ISSN Online 2527-5933
MATH-EDU: Jurnal Ilmu Pendidikan Matematika
Volume 11, Nomor 1, April 2026, pp. 64-76

Analysis of Students' Mathematical Reasoning Ability in Solving Problems on Quadratic Equations at SMP Negeri Bitefa

Aprilia Priska Deluci Binsasi[1], Hendrika Bete[2]*, Maria Naimnule[3]
[1,2,3]Mathematics Education Study Program, Universitas Timor, East Nusa Tenggara, Indonesia
Correspondence: hendrikabete301192@gmail.com

Article Information
Received:
21st April 2026

Accepted:
13th May 2026

Publish:
30th April 2026

Keywords
Mathematical Reasoning, Quadratic Equation, Problem Solving,
Junior High Schooll

Abstract
This study aimed to analyze students' mathematical reasoning ability in solving problems on the topic of quadratic equations at SMP Negeri Bitefa. The research used a qualitative descriptive approach with 18 eighth-grade students as participants. Data were collected through tests of mathematical reasoning and follow-up interviews with three selected subjects representing high, medium, and low levels of reasoning ability. The results showed that students' reasoning abilities varied across five indicators: (1) making initial conjectures and predictions based on problem context, (2) performing mathematical manipulations to find patterns and relationships, (3) constructing systematic mathematical arguments and proofs, (4) evaluating mathematical arguments for accuracy, and (5) integrating analysis results to draw logical conclusions. Students with high ability were able to meet all indicators. students with medium ability were able to meet three indicators, and students with low ability were only able to meet two indicators. The strongest performance appeared in the ability to draw conclusions (50.74%), while the weakest was in generating conjectures (44.81%). These results indicate the need for mathematics learning that emphasizes the application of learning strategies that are adapted to mathematical reasoning abilities.

How to Cite: Binsasi A.P.D & Bete, H & Naimnule, M (2025). Analysis Of Mathematical Reasoning Ability in Solving Problems on Quadratc Equations at SMP Negeri Bitefa. *Math-Edu: Jurnal Ilmu Pendidikan Matematika*, 11 (1), 64-76.

Introduction

Mathematics learning in schools has a very important role in developing students' thinking and reasoning skills. Through mathematics learning, students are invited to practice logical, systematic, and critical thinking in solving various problems. In addition, mathematics also helps students in drawing conclusions based on valid evidence, which in turn will improve their reasoning skills (Suyanto, 2012). Mathematics is not just a mastery of formulas or procedures, but also involves a deep thinking process to understand basic concepts and their applications (Sardiman, 2011). This ability to think mathematically is very important because it not only helps students in solving math problems, but also in dealing with more complex problems in daily life (NCTM)., 2000). Thus, mathematics learning has a close relationship with improving reasoning skills, and both support each other in the learning process. Even so, there are still many students who face difficulties in developing mathematical reasoning skills. This can hinder their understanding of more abstract and complex mathematical material (Hiebert, J., & Grouws, 2007). Therefore, it is important for educators to create a learning environment that can stimulate and practice students' reasoning, so that they not only understand mathematical concepts, but also apply them well.

The purpose of learning mathematics in school is to train the way of thinking and reasoning in drawing conclusions. Reasoning is a thought process to draw conclusions based on a truth whose truth has been proven (Supriyanto, 2018). So that reasoning skills in mathematics learning have an important role, this is in line with this opinion, reasoning skills in mathematics play an important role starting from understanding concepts to solving problems (Prasetyo, 2017). In line with the expression that mathematical material can be understood through reasoning and reasoning can be trained through learning mathematics. (NCTM)., 2000)stated that mathematics learning and mathematical reasoning skills are interconnected, inseparable. Although mathematical reasoning is a very important aspect in learning mathematics, there are still many students who are weak in mathematical reasoning skills (Hidayat, 2020).

