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Mathematical Reasoning Ability of Junior High School Students: Application of Discovery Learning Model

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ABSTRACT

Mathematical reasoning ability is necessary for solving mathematical problems. Therefore, the intent of this study is to enhance students' mathematical reasoning ability through the application of a discovery learning model focused on quadratic function material. This research is Classroom Action Research, designed by Kemmis and McTaggart. The research subjects were 32 students of grade IX at Public Junior High School 1 Tapa. This study used tests for mathematical reasoning, teacher and student activity observation sheets, and questionnaires. The data was analyzed quantitatively and qualitatively using percentages. The findings of this study indicate an increase in students' mathematical reasoning ability after applying the discovery learning model. Teacher activities in cycle I with a percentage of 73.68% increasing in cycle II to 89.47%; student activities in cycle I with a percentage of 72.50% increasing in cycle II to 87.50%; questionnaire results in cycle I only 20 people with a percentage of 62.50% increasing in cycle II to 28 people with a percentage of 87.50%; and the results of students' reasoning ability in cycle I only 23 people with a percentage of 71.87% increasing in cycle II to 28 people with a percentage of 90.62%. There were still 4 people with a percentage of 9.28% who scored <75. In cycle II, the teacher activities, student activities, questionnaires, and reasoning skills met the success indicators.

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1. INTRODUCTION

One of the most essential fields of science to master and learn is mathematics (Maass et al., 2019). Daily routines embed mathematics in formal, non-formal, and informal environments. Math subjects serve as the medium of instruction in a formal setting. Math lessons have different levels of difficulty (Verschaffel et al., 2020). Therefore, the level of education determines the teaching of this subject. Mathematics is considered important because it is the basis of other learning. The aim of mathematics education is to enable students to master mathematical concepts, principles, facts, and rules, as well as to apply mathematical thinking in solving problems encountered during the learning process or in everyday situations related to mathematics (Vos, 2018; Kilpatrick, 2020).

We expect mathematics learning to cultivate various potentials in students, manifesting as mathematical abilities (Grootenboer et al., 2023). Math problem solving requires reasoning skills (Hasbi et al., 2019; Permana et al., 2020). In solving mathematical problems, mathematical thinking ability is a skill that plays an important role. We need this ability to solve various problems in mathematics. According to NTCM, the five process standards for basic mathematical abilities in mathematics learning consist of reasoning, problem solving, communication, representation, and connection (Putri et al., 2019; Hasbi et al., 2019).

The reasoning ability that students must master in mathematics learning activities builds upon the basic mathematical abilities, which are the process standards above (Mukuka et al., 2023). It is critical to developing and refining students' cognitive processes to articulate and convey mathematical concepts. Reasoning can encourage students' mental processes, such as creating and evaluating logical arguments or drawing a conclusion (Bayat et al., 2022). Logical, analytical, and systematic thinking activities carried out by someone to explain ideas and make conclusions based on the information obtained are mathematical reasoning skills. Reasoning can help provide mathematical understanding, so reasoning and mathematics are one and interrelated (Jeannotte & Kieran, 2017; Muslimin & Sunardi, 2019).

Basically, almost all activities carried out in everyday life require reasoning, because it is a tool that plays an important role (Fauziah et al., 2021). When doing mathematical reasoning, students must be able to master two things, namely the ability to provide an explanation of the proof of completion that has been made and the ability to apply procedures to solving problems mathematically (Sopwatillah, 2021). Mathematical reasoning is divided into two types: inductive reasoning and deductive reasoning (Rot & Rot, 2021). Reasoning that involves the process of making inferences or explanations about a model, relationship, or process, which can be considered true or false, is inductive reasoning. Deductive reasoning, in contrast, focuses on definite matters such as formulas, logical calculations, and proofs, where the truth is already established as true, false, or uncertain (Castañeda et al., 2023).

Some researchers have previously conducted research on mathematical reasoning ability, but the results are different. For example, research Rismen et al. (2020); Cahyani & Sritresna (2023) stated the students' reasoning skills were still at a low level. This finding contradicts the results of research conducted by Ellis et al. (2019) and Rahmawati & Astuti (2022), which indicate that students' reasoning ability falls into the middle category, as well as the findings from Putri et al. (2019), which suggest that students' reasoning ability is high.

