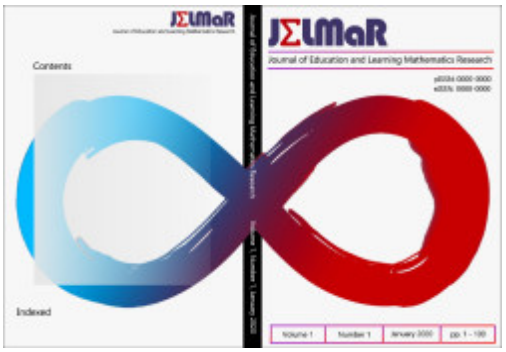

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Problem-Solving Ability Through the Fast Feedback Method with a Student Answer Grouping Model

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Abstract: *A common problem in mathematics learning is teachers' delays in providing feedback to students, thus slowing down the process of conceptual understanding. The Fast Feedback method allows teachers to respond quickly to students' answers during learning activities. This study aims to improve students' mathematical problem-solving skills through the Fast Feedback method with an answer grouping model. This study used a Classroom Action Research (CAR) approach implemented in three cycles with the stages of planning, implementation, observation, and reflection. The subjects were 42 students of SMP Harmoni School Terpadu Teluk Bintuni Regency, studying the Pythagoras Theorem. Data was collected through task cards, observation sheets, and documentation. The results showed an increase in students' problem-solving skills in each cycle. The number of students answering correctly increased from 31 students in cycle I to 38 students in cycle II, and 39 students in cycle III. Thus, the application of the Fast Feedback method with an answer grouping model has been proven to improve students' mathematical problem-solving skills. The Fast Feedback method using the answer grouping model is expected to be used in in-depth mathematics learning and have an impact on efforts to improve student learning outcomes.*

Keywords*: problem solving, fast feedback, answer grouping model*

INTRODUCTION

The educational process is a process of humanizing humans through educational transformation, namely cultivating and civilizing humans (Dimyati, 2006). Model innovation and evaluation of learning are crucial in transforming knowledge, but this cannot be achieved because the number of students accommodated exceeds the determined capacity, so the teacher only uses the lecture method.

Such a situation can certainly cause the learning balance of everyone to be inaccurately observed. Therefore, a strategy or intuitive method is needed to determine the extent of students' understanding of the learning material they have received. The strategy commonly used is to provide evaluations in the form of assignments or tests, but with the number of students exceeding the determined class capacity, this causes the evaluation time to be long. The correction that takes a long-time result in students' errors being discovered late, while the learning process continues, so that there is no intuitive time to make corrections. This kind of absence causes students who have not yet understood the material intuitively to have difficulty understanding the following material, because in mathematics learning, the materials are interrelated and interconnected.

NCTM (2000), Depdiknas (2006), and Hamsah (2003) state that problem solving can involve creating new ideas, discovering new techniques, or products. Even in mathematics learning, while problem solving has a specific meaning, the term has different interpretations, such as solving non-routine story problems and applying mathematics to everyday life.

Herman (2001), problem solving can also encourage students to evaluate how to choose learning with a problem-based approach that has the following characteristics: applying knowledge in life, choosing problems that are related to real-life situations, and developing scientific traits such as honesty, thoroughness, openness, professionalism, and

hard work. Problem solving is the process of thinking and finding solutions to the problem (Gulo W, 2002)

Evaluations requiring lengthy corrections can be addressed by using the Fast Feedback method, an evaluation method with rapid correction techniques. According to Berg (2008), fast feedback is a learning method that emphasizes providing rapid feedback on student responses during learning activities. This method allows teachers to immediately determine students' level of understanding and correct conceptual errors directly. Several recent studies have shown that this strategy can increase student engagement and learning effectiveness (Rahmawati & Nugraha, 2021; Putri et al., 2023). The difference from previous studies is that this study uses the Fast Feedback method with a model of grouping student answers. Based on this, research is needed on problem-solving skills through the Fast Feedback method with a model of grouping student answers.

