Analysis of Garde IX Student's Mathematical Understanding Ability on Quadratic Equation Material

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Abstract

This study aims to describe the mathematical understanding ability of grade IX students in the quadratic equation material. This research method uses a qualitative descriptive research type. The subjects in this study were grade IX students of the Syahrani Bariah Zulkarnanen Islamic Boarding School with a sample size of 5 students. The data collection technique used a test technique in the form of essay questions totaling 4 questions and each question representing each indicator of mathematical understanding ability. The results of the study showed that the mathematical understanding ability in indicators 1) students are less able to restate the concepts that have been learned, 2) students are less able to identify examples not from examples, 3) students are able to change the form of representation into other forms of representation, 4) students are able to develop the concept of quadratic equation material. So the students' mathematical understanding ability in understanding the problem, planning the solution, and rechecking all the steps that have been done is classified as moderate.

Keywords: *Mathematical Understanding Ability; Quadratic Equations; Mathematics.*

Abstrak

Penelitian ini bertujuan untuk mendeskripsikan kemampuan pemahaman matematis siswa kelas IX pada materi persamaan kuadrat. Metode penelitian ini menggunakan jenis penelitian deskriptif kualitatif. Subjek dalam penelitian ini adalah siswa kelas IX Pondok Pesantren Syahrani Bariah Zulkarnanen dengan jumlah sampel 5 siswa. Teknik pengumpulan data menggunakan teknik tes berupa soal essay yang berjumlah 4 soal dan tiap soal mewakili masing – masing indikator kemampuan pemahaman matematis. Hasil penelitian menunjukkan bahwa kemampuan pemahaman matematis pada indikator 1) siswa kurang mampu menyatakan ulang konsep yang telah dipelajari, 2) siswa kurang mampu mampu dalam mengidentifikasi contoh bukan dari contoh, 3) siswa mampu mengubah bentuk representasi kedalam bentuk representasi lainnya, 4) siswa mampu mengembangkan suatu konsep materi persamaan kuadrat. Jadi kemampuan pemahaman matematis siswa dalam memahami masalah, merencanakan penyelesaian, dan melakukan pengecekan kembali terhadap semua langkah yang telah dikerjakan tergolong sedang.

Kata Kunci: Kemampuan Pemahaman Matematis; Persaaamaan Kuadrat; Matematika.

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INTRODUCTION

Mathematics is a science that studies abstract structures with logical reasoning in statements that are equipped with evidence and through exploration activities that require imagination, intuition and discovery as problem-solving activities and communication tools, knowledge of numbers and calculations and the relationships between these things (Susilawati et al., 2023). Mathematics plays an important role in the development of logical, analytical, and systematic thinking skills, and supports the advancement of science and technology. According to (Susanti, Y. 2020) that mathematics is a group of sciences that discusses the sciences of calculation. In addition, mathematics discusses sciences that are related to logic, can be accepted by common sense which is always based on logic accompanied by accurate facts. In line with that, (Susanti, Y. 2020: 436) argues that the perception of mathematics is a relatively difficult lesson while on the other hand mathematics lessons are very much needed in today's digital and technological era. Therefore, one of the important factors in learning mathematics today is the importance of improving students' mathematical understanding abilities.

Based on this, understanding is a process and way of interpreting a condition and facts obtained based on the level of ability possessed by each person. Understanding is not just knowing and restating what is learned. However, understanding can know the meaning contained in the information (Hermawan et al., 2021). Students' mathematical understanding ability is an important aspect in learning mathematics. Without understanding, students will find it difficult to digest a mathematical concept that will be obtained (Arham et al., 2022). According to (Wijaya et al., 2018) mathematical understanding is students' knowledge, especially regarding concepts, principles, procedures and students' ability to use strategies in solving a given problem. Someone who already has mathematical understanding ability means that the person has been able to know what has been learned and the steps taken. In line with that, according to (Sengkey et al., 2023) the ability to understand mathematical concepts is the ability to absorb and interpret a mathematical concept and then connect it to various

concepts and be able to restate the concept. Then the ability of mathematical understanding according to (Tianingrum et al., 2017) is the materials taught to students not in the form of memorization, but as a goal to achieve the expected concept in the objectives of the learning process. So that students are able to understand something based on their learning experience.