Students in class IX at public junior high school 1 Tapa display various reasoning abilities. Researchers directly observed teaching in the classroom and analyzed the results of students' final exams, which revealed that only one class achieved the predetermined minimum completeness criteria with an average score of 81.4%. However, the other classes did not meet the minimum completeness criteria, with class

IX.3 having the lowest average score of 54.3%. Students' reasoning skills in solving mathematical problems closely correlate with the results of their final exams.

These results are supported by the results of the initial test conducted by the researcher in the form of a description test that contains indicators of reasoning. The test results indicate that students' reasoning abilities vary. Of the 32 people who took the initial test, there were only 9 people, or 28.13%, who reached the minimum completeness criteria of 75, and there were still 23 people, or 71.87%, who were not complete. The average score of all students in class IX.3 was only 61.19%. These results indicate that the mathematical reasoning ability of students in class IX.3 at public junior high school 1 Tapa is still relatively low. Therefore, this research is important to do to improve students' mathematical reasoning ability.

In addition, research that supports this is a study by PISA and TIMSS. The 2018 study by PISA (Program for International Student Assessment) was in the mathematics category. Out of 73 countries, Indonesia occupied position 67 with an average score of 379 (Julfianto et al., 2022). Then the Trends in International Mathematics and Science Study (TIMSS) revealed that the math achievement results were 6% high, 15% medium, and 54% low. Out of 49 countries, Indonesia is listed in position 45 (Ariati & Juandi, 2022).

The low level of student reasoning ability is due to students' lack of basic understanding of the material. Basic understanding of the material will result in further learning because, in mathematics, the presentation of material is always related (Habsah, 2017). Ineffective learning activities also contribute to students' low mathematical reasoning skills. In class IX of public junior high school 1 Tapa, a direct learning model is still often used. This model allows students to depend solely on the teacher. The learning cycle is only in the form of giving material using the lecture method, writing on the board, and giving exercises. The cycle will result in students becoming disinterested, unfocused, and bored with the learning process. This type of learning process contradicts methods that enhance students' mathematical reasoning abilities. Essentially, positive experiences that occur both inside and outside the learner contribute to the learning process (Prastika et al., 2023).

The learning process also requires teacher innovation and creativity to make students' mathematical reasoning skills improve (Olsson & Granberg, 2024). Therefore, it is important to choose and implement a learning model that encourages students to actively participate in learning activities. This model aids students in their pursuit of enhancing their mathematical reasoning abilities.

To improve mathematical reasoning skills, educators can select and use various models in the learning process (Danişman & Erginer, 2017). However, the discovery learning model is the better one. Constructivism serves as the basis for the development of this model. The discovery model focuses on the importance of understanding relationships, meanings, and concepts with an intuitive process to make a conclusion (Muhammad & Juandi, 2023). This learning model will make students directed in the learning process and use their own reasoning to be able to solve problems and find a concept (Simamora & Saragih, 2019). The use of the discovery learning model can significantly enhance students' mathematical reasoning abilities (Rahman et al., 2019). Mendrofa and Mendrofa (2022) conducted the same research related to the discovery model using reasoning tests, where students who followed the learning applied to the discovery learning model obtained learning outcomes that were not the same as students who followed learning with other models. In this case, compared to other models, the learning outcomes of students who applied the discovery learning model were better. The improved learning outcomes cannot be separated from students' reasoning skills.

In fact, the discovery learning model is more appropriate and effective than other learning models for improving students' mathematical reasoning ability (Sary et al., 2022). In addition, research by Siregar et al. (2020) also indicates that the use of discovery learning models in learning activities can improve students' reasoning skills, teacher activities, and student activities. The discovery model has several stages, namely, the stimulation stage, the problem identification stage, the data collection stage, the data processing stage, the proof stage, and the generalization stage (Listyotami et al., 2018). Based on the explanation above, this research was conducted to utilize the discovery learning model to improve the mathematical reasoning abilities of junior high school students.

2. METHOD

This is a type of class action research conducted in the 2024/2025 academic year. This study aims to improve students' mathematical reasoning ability through the application of a discovery learning model on quadratic function material in class IX at public junior high school 1 Tapa. The study encompasses 32 students from class IX in three public junior high schools. The subjects of this study are 16 boys and 16 girls from public junior high school 1 Tapa. Classroom action research is a study that has the aim of improving the quality and learning outcomes.