METHOD

This study uses a Classroom Action Research (CAR) approach. CAR is research conducted by teachers in their own classrooms through a process of self-reflection with the aim of improving the quality of learning so that student learning outcomes increase (Wardhani, 2010). According to Arikunto (2009), it is a scrutiny of learning activities in the form of an action, which is deliberately presented and occurs in a class simultaneously. Suhardjono (2009), Classroom Action Research is action research conducted with the aim of improving the quality of learning practices in the classroom.

The model used in this study is the Kemmis and Mctaggart model, as it is considered easy to understand and implement. This model consists of four stages in each cycle: planning, action implementation, observation, and reflection, which are repeated until success indicators are achieved

The researcher acted as the main instrument directly involved in all stages of the research, from the planning stage to reflection. The research was conducted at SMP Harmoni School Terpadu, Teluk Bintuni Regency, in class VIII with 42 students. Data sources consisted of primary data (observation results, question cards, and documentation of learning activities) and secondary data (documents such as lesson plans and student name lists). Data collection techniques included providing task cards, observing teaching and learning activities (KBM), and documentation of learning administration

Data were analyzed descriptively and qualitatively, with a success indicator of at least 70% of students correctly answering the teacher's assignments in each cycle, with a maximum of 10 minutes for each fast feedback cycle, until the target achievement was met. Data validity was tested through triangulation of sources and techniques, comparing observation results, student answers, and reflective discussions with the teacher or partners.

The research stages include planning: Developing lesson plans, task cards, and observation sheets. Implementation: The teacher applies the fast feedback method through grouping student answers and providing direct feedback. Observation: The observer records the learning process using the observation sheet. Reflection: The teacher and researcher jointly review the results of each cycle to improve implementation in the next cycle until the target is achieved.

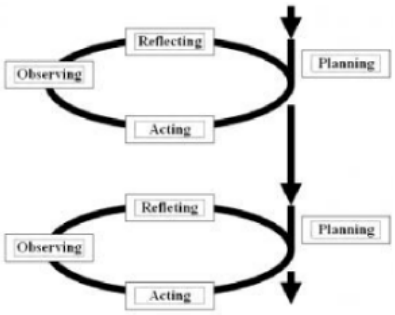

Figure 1. Kemmis and McTaggart's action research design

Research steps:

1. Preparation

Researchers created a Learning Implementation Plan (RPP) for each feedback stage. Afterward, they created task cards to be given throughout the learning process. They also created a teaching and learning observation sheet, which was filled out by other observers who observed the learning process.

2. Implementation

The teacher carries out learning and each stage of fast feedback according to the lesson plan. The steps taken are as follows: students are given task cards to be worked on individually; the teacher takes two or three student answers and among the three student answers, one of them is chosen as the correct answer as the answer key; the three answers are posted on a board that has been prepared in front of the class; students are asked to match their answers and then group them according to the answers that have been posted on the board; the teacher counts the number of students' correct answers or those posted on the board containing the answer key; if the number of students' answers that answer correctly is <70% then learning is carried out to correct student errors and then a recheck is carried out by issuing a secondtask card with an equivalent level of difficulty; if the students' correct answers are 70% then it is continued to the next stage of questions with a higher level of difficulty.

The success percentage can be calculated using the following formula:

$$Percentage\ of\ Succes = \frac{Number\ of\ student'scorrect\ answers}{Number\ of\ students} \times 100\%$$

3. Observation

During the lesson, an observer will observe the progress of the study. This observer will complete a teaching and learning observation sheet, which will be used to determine the effectiveness of mathematics teaching and learning activities using the fast feedback method.

4. Reflection

After completing the learning in cycle 1, the researcher reflects on and corrects any errors that occurred that day, which can be corrected later that day or in the next cycle. If the success indicators are met, the research is considered successful.

RESULTS AND DISCUSSION

This study applied the fast feedback method with an answer grouping model to improve students' mathematical problem-solving skills in the Pythagoras Theorem. Learning was conducted in three cycles, each consisting of three task cards of equal difficulty. Learning outcomes were assessed based on the number of students who

answered correctly on each task card. Learning was considered effective if at least 70% of students answered correctly.