Based on the definition above, it can be seen that mathematical understanding ability is the ability of students to understand something related to mathematical concepts, be it definitions, formulas and procedures that are in accordance with the problems or materials that have been presented. The results of previous field studies show that there are many students who do not like mathematics, reinforced by the opinion of (Abdul, 2015) which states that efforts have been made so that mathematics is mastered and liked by students well by education experts and mathematics education experts. However, the results show that there are still many students who do not like and enjoy mathematics lessons. There are many factors that cause students to not understand the concepts of mathematics lessons. Reinforced by (Arham et al., 2022) in his research that most students who have difficulty in solving the problems given are due to a lack of understanding of basic mathematics material.

Based on previous research, the mathematical understanding ability of class VIII students of SMPS West Bandung Regency in solving algebraic problems is still low, students do not apply formulas in simple calculations and do calculations algorithmically and link one concept to another, so researchers suggest innovating in mathematics learning such as using innovative learning Based on previous research, the mathematical understanding ability of class VIII students of SMPS West Bandung Regency in solving algebraic problems is still low, students do not apply formulas in simple calculations and do calculations algorithmically and link one concept to another, so researchers suggest innovating in mathematics learning such as using innovative learning approaches or models (Mulyani et al, 2018). The ability to understand students' mathematical concepts related to the most widely studied characteristics, for learning media is still less interesting to researchers due to the lack of use of media in learning and limited

technology in certain areas (Kahirunnisa et al., 2022). In line with that (Hermawan et al., 2021) in the results of his research that the ability to understand mathematics at the Junior High School (SMP) and Senior High School (SMA) levels using the Student Teams Achievement Division (STAD) learning model has a positive impact on student learning outcomes. This is proven by the increase in mathematical understanding abilitie.

Based on temporary observations, there are still many students who do not understand the quadratic equation material so that students find it difficult to master mathematical understanding and also subject hours, and students at the Syahrani Bariah Zulkarnaen Islamic boarding school have mathematics lesson hours between 1-2 hours per week less than other public schools. Therefore, the purpose of this study is to describe students' mathematical understanding abilities in solving quadratic equation material problems. Someone who already has mathematical understanding abilities means that the person already knows what he is studying, the steps that have been taken, can use concepts in the context of mathematics and outside the context of mathematics. Indicators of mathematical understanding abilities based on Skemp's theory described in (Wijaya et al, 2018), namely: a) re-explaining the concepts that have been studied, b) classifying objects according to certain properties, c) presenting concepts in various forms, d) developing the requirements of a concept.

RESEARCH METHODS

The research method used in students' mathematical understanding includes qualitative analysis methods. In qualitative methods, researchers try to understand and interpret so that they can conclude the results of the research that has been carried out. The location of the research will be carried out at the Syahrani Bariah Zulkarnaen Islamic Boarding School, with a total of 5 respondents from class IX. The data collection technique in this study was carried out using essay tests and in-depth interviews were conducted on the research subjects. The data collection techniques used were, 1) Participatory observation, 2) Interviews, 3) Documentation.

In this study, the written test is in the form of an essay. The procedure in this study consists of 3 stages, namely: 1) preparation stage, 2) implementation stage, 3) final stage. The steps in the preparation stage carried out in the preparation stage include: (1) Conducting pre-research on class IX students of the Syahrani Bariah Zulkarnaen Islamic Boarding School; (2) Preparing research questions for the mathematical comprehension ability test; Implementation Stage: (1)Giving tests to grade IX students of Syahrani Bariah Islamic Boarding School (2) Analyzing the answers of research subjects. Final stage 1) Analyzing data obtained from test results 2) Describing the results of data analysis and providing conclusions as answers to the problem formulation 3) compiling a research report.

RESULTS AND DISCUSSION

This research was conducted in one of the ninth grade students of Syahrani Bariah Zulkarnaen Islamic Boarding School. The research conducted was a discussion and analysis of answers to reveal the mathematical understanding abilities of students from each essay test question answer used as a research sample. Describes students' mathematical understanding in solving questions on the quadratic equation material in each question.

The research sample consisted of 5 students. The data from this study were in the form of scoring results of students' mathematical understanding abilities, the data collection of which used an instrument in the form of 4 essay test questions. The following are the score results based on the indicators that have been set.