In collecting data, there are several instruments used by researchers, namely tests of students' mathematical reasoning abilities in the form of description questions (essays) that contain reasoning indicators, observation sheets on student and teacher activities, and questionnaires. Researchers test the instrument for validation and reliability before using it. Researchers analyze the results of observations of teacher and student activities using the following formula:

$$\frac{score\ obtained}{maksimum\ number\ of\ scores} \times 100\%$$

By using percentages, the average results of the questionnaire and reasoning ability test were analyzed using the following formula:

$$\bar{x} = \frac{\sum_{i=1}^{a} X_i}{n}$$

Furthermore, we group the analysis results into predetermined criteria to gauge the research's success.

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This research was conducted over 2 cycles, following the stages of classroom action research as designed by Kemmis and McTaggart, which include the planning stage, action stage, observation stage, and reflection stage.

Planning Stage

Some of the activities that will be carried out are. The principal and subject teacher at public junior high school 1 Tapa were consulted regarding the implementation of the research. Develop a lesson plan with quadratic function material. We are supplying educational resources. Prepare instruments that will be used in research, such as reasoning tests, teacher observation sheets, questionnaires, and student observation sheets. Make a final evaluation.

Action Stage

Once the planning stage is complete, the action begins. This stage is the implementation of the planning stage. This stage involves the draft learning plan that has been prepared. The design of learning activities, specifically those that apply the discovery learning model, ensures the expected results.

Observation Stage

At this stage, observations focused on student and teacher activities during learning activities. We conducted observations during the learning activities, paying close attention to the research instruments prepared in the form of observation sheets. This observation aims to see student activities such as student interaction and student understanding, obstacles found by students while learning activities applied to the discovery learning model on quadratic function material, and teacher proficiency in managing learning.

Reflection Stage

This stage involves the analysis of the data collected during the action's implementation. We employ both quantitative and qualitative methods to analyze the data from the study. We will quantitatively determine the percentage level of students' ability to study mathematics during the learning process. Qualitatively, it will describe the ability of students in the learning process in the form of words. At this stage, the researcher can see the level of success and obstacles experienced by students during the teaching and learning activities applied by the discovery learning model. The researcher then uses the reflection's findings to make improvements and determine the steps for the next cycle. If we achieve the success indicator, we will terminate the cycle.

3. RESULTS AND DISCUSSION

Results

Cycle I

a. Planning Stage

After talking with the subject teacher and principal to help with the research, we agreed to do in-person learning activities using the discovery learning model focused on quadratic functions for 32 students in class IX.3 at public junior high school 1 Tapa. During the planning stage, the teachers and researchers took the following steps:

1) Develop an activity flow or a learning action plan for implementation.
2) Prepare learning media that will be used, such as teacher handbooks and other media that support the learning process.
3) Preparing research instrument sheets such as reasoning ability tests, teacher observation sheets, questionnaire sheets, and student observation sheets.
4) Determining the division of time for the implementation of cycle I learning and planning the division of time for the implementation of cycle II learning if cycle I has not achieved the achievement indicators to be achieved in the study.

b. Action Stage

We conducted three face-to-face meetings in cycle I. The first meeting for providing material lasted 120 minutes (3 lesson hours), the second meeting for providing information and distributing questionnaires lasted 80 minutes (2 lesson hours), and the third meeting for giving reasoning test questions lasted 120 minutes (3 lesson hours).

c. Observation Stage

1) Teacher Activity

Table 1 shows detailed information about what teachers did during two in-person learning sessions in Cycle I, which were centered on teaching using the discovery learning model.

Table 1. Result of Observation Of Teacher Activity Meeting I And II Cycle I

Assessment Criteria	**Presentation of Number of Aspects**				**Average Percentage (%)**	**Total**
	Meeting I		**Meeting II**			
	Number of Item	**Percentage (%)**	**Number of Item**	**Percentage (%)**		
SB (4)	2	10,53%	5	26,32%	18,42%	73,68%
B (3)	11	57,89%	10	52,63%	55,26%	
C (2)	6	31,58%	4	21,05%	26,32%	26,32%
K(1)	0	-	0	-	0	
Total	19	100,00%	19	100,00%	100,00%	100,00%

From the data in Table 1, we see that during meetings I and II of the learning activities using the discovery learning model in cycle I, the teachers' activities averaged 73.68%.

2) Student Activity

Table 2 provides detailed data on the observations of student activities during two face-to-face meetings in cycle I, where the discovery learning model was applied to deliver material.