The research was conducted in class VIII of SMP Harmoni School Terpadu Kabupaten Teluk Bintuni with a total of 42 students, on the Pythagoras Theorem metric. The results of initial observations through interviews with mathematics teachers showed that learning still uses conventional learning models, namely the lecture method. The researcher chose this class VIII because of the advice and direction from the leader, namely the principal. Class VIII is a heterogeneous class in terms of cognitive abilities. The schedule for class VIII Mathematics lessons is on Monday for 2 x 40 minutes starting from 07.30-09.50, and Tuesday for 3 x 40 minutes starting from 09.30-11.10.

Table 1. Research results

Cycle	Task Card to -	Time for 1 x *Feedback Cycle*		Percentage of Students Correct
		Allocation	Reality	
1	1	5′	4.5′	73,08 %
	2	5′	3.37′	92,31 %
	3			-
2	1	5′	5′	100 %
	2	5′	4.7′	69,23 %
	3	5′	3.5′	100 %
3	1	5′	4.43′	92,30 %
	2	5′	4.50′	96,15%
	3			-

In cycle 1, it begins with planning. Preparations made to carry out the first meeting include preparing material on right-angled triangles and squares for action research, compiling student observation sheets, making task cards, and compiling a Learning Implementation Plan (RPP) on the material on right-angled triangles and squares so that learning objectives can be achieved optimally.

Furthermore, the cycle 1 action was carried out in one meeting, in this cycle 1 before entering the Pythagoras Theorem material, students were first reminded of the material related to the Pythagoras Theorem, namely the area of a square and the area of a right triangle. The details of the learning carried out are as follows. The first meeting was held on Tuesday, January 24, 2025, from 07.30 - 09.50. The material taught before entering the Pythagoras Theorem was to recall the material on the area of a square and a right triangle so that in the future students would not have difficulty in learning about the Pythagoras Theorem. The teacher used learning media in the form of a Grade VIII Mathematics Student Worksheet Junior High School/Islamic Junior High School (LKS), and eighth grade mathematics student books. Before the lesson begins, the teacher conveys the learning objectives to be achieved in the lesson and motivates students to learn. The material studied by students is about the area of a square and the area of a right triangle. The teacher provides examples by giving students various shapes of triangles, and students already understand the shape of a right triangle, then the teacher gives examples of quadrilaterals. Various examples of quadrilaterals and right triangles, students can calculate the area of quadrilaterals and right triangles. After students are given an explanation of the material on quadrilaterals and right triangles, the teacher gives students questions to be worked on individually in the form of question cards consisting of 3 question cards with the same level of difficulty that have been prepared in advance by the teacher to determine the level of student understanding of the material that has been taught. The duration of working on each question card ranges from 5 to 10 minutes, after that the teacher takes 2 to 3 student

answers, one of which is correct, to be posted on the board provided, after that students are asked to match their answers and group them according to the answers that have been posted, the teacher counts the number of students' correct answers whether it is above 70% of students answering correctly or not, if the student's answer is above 70% of students answering correctly then it is continued to the next question card with the same level of difficulty, and if less than 70% of students have not answered correctly then feedback or re-learning is carried out to correct students' conceptual errors, as in figure 13 below.

Reinforcement of the material that has been taught by providing reflection and providing information for next week's meeting at the end of the lesson. Next, learning observations are carried out by filling out the observation sheet by the mathematics teacher. Filling out the observation sheet is done while the lesson is in progress. In this cycle, based on the observation sheet, the researcher provides an average of 10 minutes of feedback once. On each task card given, the teacher provides 1 feedback. Student responses when the teacher provides feedback are 0% - 20% of students ask the teacher when feedback is given, 0% - 20% of students discuss when the teacher provides feedback, and 20% - 40% of students pay attention to the teacher's explanation when the teacher provides feedback. The percentage of 80% - 100% of students who answer correctly after being given feedback.