Mathematical reasoning skills are the ability to draw conclusions based on relevant data and several statements that have been proven to be true (Yovita, M., Lestari, D., & Rahmawati, 2023). Mathematical reasoning is the foundation for constructing mathematical knowledge (Fauziyah., 2022). In fact, in mathematics learning, students' reasoning skills are still weak. The view of students who consider mathematics to be difficult and complicated is one of the reasons why students' reasoning skills are still weak. Most students have difficulty in doing math problems in learning because they already think that mathematics is a difficult, unpleasant, and even scary science, and that the object in learning is still abstract, so that students' comprehension skills are not maximized and affect their reasoning skills (Solihah, 2023). Overall, mathematical reasoning skills include the development of critical and logical thinking skills that enable individuals to understand and apply mathematics in a variety of contexts, as well as communicate the results of their reasoning in a way that is coherent and understandable to others, (NCTM)., 2000).

The math problems that are often encountered in schools vary, but in general they are related to the understanding of basic concepts that are very important for students. Many students have difficulty applying mathematical concepts in real-life situations or in solving more complex problems. One of the common problems faced by students is the difficulty in understanding the relationship between mathematical concepts and how they are used in solving more difficult problems. This often leads to students' dependence on solutions that they are familiar with or used to, such as working on problems that have only one single answer (NCTM)., 2000). Students tend to rely on tested procedures, instead of trying to relate mathematical concepts to more open-ended problem situations. This problem hinders students' ability to develop more complex critical thinking and problem-solving skills, which should be the main goal in mathematics learning (Sulistiani, N., 2016).

In fact, the problems found in schools, especially at Bitefa State Junior High School, show that there are deeper challenges. Based on the results of an interview with one of the mathematics teachers, it is known that students' habits of working on problems with single answers, as well as the lack of practice for more challenging questions. In addition, the learning methods used by teachers still tend to be conventional, where learning is dominated by the teacher's explanation. In this condition, most students only passively listen and take notes of the teacher's explanations, while only a few students actively ask questions or answer questions. As a result, the learning process becomes one-way, which in turn hinders the development of students' adaptive reasoning skills. This phenomenon is in line with the opinion (Sulistiawati, 2014), who states that the low mathematical reasoning ability of students is one of the reasons for the lack of involvement of students in mathematics learning. This worsens the condition of students who are used to learning methods that do not provide space for students to think critically and creatively. One example of a problem that can help spark students' creativity is the quadratic equation problem, which can hone mathematical reasoning skills. Square equation problems provide students with the opportunity to not only memorize the completion procedure, but also to think more deeply and look for different ways of solving that can be used. Thus, quadratic equation problems can be an effective means to develop mathematical reasoning skills and students' creativity in solving problems (Pelfrey, 2000).

This study aims to analyze students' mathematical reasoning skills in solving quadratic equation problems in depth. This research will identify the extent to which students understand and apply the concepts of quadratic equations, as well as explore various factors that affect students' mathematical reasoning skills, such as teaching methods, quality of learning resources, and learning motivation. By analyzing the difficulties faced by students and the factors that affect their abilities, it is hoped that this research can formulate effective solutions to improve students' mathematical reasoning skills in solving quadratic equation problems.

Methods

This study uses a qualitative approach with a descriptive research type. This research has been conducted in the 2024/2025 academic year in the even semester at SMPN BitefaThe subjects in this study were 18 students of class VIIIA. The author provided a mathematical reasoning ability test. Based on the results of the mathematical reasoning ability test, 3 students were selected as research subjects, namely 1 student with high mathematical reasoning ability, 1 student with medium mathematical reasoning ability, and 1 student with low mathematical reasoning ability. The instruments of this study were mathematical reasoning ability test questions, interview guidelines and documentation. Data analysis techniques include data reduction, data presentation and conclusion drawing.

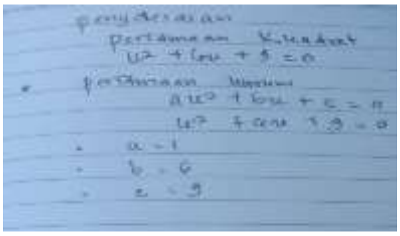
Result and Discussion

Result

The researchhers describe the result of tests and interviews conducted with the research subjects. There are two types of data in this study written test data and interview data from the three research subjects. The The first data is written test data from the selection of three research subjects based on the research results. The second data is interview data from the results of the research subjects' mathematical reasoning ability test.