Table 2. Result of Observation Of Student Activity Meeting I And II Cycle I

Assessment Criteria	Presentation of Number of Aspects				Average Percentage (%)	Total
	Meeting I		Meeting II			
	Number of Item	Percentage (%)	Number of Item	Persentase (%)		
SB (4)	2	10,00%	4	20,00%	15,00%	72,50%
B (3)	11	55,00%	12	60,00%	57,50%	
C (2)	7	35,00%	4	20,00%	27,50%	27,50%
K(1)	0	-	0	-	-	
Total	20	100,00%	20	100,00%	100,00%	100,00%

From the data in Table 2, we see that during meetings I and II of the discovery learning model in cycle I, students were active about 72.50% of the time.

3) Questionnaire

Table 3 presents in detail the results of the questionnaire as a response from students after completing the learning process applied to the recovery learning model in cycle I.

Table 3. Results of Cycle I Questionnaire

Criteria	Number of Citeria	Percentage	Total
(4) SB	2	6,25%	62,50%
(3) B	18	56,25%	
(2) C	9	28,13%	
(1) K	3	9,37%	37,50%
(0) SK	0	-	
Total	32	100,00%	100,00%

From the data in Table 3, we see that out of 32 students who took part in the discovery learning model in cycle I, 20 students, or 62.50%, met the completion criteria, while 12 students, or 37.50%, did not meet the criteria.

4) Reasoning Test

Table 4 presents in detail the results of students' mathematical reasoning ability tests after completing the learning process applied to the cycle I recovery learning model.

Table 4. Students' Mathematical Reasoning Ability Test Results Cycle I

No	Score	Number of Student	Percentage (%)
1	≥ 75	23	71,87%
2	< 75	9	28,13%
	Total	32	100,00%

By looking at the data in Table 4, it is obtained that of the 32 students who took the cycle I test of 6 items, there were 23, or 71.87%, of students who scored ≥ 75 (complete). Nine students, accounting for 28.13%, failed to achieve a score of less than 75.

d. Reflection Stage

After the discussion with the subject teacher, the results were obtained, namely, from the four data obtained: teacher activities, student response questionnaires, student activities, and student mathematical reasoning ability tests, which are measurements in the study that have not met the predetermined indicators.

Cycle I's learning activities have not proceeded smoothly, and numerous aspects still require improvement. This situation shows that Cycle I learning applied the discovery learning model to the sub-material of explaining and presenting quadratic functions with tables, graphs, and equations, but it has not been able to make students' mathematical reasoning skills, teacher activities, and student activities improve. Therefore, the researcher needs to review the learning aspects to ensure their alignment with the existing design.

Cycle II

a. Planning Stage

The researchers redesigned the learning approach in cycle II to achieve optimal results by analyzing students' mathematical reasoning abilities and incorporating findings from cycle I, which involved learning activities that explained and presented quadratic functions through tables, graphs, and equations. The material used in cycle II was quadratic function material with the subject matter of explaining the relationship between the coefficient and discriminant of a quadratic function with its graph and presenting and solving problems that use the properties of a quadratic function with learning that applied the discovery learning model. Some aspects of teacher activities, student activities, and mathematical reasoning skills in cycle I that have been implemented but have not been maximized or have not achieved optimal results need to be improved. The plan that will be implemented to make teacher activities, students, and questionnaires as a response to students while participating in learning activities by applying the discovery learning model in order to increase, namely:

1). Re-discuss the flow of learning activities based on the lesson plan that has been made.
2). During the learning activities, we will optimize both teacher and student activities by concentrating on those that meet the necessary criteria.
3). Deepen the teaching material.
4). Giving questions and material overviews in accordance with the material being taught.
5). Carry out learning by giving exciting icebreakers.
6). Optimizing time for assignments and tests.
7). Assigning tasks and responsibilities to each group member individually.
8). Giving examples that have a connection between the subject matter and everyday life.

b. Action Stage

Cycle II implemented learning through three face-to-face meetings, just as cycle I did. The first meeting is for providing material with 120 minutes (3 lesson hours), the second meeting is for providing material and distributing questionnaires with 80 minutes (2 lesson hours), and the third meeting is for giving reasoning test questions with 120 minutes (3 lesson hours).

c. Observation Stage

1) Teacher Activities

Table 5 shows detailed information about what teachers did during two in-person learning sessions in cycle II while using the discovery learning model to teach.

Table 5. Results of Observations of Teacher Activities of Meeting I and II Cycle II

Assessment Criteria	Presentation of Number of Aspects				Average Percentage (%)	Total
	Meeting I		Meeting II			
	Number of Item	Percentage (%)	Number of Item	Percentage (%)		
SB (4)	8	42,11%	6	31,58%	36,84%	89,47%
B (3)	9	47,36%	11	57,89%	52,63%	
C (2)	2	10,53%	2	10,53%	10,53%	10,53%
K(1)	0	-	0	-	-	
Total	19	100,00%	19	100,00%	100,00%	100,00%

From the data in Table 5, we see that during meetings I and II in cycle II, the teacher's activities averaged 89.47% when using the discovery learning model.