Furthermore, reflection is conducted after the entire cycle has taken place. Reflection on cycle 1 is used to improve cycle 2 and so on. The reflection conducted in cycle 1 is that the researcher must prepare everything better. Must be able to master the class better, so that teaching and learning activities can take place better, because there are still some students who are still less active in learning. In cycle I, learning focused on understanding the concept of the area of a square and a right triangle as the basis for applying the Pythagoras Theorem. The results showed that 73.08% of students understood this concept correctly. After being given feedback and further practice, the completeness increased to 92.31%, indicating that students have understood the basic concept of the area of a plane figure. In cycle 1, question cards were given to determine students' understanding of the area of a square and a right triangle before entering the Pythagoras Theorem. Task card 1A in this first cycle was completed by 42 respondents, based on the results of corrections on the task card there were 73.08% of students (31 students) who had understood the concept of finding the area of a square and a right triangle. There were 26.92% of students (11 students) who still did not complete the task cards completely, namely not including the unit of area. This happened because students rushed through the task cards and considered it unimportant, but their calculations were correct. To address errors that occurred due to inattentionin completing the assignment, the teacher provided feedback with how to remind and emphasize that to find the area do not forget to give the unit of area. After being given feedback by the teacher, the students were given task card 1B which was worked on by 26 students. In this second task, students were given question cards with the same level of difficulty as the first task card. Based on a quick check conducted by the teacher, 92.31% of students (39 students) had answered the question cards correctly and the students understood how to give the unit of area to find the area. However, there were still 7.69% of students (2 students) who were still not careful in working on the question cards. This happened because students were not careful in working on the questions, so they forgot to give the unit of area. The results obtained that more than 70% of students were correct in working on task cards 1A and 1B, so students are said to have understood the concept of the area of a square and the area of a right triangle. Based on this, it is necessary to carry out the next cycle.

In cycle 2, it begins with planning. Preparations made for the second meeting include preparing material on calculating the length of a right triangle's side if the other two sides are known for action research, compiling student observation sheets, making task cards, and compiling a Learning Implementation Plan (RPP) on the material on calculating the length of a right triangle's side if the other two sides are known so that learning objectives

are achieved optimally.

Next, cycle 2 action was carried out in one meeting. In cycle 2, students were given an explanation of the material on how to calculate the length of the side of a right triangle if the other two sides are known. In the second cycle meeting, it was held on Thursday, January 26, 2025, at 09.30 - 11.10. The material taught was about calculating the length of the side of a right triangle if the other two sides are known. Before the lesson began, the teacher conveyed the learning objectives to be achieved in the lesson and motivated students to learn. The teacher provided an explanation and gave several example questions on how to find the length of the side of a right triangle if the other two sides are known. After students were given an explanation of the material on how to calculate the length of the side of a right triangle if the other two sides are known, the teacher gave questions to be worked on individually in the form of question cards consisting of 3 question cards with the same level of difficulty that had been prepared in advance by the teacher to determine the level of student understanding of the material that had been taught. The duration of working on each question card ranges from 5 to 10 minutes, after that the teacher takes 2 to 3 student answers, one of which is correct, to be posted on the board provided, after that students are asked to match their answers and group them according to the answers that have been posted, the teacher counts the number of students' correct answers whether it is above 70% of students answering correctly or not, if the student's answer is above 70% of students answering correctly then it is continued to the next question card with the same level of difficulty, and if less than 70% of students have not answered correctly then feedback or re-learning is carried out to correct students' conceptual errors.

Reinforcement of the material that has been taught, providing reflection and providing information for next week's meeting at the end of the lesson. Next, observations were carried out with learning observations carried out by filling out observation sheets by the mathematics teacher. Filling out the observation sheets were done while the lesson was in progress. In this cycle 2, based on the observation sheets, on average the researcher gave 1 feedback for 10 minutes. On each task card given, the teacher gave 1 feedback. Student responses when the teacher gave feedback were 20%-40% of students asked the teacher when the feedback was given, 0%-20% of students discussed when the teacher gave feedback, and 20-40% of students paid attention to the teacher's explanation when the teacher gave feedback. The percentage of 80%-100% of students who answered correctly after being given feedback.

