of learning goes well, students contribute actively, it is influenced by student factors that have adapted to learning using a scientific approach. In the implementation of the second cycle test, the results increased compared to cycle I. It can be seen both in terms of learning implementation, student activeness, and the results of working on mathematical understanding ability tests. Data on the results of the second cycle learning test obtained values that can be seen in the table.

**Table 2.** Test Scores of Learning Outcomes of Cycle II Algebra Material

Category	Multiple students	Persentase
Complete	17	85%
Incomplete	3	15%
Total	20	100%

From Table 2, it can be seen that students who pass or complete the final evaluation of algebra material appear to have increased their classical ability to 85%. There are only 15% of students do not graduate. This proves that students' mathematical understanding ability grows with the activities given to achieve goals. It also shows that students' mathematical understanding skills improve as a result of successful classroom action research. Thus, researchers and mathematics teachers agree on research in cycle II and sufficient research.

### **Discussions**

The research conducted was by using classroom action research (PTK). Classroom action research is research on improving the teaching and learning process (Ritonga et al., 2020). Consisting of 2 cycles with two meetings carried out with research steps, the quantity of meetings for each cycle is adjusted to the compatibility of the material discussed. In the first cycle of learning using a scientific approach to algebra material, it turns out that students experience fairly simple difficulties in making mathematical models and interpreting algebraic operations, and solving problem problems, this is because learning to use a scientific approach feels foreign. So, the percentage of achievement of student learning outcomes has not been maximized and continued the second cycle of research.

Cycle II teaching and learning activities of students have adapted using a scientific approach. So that in cycle II there is an increase where students are very enthusiastic to be active in learning and can answer the questions that have been given by the teacher, this is reinforced by the results of the final student test where the average score increases almost close to the maximum score, therefore the student's understanding ability has increased. The results are

certainly very satisfying for researchers and mathematics teachers in schools because learning with a scientific approach can improve students' mathematical understanding abilities.

Students' mathematical understanding ability increases by applying a scientific approach in this learning process in line with previous research on the application of scientific approaches in learning increased mathematical understanding (Megati et al., 2022) The results of Ruslau et al., (2018) , also stated that learning to apply scientific approaches is influential or provides good results on students' mathematical understanding abilities.

Based on the results of the research obtained that a scientific approach can be applied in classroom learning to improve students' mathematical understanding abilities, especially on algebra material. The influence of students' mathematical understanding ability can be seen from the pretest score value on the final score, namely the posttest score. Thus, the scientific approach is an effort that can be made in the learning process to see or improve students' mathematical understanding.

## CONCLUSION

Based on the results of the study, it was concluded that the scientific approach can be applied to the mathematical understanding of grade VII students of SMP IT Nur Al Rahman in the classroom using algebra material. The impact of students' mathematical understanding ability can be seen in the results of the first cycle exam and the second cycle final exam. This shows that students' mathematical understanding ability has improved which is reflected in the achievement of question indicators after 2 learning cycles. Therefore, the scientific approach is an effort that can be made in the learning process to see or improve students' mathematical understanding. Suggestions that researchers can give to mathematics teachers in schools should apply a scientific approach to improve students' mathematical understanding, especially regarding the concept of material mastery.

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