2) Student Activity

Table 6 provides detailed data on the observations of student activities during two face-to-face learning meetings in cycle II, which focused on delivering material using the discovery learning model.

Table 6. Results of Observations of Student Activities Meeting I and II Cycle II

Assessment Criteria	Presentation of Number of Aspects				Average Percentage (%)	Total
	Meeting I		Meeting II			
	Number of Item	Percentage (%)	Number of Item	Percentage (%)		
SB (4)	6	30,00%	4	20,00%	25,00%	87,50%
B (3)	11	55,00%	14	70,00%	62,50%	
C (2)	3	15,00%	2	10,00%	12,50%	12,50%
K(1)	0	-	0	-	-	
Total	20	100,00%	20	100,00%	100,00%	100,00%

By examining the data in Table 6, we see that student activities during the discovery learning model in cycle II averaged 87.50% across all observed aspects in meetings I and II.

3) Questionnaire

Table 7 presents in detail the results of the questionnaire as a response from students after completing the learning process applied to the recovery learning model in cycle II.

Table 7. Results of Cycle II Questionnaire

Criteria	Number of Citeria	Percentage	Total
(4) SB	10	31,25%	87,50%
(3) B	18	56,25%	
(2) C	4	12,5%	12,50%
(1) K	0	-	
(0) SK	0	-	
Total	32	100,00%	100,00%

By looking at the data in Table 7, it is obtained that of the 32 students who have participated in the learning process applied to the discovery learning model in cycle II, there are 28, or 87.50%, of students who have reached the completion criteria, while 4, or 12.50%, of students have not reached these criteria.

4) Reasoning Test

Table 8 presents in detail the results of students' mathematical reasoning ability tests after completing the learning process applied by the recovery learning model in cycle II.

Table 8. Students' Mathematical Reasoning Ability Test Results Cycle II

No	Score	Number of Student	Percentage (%)
1	≥ 75	28	90,62%
2	< 75	4	9,38%
Total		32	100,00%

By looking at the data in Table 8, it is obtained that of the 32 students who took the cycle II test of 5 questions, there were 28, or 90.62%, of students who scored ≥75 (complete). Four students, accounting for 9.38%, failed to achieve a score of less than 75.

d. Reflection Stage

From the analysis of cycle II learning activities, it indicates that the predetermined success indicators have been achieved. Teacher activities, questionnaires, student activities, and students' mathematical reasoning skills on quadratic function material have reached predetermined criteria. Referring to these findings, the teacher as a partner and the researcher made a decision that the learning activities that applied the discovery learning model were not continued. This means that learning activities using the discovery learning model do not need to continue in cycle III.

The results should include the rationale or design of the experiments as well as the results of the experiments. Results can be presented in figures, tables, and text. The results should include the rationale or design of the experiments as well as the results of the experiments. Results can be presented in figures, tables, and text.

Discussion

The results of cycle I observations at meetings I and II of teacher activities and student activities during the learning activities have not yet reached the success indicators of action. Of all the aspects observed, teacher activity only averaged 73.68%, and student activity averaged 72.50%. There are still several aspects that meet the criteria. Among these aspects, the teacher conveys motivation and apperception to students during the introductory activities. The teacher's delivery of apperception remains less focused on the topic under discussion during the learning process. This lack of focus affects student activity, as they do not remember the previous material that serves as the foundation for the new content to be learned.

In the aspect of managing learning activities, the teacher asks triggering questions that are not related to the material, the teacher provides an overview of the material that is directly at the core of the material, the teacher answers student questions still inaccurately, and the teacher guides students in the process of drawing conclusions that are still lacking. This will also impact the student activity, where students will have difficulty working on the distributed student worksheet. In the aspect of closing activities, the teacher still lacks timely delivery of the next material and adequate feedback related to the learning carried out. The delivery of material at the next meeting is done when students are still focused on filling out the student worksheet, which should be delivered after the closing activity after the student worksheet is collected. Then, for giving responses related to the learning carried out, the teacher should appoint several students as a comparison.