Description of data from the analysis of mathematical reasoning skills of students who have high abilities (S1)

Subject's mathematical reasoning ability (S1) in solving test questions



Make initial guesses and predictions based on the context of the problem

Figure 1. Subject's (S1) ability to solve test questions

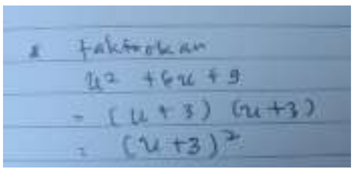
Based on Figure 1 S1 and the results of the interview, it can be concluded that making initial conjectures and predictions based on the context of the S1 subject's problem shows excellent initial ability. S1 directly writes down the general form of the quadratic equation $x^2 + bx$ + c = 0 and identifies the coefficient values a = 1, b = 6, and c = 9. S1 also predicted that the equation has twin roots. This shows that S1 is able to make initial guesses based on the structure of the problem, and understands that perfect squares often result in twin roots. This prediction is very accurate and shows the depth of understanding of the context of the problem. The following are the results of interviews with the subject (S1) that support the answers to the test questions:

P : How do you solve the problem

S1 : From that question, I immediately knew that it was a quadratic equation.

P : What do you do after finding out it's a quadratic equation?

S1 : I immediately wrote the general form, which is the one with the second power, $x^2 + bx$ + c = 0. Then I look at the values a, b, and c. In the problem a = 1, b = 6, and c = = 9.



Perform mathematical manipulations to determine patterns and relationships

Figure 2. Subject's (S1) ability to solve test questions

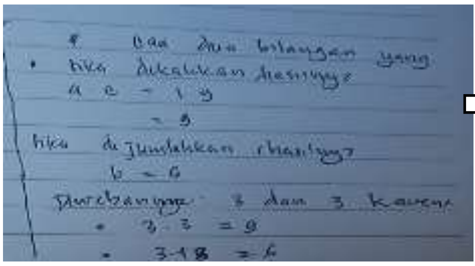
Based on Figure 2 S1 and the results of the interview, it can be concluded that Perform mathematical manipulation to find patterns and relationships. S1 is able to factor the square shape into $(x + 3)^2$. S1 not only factors automatically $x^2 + 6x + 9 = 0$ or repeatedly without understanding the meaning or concept, but also explains the reason for choosing the numbers 3 and 3, because it meets the conditions a · c = 9 and b = 6. This shows that S1 performed algebraic manipulations while also finding patterns that the shape is perfectly squared. There were no procedural or conceptual errors made by S1 in this process.

P : Then, how do you determine how to solve it?

S1 : Since it is shaped like a perfect square, I predict the roots of this equation are twin. So I try to factorize.

P : Why did you choose the factorization method?

S1 : Since 3 × 3 = 9 and 3 + 3 = 6, so it matches the values b and c. I know that this kind of shape is usually (+ 3)². That's why I use direct factorization.x



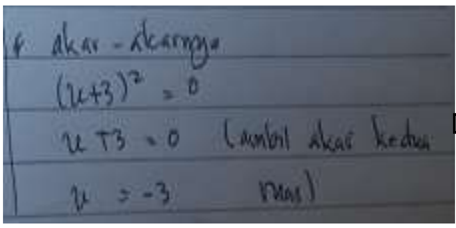
Systematically formulate mathematical arguments and proofs

Figure 3. Subject's (S1) ability to solve test questions

Based on Figure 3 S1 and the results of the interview, it can be concluded that, Systematically formulate mathematical arguments and proofs. The steps to complete the S1 are arranged sequentially and systematically, starting from identification, factorization, to conclusion. S1 explains why the form of factorization was chosen and states the mathematical reasons logically. For example, S1 lists that 3 and 3 are used because 3 + 3 = 6 and 3 · 3 = 9, correspond to the values b and c. This demonstrates the ability to structure arguments and proofs in a structured manner and based on strong logical relationships.

P : Do you also check the roots?

S1 : Yes, from (+ 3)² = 0, means = −3. Since the roots are the same, it means that it is a twin root. I also wrote the conclusion that it was.xx



Examining and evaluating mathematical arguments to ensure truth

Figure 4. Subject's (S1) ability to solve test questions

Based on Figure 4 S1 and the results of the interview, it can be concluded that, examine and evaluate mathematical arguments to ensure truth. S1 does not stop at the results of the factorization, but re-examines the answer. SI checks that (x+ 3 $)^2$does produce a root $x = -3$ and that the result is a twin root. This shows that S1 has a habit of reflecting and evaluating the process of completion, rather than just focusing on the final answer. This ability reflects a deeper and reflective understanding. The following are the results of the interview with the subject (S1) which supports the answer:

P : Do you also check the roots?