Next, reflection is conducted after each cycle has completed. Reflection on cycle 2 is used to improve cycle 2 and so on. Reflection on cycle 2 indicates that the researcher has been able to effectively control the class. Communication with students has been well-established. Students have achieved indicators of success, but some students are still less active in learning. Many students complained about the implementation of the fast feedback method.

In this cycle 2, the assessment aspect and success indicator to be achieved is that students can calculate the length of a side if both sides of a triangle are known by using the Pythagoras Theorem formula. Question cards are given to determine students' understanding of calculating the length of a right triangle's side if the other two sides are known. Task card 2A is given to determine whether students have understood the Pythagoras Theorem formula if the other two sides are known. Task card 2A in this first cycle was done by 42 students, based on the results of a quick check conducted by the teacher, 100% of students (42 students) were correct in writing the Pythagoras Theorem formula if both sides are known.

After the students understand the Pythagoras Theorem formula, they proceed to the next feedback cycle by giving task card 2B. Task card 2B in this second cycle was done by 22 students, based on the results of a quick check conducted by the teacher, 68.18% of students (15 students) were able to calculate one side of a triangle if both sides were known

using the Pythagoras Theorem formula. Students have understood the concept of calculating correctly, because they are correct in calculating using the Pythagoras Theorem formula, in doing this 2B task there are still some students who experience conceptual errors, because there are 23.07% of students (10 students) only square it, and 7.7% of students (3 students) only calculate the known side without squaring it first, in order to overcome conceptual errors in students, the teacher provides feedback by explaining again how to find one side if both sides are known using the Pythagoras Theorem formula. After being given feedback by the teacher, students are given task card 2C which is done by 42 students. In this third task, students were given question cards with the same level of difficulty as task card 2B. Based on a quick check conducted by the teacher, 100% (26 students) answered the question cards correctly and students understood and comprehended how to find the side if both sides were known using the PythagorasTheorem formula. The results showed that more than 70% of students had answered correctly in working on task card 2C, so students were said to have succeeded in understanding the concept of calculating the length of the side of a right triangle if the other two sides were known. Based on this, the next cycle needs to be carried out.

In this cycle 3, question cards were given to determine students' understanding of determining the type of triangle if the length of the side and the Pythagoras triple were known. Task card 3A in this first cycle was completed by 42 respondents, based on the results of corrections on the task cards, 92.30% of students (39 students) had understood the concept of determining the type of triangle if the length of the side and the Pythagoras triple were known.

In cycle 3, it begins with planning. Preparations made for the third meeting include preparing materials on determining the type of triangle if the length of its sides and Pythagoras Triples are known for action research, compiling student observation sheets, making task cards, and compiling a Learning Implementation Plan (RPP) on the material on determining the type of triangle if the length of its sides and Pythagoras Triples are known so that learning objectives can be achieved optimally.

Next, the cycle 3 action was carried out in one meeting. In cycle 3, students explained the material on determining the type of triangle if the length of the side and the Pythagoras triple were known. The details of the learning carried out are as follows. The third meeting was held on Tuesday, January 31, 2025, at 07.30 - 09.50. The material taught was about determining the type of triangle if the length of the side and the Pythagoras triple were known. Before the lesson began, the teacher conveyed the learning objectives to be achieved in the lesson and motivated students to learn. The teacher provided an explanation and provided several example questions on determining the type of triangle if the length of the side and the Pythagoras triple were known. After students were given an explanation of the material on how to determine the type of triangle if the length of the side and the Pythagoras triple were known, the teacher gave questions to be worked on individually in the form of question cards consisting of 3 question cards with the same level of difficulty that had been prepared in advance by the teacher to determine the level of student understanding of the material that had been taught. The duration of working on each question card ranges from 5 to 10 minutes, after that the teacher takes 2 to 3 student answers, one of which is correct, to be posted on the board provided, after that students are asked to match their answers and group them according to the answers that have been posted, the teacher counts the number of students' correct answers whether it is above 70% of students answering correctly or not, if the student's answer is above 70% of students answering correctly then it is continued to the next question card with the same level of difficulty, and if less than 70% of students have not answered correctly then feedback or re-learning is carried out to correct students' conceptual errors.