Table 1. Description of Students' Mathematical Understanding Ability in Restating the Concepts Learned

No	Name	Score
1	RR	12,5
2	M	12,5
3	UH	12,5
4	A	0
5	H	12,5
	Sum	50
	Presentation	40%

Based on the data obtained and listed in Table 1, it shows that students' understanding ability in restatingconcepts that have been learned in question 1 with a percentage of 40%.

Table 2. Description of Students' Mathematical Understanding Ability in Identifying Examples Not from Examples

No	Name	Score
1	RR	12,5
2	M	12,5
3	UH	12,5
4	A	12,5
5	H	12,5
	Sum	62,5
	Presentation	50%

Based on the data obtained and listed in Table 2, it shows that students' understanding ability in identifying examples other than those studied in question 2 is 50%.

Table 3. Description of Students' Mathematical Understanding Ability in Changing Representation Forms into Other Representation Forms.

No	Name	Score
1	RR	25
2	M	12,5
3	UH	25
4	A	25
5	H	25
	Sum	112,5
	Presentation	90%

Based on the data obtained and listed in Table 3, it shows that students' understanding ability in changing the form of representation into other forms of representation that have been studied in question 3 is 90%.

Table 4. Description of Students' Mathematical Understanding Ability in Developing the Requirements of a Concept.

No	Name	Score
1	RR	25
2	M	25
3	UH	25
4	A	12,5
5	H	25
	Sum	112,5
	Presentation	90%

Based on the data obtained and listed in Table 4, it shows that students' understanding ability in developing the requirements for a concept that has been studied in question 4 is 90%.

The average percentage of students' mathematical understanding ability in restating the concepts learned in question number 1 with a percentage of 40%. Based on the results of the initial test, students' mathematical understanding ability in restating the concepts learned is still not good. To improve students' understanding ability, mathematics learning is needed that can apply something in an easier way, or a more interesting way of delivery.

Question Number 1 is to mention the characteristics of quadratic equations. The answer is based on the image below.

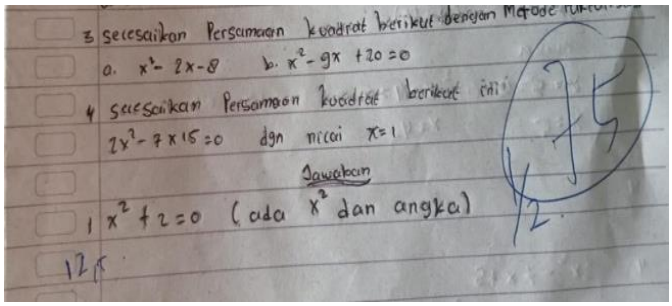

Figure 1. Student Answers for Question Number 1

In question Number 1, many students had difficulty in mentioning the characteristics of quadratic equations. Based on the results of the answers to the 5 students, there were 4 students who only knew the characteristics of quadratic

equations incompletely and only some of the characteristics mentioned. Then 1 more student did not know at all and was wrong in stating the answer to question Number 1.

The average presentation of students' mathematical understanding ability in identifying examples that are not from examples in question Number 2 with a presentation of 50%. Based on the test results, students' mathematical understanding ability in identifying examples that are not from examples is still not good, so it is necessary to learn mathematics to improve students' understanding ability which includes many more examples of the properties of an object.

Question Number 2 is which of the following equations is a quadratic equation:

a. $16x^2 - 4 = 0$
b. $7 = 4x + x + 9$
c. $2y = x + 16$
d. $3x^2 - 11x - 8 = 0$
e. $Y = 29 - 4y + x$
f. $\sqrt{x^2} + 3x + 1 = 0$
g. $7y - 2y^2 - 5$
h. $y^2 + x = 5 = 5\ 2x$

Answer based on the image below.

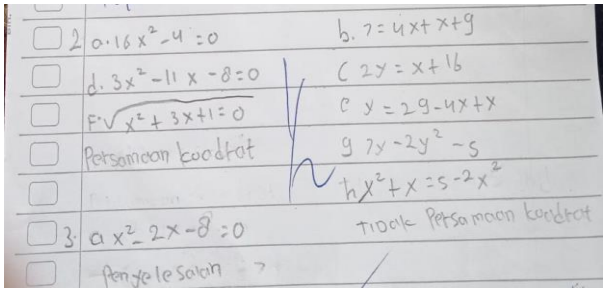

Figure 2. Student Answers for Question Number 2

In question Number 2, many students have difficulty in grouping or identifying which are quadratic equations and which are not. Based on the results of the answers of the 5 students, the 5 students grouped the quadratic equations, some of which were correctly grouped, but there was one quadratic equation that was not correct and was not grouped into the quadratic equation group.