P : Do you think the steps you are taking are right?

S1 : Yes, from $(x+3)^2 = 0$, means $x = -3$. Since the roots are the same, it means that it is a twin root. I also wrote the conclusion that it was.

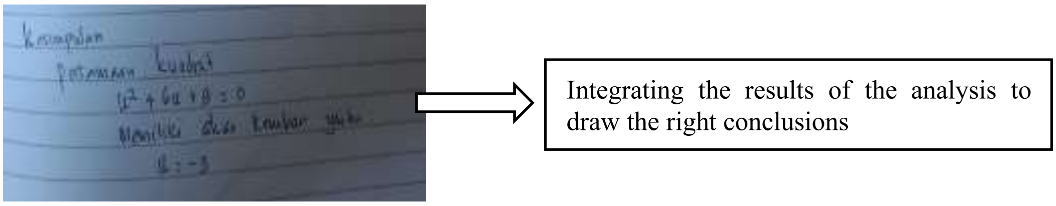


Figure 5. Subject's (S1) ability to solve test questions

Based on Figure 5 S1 and the results of the interview, it can be concluded that, Integrating the results of the analysis to draw the right conclusions. Finally, S1 draws the precise and clear conclusion, that the equation $x^2 + 6x + 9 = 0$ has a twin root x = -3

The conclusion of S1 in solving the test questions is based on a thorough analysis process, starting from the identification of general shapes, algebraic manipulation, to the evaluation of results. This ability shows that S1 is able to combine all mathematical thinking processes to form a complete understanding and draw valid conclusions. S1 subjects mastered all the indicators of high-level mathematical reasoning very well. S1 is not only able to solve problems correctly, but also understands every step taken. The solution is displayed logically, completely, and with a deep reason. With this ability, S1 is ready to face more complex math problems, both in terms of concepts and solution strategies.

S1 subjects show mastery of all indicators of mathematical reasoning, namely: making initial conjectures and predictions based on the context of the problem, performing mathematical manipulations to find patterns and relationships, systematically arranging arguments and proofs, examining and evaluating arguments to ensure truth, and integrating the results of the analysis to draw the right conclusions. This ability is reflected in the way S1 solves problems sequentially, logically, and accompanied by strong mathematical reasons. S1 not only understands the completion procedure, but is also able to explain the concept and reasons behind each step taken. This shows that the subject has a mathematical mindset that is based on understanding, organized, and able to reassess. With a strong mastery of problem-solving concepts and strategies, S1 subjects have great potential to develop high-level thinking skills, especially in solving more complex and analytical mathematical problems at the higher education level.

Description of data on the results of the mathematical reasoning ability test for students who have moderate abilities (S2)

Subject's mathematical reasoning ability (S2) in solving test questions

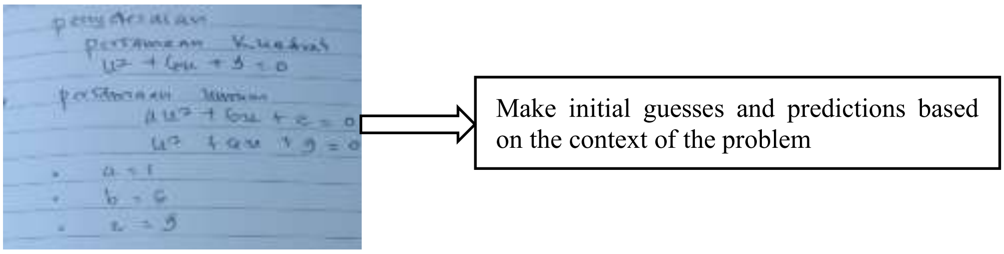


Figure 6. Subject's ability (S2) to solve test questions

Based on figure 6, the subject (S2) was able to successfully complete the test questions The subject (S2) was able to identify information and make the initial conjecture of the S2 was able to recognize that the question was related to quadratic equations. This is shown by writing the general form of the quadratic equation ax^2+ bx + c = 0, as well as identifying the coefficient values precisely: a = 1, b = 6, and c = 9, this identification shows that S2 can relate the form of the problem to the algebraic concepts that have been studied earlier.