In cycle II, both teacher and student activities increased, with the percentage of teacher activities rising to 89.47% and the percentage of student activities increasing to 87.50%. In the aspect of introduction, the teacher provides apperception about the topic that will be the subject of discussion in the ongoing learning and motivates students effectively so that students can reveal their initial knowledge related to the material to be taught. Then, in the aspect of managing learning activities, the teacher asks triggering questions that can build and make students remember the material that has been learned before, which is the basis for the main topic of learning to be discussed. The teacher provides a basic description of the material, guiding the discussion towards its core. Not only that, the teacher has also been able to answer several student questions appropriately in accordance with the answers needed by students and the material being studied. In drawing conclusions, the teacher guides each group well and optimally.

During the closing activities, the teacher utilized the prepared lesson plan to present the material for the upcoming meeting. In expressing opinions, the teacher asks 2-3 students to offer their opinions regarding the learning carried out. With the optimization carried out in teacher activities, it has a positive impact on student activities, where students play a more active role in the learning process. Learning becomes captivating and not boring because the material and learning flow are easier for students to understand. In addition, students will also be more willing to ask questions during the learning process. This phenomenon makes learning engaging and not boring. This finding is the same as the research conducted by Pratama et al. (2024), which indicates that there is an increase in teacher and student activities in learning activities that are applied to the discovery learning model.

In addition, the results of the student response questionnaire in cycle I also did not reach the success indicators in the research that had been determined. Of the 32 students who have participated in learning activities that are applied to the discovery learning model, only 20, or 62.50%, have reached the completion criteria, and 12, or 37.50%, have not. Of the 15 statements that contain positive and negative meanings, there are 5 statements that only attain an average value below 2.5, including (1) I feel enthusiastic about learning math; (2) I do and collect assignments on time; (3) I sometimes forget the responsibilities given by the group; (4) I possess many solutions in solving quadratic function problems; and (5) I feel there are no problems in everyday life related to quadratic function material.

The results of the student response questionnaire in cycle II have increased. Where from 32 students who have participated in learning that applied the discovery learning model in cycle I, only 20, or 62.50%, of students who have reached the criteria for completeness increased to 28, or 87.50%, of students. However, there are still 4, or 12.50%, of students who have not yet reached the completion criteria.

The results of the student response questionnaire in cycle II increased. Out of the 32 students who participated in learning through the discovery learning model in cycle I, only 20, or 62.50%, achieved the completion criteria, which increased to 28, or 87.50%, in cycle II. However, there are still 4, or 12.50%, of students who have not achieved the completion criteria. This finding is also the same as those of research conducted by Kusumah et al. (2023) and Sutrisno (2019), where the questionnaire results related to student responses to learning applied to the discovery learning model show a positive influence. In this case, students received ratings of 'very good' in both categories.

Then the results of the mathematical reasoning ability test previously in cycle I of the 32 students who had taken the test, with only 23, or 71.87%, of students who scored ≥75 (complete), increased to 28, or 90.62%, of students who were complete in cycle II. This finding is relevant to the findings of research conducted by Siregar et al. (2020), which indicates that applying the discovery learning model to learning activities can improve students' reasoning skills. In cycle I, students with good reasoning skills had an average score of only 64.8, which increased to 75.2 in cycle II, resulting in 80% of students achieving good reasoning skills.

The analysis of the results from teacher activities, student activities, questionnaires, and reasoning ability tests shows that each part has met the success criteria set in the research.

4. CONCLUSION

This study's findings indicate that using the discovery learning model positively affects students' mathematical reasoning ability regarding quadratic function material. This benefit can be seen in the increase in students' mathematical reasoning ability after participating in the learning activity that applied the discovery learning model. In addition, the increase also occurred in teacher activities, student activities, and questionnaire results. In cycle I learning, teacher activities reached a percentage of 73.68% and rose to 89.47% in cycle II. In cycle I learning, student activities reached a percentage of 72.50% and rose to 87.50% in cycle II. In the first cycle questionnaire, only 20 students achieved the completeness criteria, representing a percentage of 62.50%, which increased to 28 students with a percentage of 87.50% in cycle II. Then the results of students' reasoning skills also increased, where in cycle I only 23 students with a percentage of 71.87% rose to 28 students with a percentage of 90.62% in cycle II, and those who scored below 75 (incomplete) were 4 students with a percentage of 9.28%. In cycle II, the research's success indicators were met by teacher activities, student activities, questionnaires, and reasoning skills.

As a suggestion, the results of this study can be a reference for teachers or educators in managing classes to improve students' mathematics learning outcomes. We recommend conducting further research to create a medium that utilizes an interactive discovery learning model.

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