Reinforcement of the material that has been taught, providing reflection and providing information for next week's meeting at the end of the lesson. Observations were carried out

by filling out an observation sheet by the mathematics teacher. Filling out the observation sheet was done while the lesson was in progress. In cycle 3, based on the observation sheet, the researcher provided an average of 10-minute feedback. On each task card given, the teacher provided 1 feedback. Student responses when the teacher gave feedback were 20-40% of students asked the teacher when the feedback was given, 0-20% of students discussed when the teacher gave feedback, and 40-60% of students paid attention to the teacher's explanation when the teacher gave feedback. The percentage of students who answered correctly after being given feedback was 80-100%.

Furthermore, reflection is conducted after the entire cycle has been completed. Reflection on cycle 3 is used to improve cycle 3 and so on. The reflection conducted in cycle 3 is that the researcher has been able to control the class well. Communication with students has been well established. Students have achieved success indicators, but there are still some students who are still less active in learning. Students have begun to get used to the fast feedback method applied. There are 7.70% of students (3 students) who still do not understand the concept of determining a triangle if the sides are known. The error that occurred in this cycle is because students add up all the known sides. The percentage of success on question card 1 is already more than 70%, then continued to question card 2 with the same level of difficulty as task card 1, to ensure whether students have understood this material. Based on the results of a quick check on task card 3B, 96.15% of students (40 students) understood the concept of determining the type of triangle if the length of the side is known and Pythagoras Triples. There are 3.85% of students (1 student) who are still not confused about distinguishing obtuse triangles and acute triangles. When explaining this material, the teacher has emphasized many times that if $2 < 2 + 2$ then the triangle is an acute triangle, and if $2 > 2 + 2$ then the triangle is an obtuse triangle. The results were obtained that more than 70% of students who answered correctly did task cards 3A and 3B, then students were said to have succeeded in determining the type of triangle if the length of the side and the Pythagoras Triple were known, and the indicator had been achieved.

Based on the results of classroom action research conducted in three cycles, it was found that the application of the Fast Feedback method with an answer grouping model was able to improve students' abilities in solving mathematical problems, especially in the Pythagoras Theorem material. The improvement was shown by the percentage of students who were able to answer questions correctly in each cycle, which continued to increase to reach 96.15% in the 3rd cycle, exceeding the minimum success indicator (70%). The observed problem-solving abilities included: (1) Determining formulas and solution strategies, (2) Calculating the sides of triangles correctly, (3) Applying the concept of the Pythagoras Theorem in story problems, (3) Evaluating answers by comparing various alternative solutions. This finding is in line with (Gwijangge, et al. 2024; Marsitin, et al. 2023) the opinion that problem-solving ability indicators include: identifying known elements, being asked, and the adequacy of elements, formulating mathematical problems from given situations, determining appropriate problem-solving strategies, solving problems according to plan, checking and interpreting the results of the solution. The fast feedback method directly supports these four stages through a mechanism of rapid correction and reinforcement of targeted concepts.

This research is also supported by the findings of Ratnasari (2010) who showed that fast feedback can improve students' mathematics learning outcomes in the topic of lines and angles, with an increase from 75% to 87.5%. This shows that fast feedback helps teachers provide quick feedback on student errors and accelerates the remedial process. In addition, Wikanthi (2012) showed that the fast feedback method is also effective in learning mathematics on cubes, which increased the percentage of student success from 62.5% to 95%. Thus, the application of fast feedback is not only beneficial for improving conceptual understanding but also strengthens students' ability to solve mathematical problems comprehensively and efficiently.

CONCLUSION

The application of the Fast Feedback method using the answer grouping model has been proven to improve the mathematical problem-solving abilities of eighth-grade students at SMP Harmoni School Terpadu, Teluk Bintuni Regency. Through providing fast feedback and group discussions, students can immediately understand their errors, correct their answers, and significantly improve their mastery of mathematical concepts. The Fast Feedback method using the answer grouping model is expected to be used in in-depth mathematics learning and have an impact on efforts to improve student learning outcomes.

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