P Can you explain how you solved this test?

S2 First I read the question, then I saw that the shape was similar to the quadratic equation. So I immediately remembered the general form, which is a x^2+ b x + c = 0.

P So what do you do after recognizing the shape of the equation?

S2 I identified the coefficient. In that question I see the values a = 1, b = 6, and c = 9. I wrote that first to be clear.

P Why do you do that?

S2 So that it will be easier later when you find the roots or when you use the formula. I also became convinced that this is a matter of quadratic equations.

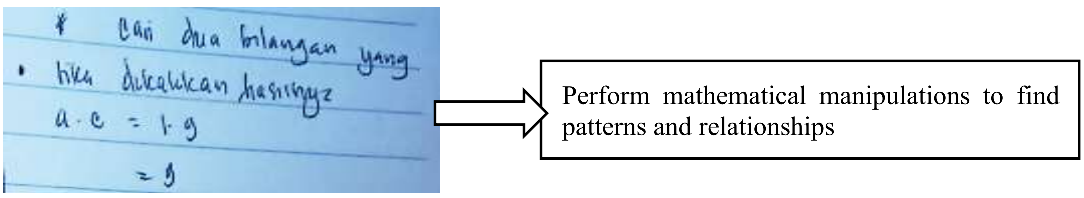


Figure 7. Subject's ability (S2) to solve problem no. 1

Based on Figure 7, S2 was able to successfully solve the test questions. Subject S2 performs Mathematical Manipulation, the subject then looks for two numbers which if multiplied the result is a·c = 9, and if added together the result is b = 6. S2 found that numbers 3 and 3 met both conditions. 3

× 3 = 9, and 3 + 3 = 6. This signifies that the subject understands the basic principles of factorization and is able to apply them correctly.

P : Once you've written the general form of the quadratic equation, what's the next step?

S2 : I look for two numbers that if multiplied the result is a · c = 9, and if added together the result is b = 6.

P : How did you find those two numbers?

S2 : I tried the numbers, and then I got 3 and 3, because 3 × 3 = 9 and 3 + 3 = 6, so it fits.

P : What is the reason you chose this method?

S2 : Because that's the way of factoring that I usually use. If the two numbers meet the requirements of times and amounts, it means that you can continue to factor.

P : So you understand that it's part of the factorization process?

S2 : Yes, that's the basic principle, and I'm used to using that method in quadratic equation problems.

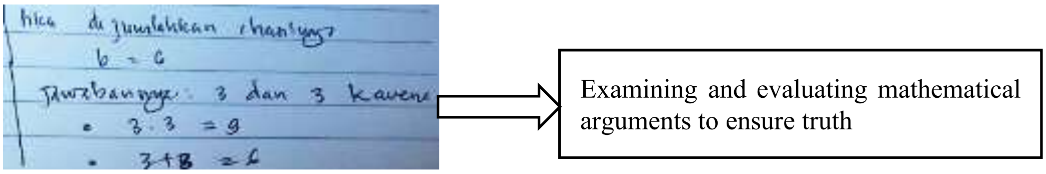


Figure 8. Subject's ability (S2) to solve test questions

Based on figure 8, S2 was able to successfully solve the test questions S2 subjects composed arguments systematically, the completion steps were written in order. Starting from writing down the general form of the equation, determining the value of the coefficient, to choosing the appropriate number for the factorization process. Although S2 has not written a complete form of factorization (e.g.: $(x+3)^2 = 0$ and has not explicitly determined the root), the logical order in his work already reflects the ability to formulate systematic arguments. Checking and evaluating the results S2 verifies the selected numbers by checking the results of multiplication and addition, namely 3 and 3. This shows the existence of internal evaluation and reflective ability in mathematical thinking. Drawing Conclusions Although S2 has not yet written the final conclusion in the form of the roots of the quadratic equation, the results of the factorization shown are correct and lead to the conclusion that the equation is a perfect quadratic form. This shows that S2 has the potential to solve problems completely with little direction or improvement. The following are the results of interviews with S2 subjects that support the answers to the test questions:

P : Can you tell us about the steps you took to solve this problem?