The average percentage of students' mathematical understanding ability in changing the form of representation into other forms of representation studied in question Number 3 with a percentage of 90%. Based on the results of the initial test, students' mathematical understanding ability in changing the form of representation into other forms of representation is quite good.

Question number 3 is to solve the following quadratic equation using the method

a. $x^2 - 2x - 8 = 0$
b. $x^2 - 9x + 20 = 0$

Answer based on the image below.

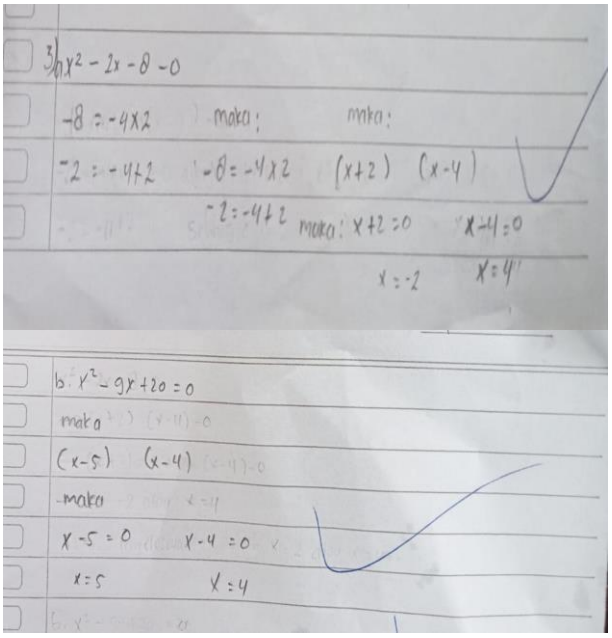

Figure 3. Student Answers for Question Number 3

In question Number 3, many students can solve the quadratic equation into factorization form. Based on the results of the answers to the 5 students, there are 4 students who solve the quadratic equation completely. Then 1 more student can solve the quadratic equation into factorization form but in the student's answer, the student wrote the wrong answer for the value of x at the end of the answer.

The average percentage of students' mathematical understanding ability in developing the requirements of a concept in the quadratic equation material studied in question number 4 with a percentage of 90%. Based on the results of the initial test, students' mathematical understanding ability in developing a concept in the quadratic equation material is quite good.

Question Number 4 is to solve the following quadratic equation:

$2x^2 - 7x + 5 = 0$ dengan nilai $x = 1$

Answer based on the image below.

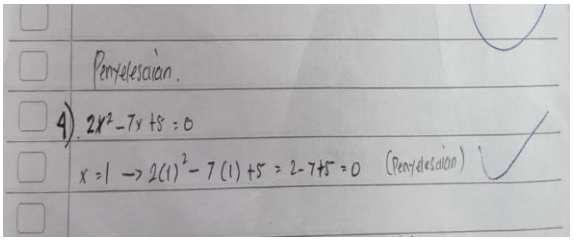

Figure 4. Student Answers for Question Number 4

In question Number 4, many students can solve the quadratic equation into factorization form. Based on the results of the answers to the 5 students, there are 4 students who solve the quadratic equation completely by entering the value of x = 1. But there is 1 more student who can solve the quadratic equation but in the student's answer, the student wrote the wrong answer for the value of x at the end of the answer, namely there is -0, the value -0 should not be there.

CONCLUSION

Based on the results and discussion of the study, it is concluded that students' mathematical understanding ability in understanding problems, planning solutions, and rechecking all the steps that have been done is classified as moderate. This is because: 1) students are less able to restate the concepts that have been learned, 2) less able to identify examples that are not from examples, 3) able to change the form of representation into other forms of representation, 4) able to develop a concept of quadratic equation material.

Based on the research results and conclusions obtained, several suggestions are proposed that can be used as input in implementing the learning

process. The suggestions from this study are the ability to understand mathematics and the quality of improving students' mathematical understanding abilities whose learning is implemented better and students have a more positive attitude towards the learning. Then carry out more interesting learning so that students do not get bored easily, and carry out learning methods that make students more active and creative.

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