S2 : First I wrote the general form of the quadratic equation, which is $ax^2 + bx + c = 0$, then I looked for the values a, b, and c of the problem. After that, I looked for two numbers that if multiplied by 9 and added to 6.

P : How can you be sure the number you choose is correct?

S2 : I checked again, 3 times 3 is 9, and 3 plus 3 is 6. So I make sure first before continuing.

P : After that, did you write down the factors?

S2 : It hasn't stopped there, but I already know it's a perfect square, because the numbers are the same. It should be $(x + 3 = 0)^2$.

P : So you realize it's a perfect square shape?

S2 : Yes, because the two numbers are the same, and the coefficients are also suitable. I just need to continue to the root if asked.

From this interview, it can be seen that the S2 subject has a good conceptual understanding of quadratic equations, is able to identify important elements of the problem, and systematically formulates solution steps. Although the written answer does not fully include the final form of the root of the equation, verbally S2 can explain the settlement process in a sequential, logical, and independent manner. S2 also showed flexibility in thinking, being aware of the existence of alternative methods, although he chose the factorization method as his main strategy. This shows that the subject not only follows the mechanical procedures, but actually understands the concept behind the steps performed. His ability to convey the reasons for choosing the method and evaluate the suitability of the numbers used shows the existence of a reflective thinking process. With a little guidance, S2 has the potential to further develop their mathematical skills, especially in solving problems completely and presenting the final result explicitly.

Description of data from the analysis of mathematical reasoning ability of students who have low abilities (S3)

S3 mathematical reasoning skills in solving test questions

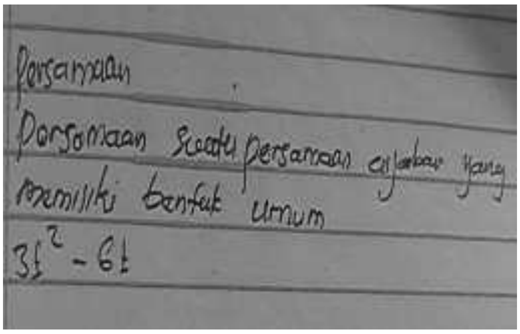


Figure 9. Subject's ability (S3) to solve test questions

Based on the picture, S3 has not been able to complete the test questions correctly. SI writes the sentence, "an equation is an algebraic equation that has a general form", and then writes the algebraic form $3x^2$−6x, but this form does not correspond to the context of the problem. This shows that the subject's understanding of the structure of quadratic equations is still very limited, especially in relating the information from the problem to the exact form of algebra. Identifying information and making the initial conjecture has not been fulfilled, the subject has not been able to identify important information from the question accurately. The equations written do not seem to come from an analysis of the long, wide, and broad information that should appear in the context of the problem. The initial conjecture made is irrelevant to the question, and does not show a logical relationship between the variables involved.

Performing mathematical manipulation was not fulfilled, and no mathematical manipulation process was found in the answers given. The writing of the $3x^2 - 6x$ form does not come from the process of calculation or modeling based on the data in the problem. This shows that the subject has not yet understood the concept of algebraic manipulation as part of problem solving. Systematically formulating mathematical arguments is not fulfilled, the subject does not show the existence of logical or systematic steps. There is no line of thought that leads to the solution of the problem, and there are no mathematical arguments that support the written form. Answers tend to be memorized without understanding their application in the given context. Checking and evaluating the results is not met, the subject does not show any evaluation process or reflection on the written results. Errors in the form of equations are not corrected, and there is no apparent attempt to adapt the answer to the context of the problem. This reflects a lack of reflective ability to verify the truth or relevance of answers. Drawing conclusions based on analysis is not fulfilled, because there is no logical settlement process from the beginning, the subject cannot draw conclusions that correspond to the given problem. There are no final results that show that the subject understands what is being asked or is able to solve the problem conceptually or procedurally. The following are the results of interviews with the subject (S3) that support the answers to the test questions.

P : Tell me, what do you understand from this matter?

S3 : Regarding the square equation, S... about finding the form of the equation.

P : Okay, what do you think is the information known from the question?

S3 : Hmm... There are numbers, and I think it can be directly written into the form of a quadratic equation.

During the interview, the subjects seemed enthusiastic about answering, but did not show a deep understanding of the problem. The subject claims to understand the content of the problem, but the answers are compiled based on memorizing the form of algebraic equations, not from understanding the context or analyzing the available information. S3 does not relate the concepts of length, width, and breadth in this problem. After being directed to review the question, the subject realized that the S3 had not paid attention to the context thoroughly. This shows that the subject's mathematical reasoning ability is still at a low level, especially in identifying important information, conducting analysis, and formulating solutions that are relevant to the context of the problem.

Discussion

Based on the results of the study on S1 who has high mathematical reasoning skills, it shows that the subject is able to meet all mathematical reasoning indicators, namely S1 is able to make initial guesses and predictions based on the context of the given problem. This is shown when the S1 identifies important information from the problem, compiles possible solutions, and predicts the general form of the results to be obtained. S1 shows the ability to perform mathematical manipulations to find patterns and relationships. For example, in solving the quadratic equation problem, S1 not only factored procedurally, but also explained the reason for the selection of numbers used by associating the coefficients and forms of perfect squares, which shows mastery of algebraic structures. S1 is able to formulate mathematical arguments and proofs systematically. The S1 thinking process is shown logically and sequentially, starting from identifying problems, choosing a solution strategy, to justifying each solution step. The arguments presented are not only precise, but also structured based on valid mathematical principles. S1 can also examine and evaluate mathematical arguments to ensure the correctness of answers. This finding is in line with research conducted (Fauzan, 2013), who stated that students with high mathematical reasoning skills are able to manipulate algebra and develop mathematical arguments systematically in solving problems. In addition, the results of this study are supported by a study conducted (Hidayat, R., & Wibowo, 2017) which confirms that students who have high mathematical reasoning skills can integrate and draw the right conclusions based on in-depth mathematical analysis. Similar research (Nurhadi., 2015) also found that students' ability to formulate initial conjectures and predict mathematical forms is very closely related to thinking flexibility and creativity in solving mathematical problems, especially on the topic of quadratic equations.

The results of the study on S2 who have moderate mathematical reasoning skills show that the subject is able to meet some of the indicators of mathematical reasoning, namely, the ability to make initial guesses and predictions based on the context of the problem seen when S2 can identify basic information from the problem and formulate conjectures on the form of solution. Although these assumptions are not always accurate, they show an effort to understand the context before solving the problem. In terms of mathematical manipulation to find patterns and relationships, S2 shows fairly good skills on basic manipulations, such as simple algebraic operations and value substitution. However, when faced with more complex forms of problems or those that require further exploration, S2 tends to get confused and simply follow common procedural steps without really finding deep mathematical patterns or relationships. This finding is in line with the results of research conducted (Suherman, 2014), which shows that students with mathematical reasoning skills at the intermediate level tend to master basic concepts and solving procedures, but are still lacking in formulating logical arguments and evaluating solutions.

The results of the study on S3 students who have low mathematical reasoning skills show limitations in meeting most of the indicators of mathematical reasoning, especially in terms of mathematical manipulation, argument preparation, evaluation, and conclusion drawn. This finding is consistent with the results of research conducted (Wijaya, 2015), which states that students with low mathematical reasoning skills tend to have difficulty understanding mathematical concepts in depth and are less able to formulate logical arguments and evaluate mathematical solutions. Research by (Sari, D., & Putra, 2016) also revealed that students with low mathematical skills are often only able to work on problems procedurally without understanding the context and relationship patterns underlying the problem, so that the process of critical and reflective thinking has not developed properly. This leads to their low ability to draw precise conclusions from mathematical analysis.

Conclusion

Based on the results and discussion in this study about the analysis of mathematical reasoning skills in solving problems in the square equation material of grade VIII students of State Junior High School, the researcher concluded that: The ability of students with high abilities. Students are able to fulfill all indicators, namely: proposing conjectures and predictions based on the context of the problem, performing mathematical manipulation to find patterns and relationships, compiling mathematical arguments and proofs, examining and evaluating mathematical arguments to ensure truth and integrating the results of the analysis to draw the right conclusions. Students with moderate abilities. Students are able to meet three indicators, namely: performing mathematical manipulation, systematically formulating mathematical arguments and proofs and integrating the results of the analysis to draw the right conclusions. Students with low ability. Students are only able to meet two indicators, namely: making initial guesses and predictions based on the context of the problem, and performing mathematical manipulations to find patterns and relationships. Thus, it can be concluded that the level of mathematical reasoning ability of students varies, and most of them are in the good category.

References

Fauziyah. (2022). Penalaran matematis sebagai pondasi dalam mengonstruksi pengetahuan matematika. *Jurnal Pendidikan Matematika*, *8*(2), 145–153.

Hidayat, R., & Wibowo, T. (2017). Analisis Kemampuan Penalaran Matematis Siswa Ditinjau dari Gaya Kognitif dalam Pemecahan Masalah. *Jurnal Pendidikan Dan Pembelajaran Matematika*, *8*(1), 45–56.

Hidayat, A. (2020). Analisis kemampuan penalaran matematis siswa dalam pembelajaran matematika. *Jurnal Ilmiah Pendidikan Matematika*, *5*(1), 23–31.

Hiebert, J., & Grouws, D. A. (2007). *The effects of classroom mathematics teaching on students' learning. In F. K. Lester (Ed.), Second Handbook of Research on Mathematics Teaching and Learning (pp. 371–404).* Information Age Publishing.

National Council of Teachers of Mathematics (NCTM). (2000). *Principles and Standards for School Mathematics*. VA: NCTM.

Nurhadi. (2015). Kemampuan Berpikir Kreatif dan Penalaran Matematis Siswa dalam Menyelesaikan Masalah Persamaan Kuadrat. *Jurnal Pendidikan Matematika Dan Sains*, *6*(2), 89–98.

Pelfrey, W. V. (2000). Developing mathematical reasoning through quadratic equations. *Journal of*

Mathematics Education, *4*(2), 78–85.

Prasetyo, A. (2017). Peran kemampuan penalaran dalam pembelajaran matematika. *Jurnal Pendidikan Dan Pembelajaran Matematika*, *3*(2), 110–118.

Sardiman, A. M. (2011). *Interaksi dan Motivasi Belajar Mengajar*. RajaGrafindo Persada.

Sari, D., & Putra, B. (2016). Keterbatasan penalaran matematis siswa berkemampuan rendah: Analisis prosedural dan pemahaman konsep. *Jurnal Ilmiah Pendidikan Matematika*, *10*(2), 55–66.

Solihah, R. (2023). Analisis kesulitan siswa dalam pembelajaran matematika dan hubungannya dengan kemampuan penalaran matematis. *Jurnal Pendidikan Dasar Dan Menengah*, *10*(3), 215–224.

Suherman, E. (2014). Kemampuan penalaran matematis siswa pada tingkat menengah: Studi kasus di SMP. *Jurnal Ilmiah Pendidikan Matematika*, *8*(1), 12–23.

Sulistiani, N., & M. (2016). Kemampuan pemecahan masalah dan penalaran matematis siswa dalam pembelajaran matematika. *Unnes Journal of Mathematics Education*, *5*(1), 45–53.

Sulistiawati, S. (2014). Keterlibatan siswa dalam pembelajaran matematika dan pengaruhnya terhadap kemampuan penalaran matematis. *Jurnal Pendidikan Matematika*, *8*(1), 37–46.

Supriyanto, E. (2018). Proses penalaran dalam pembelajaran matematika. *Jurnal Inovasi Pendidikan Matematika*, *9*(2), 88–96.

Suyanto. (2012). *Dasar-Dasar Pendidikan*. UNY Pres.

Wijaya, T. (2015). Kesulitan siswa berkemampuan matematis rendah dalam memahami konsep dan menyusun argumen logis. *Jurnal Pendidikan Dan Pembelajaran Matematika*, *9*(1), 21–33.

Yovita, M., Lestari, D., & Rahmawati, F. (2023). Kemampuan penalaran matematis siswa berdasarkan data dan pernyataan yang telah terbukti kebenarannya. *Jurnal Pendidikan Matematika*, *11*(2), 101–112.