UNIVERSITAS MUHAMMADIYAH MALANG
JP2SD (JURNAL PEMIKIRAN DAN PENGEMBANGAN SEKOLAH DASAR)
http://ejournal.umm.ac.id/index.php/jp2sd
p-ISSN: 2338-1140 e-ISSN: 2527-3043

Analysis Of Students' Errors in Solving AKM Problems Perimeter and Area Of Flat Shape

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ARTICLE INFORMATION

History:
Received *24 May 2024*
Revised *23 June 2024*
Published *4 July 2024*

Keywords:
Error analysis, AKM questions, Polya steps, circumference and area of flat shapes

ABSTRACT

Numeration in AKM, which is contextualized in various types of questions, aims to evaluate student competence. So, it is necessary to know where students' mistakes are to improve how students solve mathematical problems. This research aims to describe students' mistakes in solving problems on AKM questions related to the perimeter and area of flat shapes. This research is descriptive qualitative research. The research subjects chosen in this study were based on consideration of students' mathematical ability test results in the high (80 to 90), medium (65 to 80), and low (less than 65) categories. Then, three students were randomly selected for each ability level, with details: 1 student with high ability, 1 with medium ability, and 1 with low ability. The data collection techniques used in this research aretests, interviews, and documentation. Data analysis techniques used in the Miles and Huberman model can help understand problems well and plan problem-solving systematically. Students who are in the low category are not yet able to fulfill every indicator of solving mathematical problems and are not able to solve the problems given correctly.

How to cite: Wahyuni, Y. T., Rufiana, I. S., Faizah, S., Kusumaningrum, S. R., & Dewi, R. S. I. (2024). Analysis Of Students' Errors in Solving AKM Problems Perimeter and Area of Flat Shape: English. *Jurnal Pemikiran dan Pengembangan Sekolah Dasar (JP2SD), 12*(2). Doi: https://doi.org/10.22219/jp2sd.v12i2.33784

INTRODUCTION

The world of science and technology has entered the "global information era", and various challenges have emerged as a result, these causal matters must be faced by all elements of society, especially academics who practically have a role in forming the foundation of Indonesia's human resources (Kahar, Cikka, Afni, & Wahyuningsih, 2021). Advanced technological developments must be balanced with the rapid development of science in the world of education. Mathematics is a universal science that has a strategic place in the structure of the country's education curriculum (Peraturan Pemerintah Nomor 19 Tahun 2005 Tentang Standar Nasional Pendidikan., 2005). Mathematics is an important subject, the reason is because mathematics is the basis for studying other sciences (Nurfadhillah, 2021; Susanti, 2020). One of the mathematical skills that is difficult to understand is mathematical literacy, making mathematics a daunting task for students (Kurniadi, Gusriani, Subartini, & Napitupulu, 2020). Mathematical literacy (numeracy) is the ability to understand or analyze information related to basic mathematics to solve practical problems in various contexts of daily life (Kemendikbud Ristek, 2023).

Mathematical literacy in Indonesia is still far behind compared to developed countries (Poernomo, Kurniawati, & Atiqoh, 2021). Many students have difficulty analyzing math problems due to low numeracy, so many students make mistakes when answering the questions given (Az-Zahroh & Permadi, 2022; Napsiyah, Nurmaningsih, & Haryadi, 2022; Ratnasari & Setiawan, 2022). In 2020, there was a new government policy in the field of education in Indonesia, namely the implementation of the National Assessment (AN) in 2021, replacing the role of the National Examination (UN) which was abolished in 2020 (Indahri, 2021). This change is also used as a policy to address Indonesia's low PISA results (Rohim, 2021). For mathematical literacy (numeracy), Indonesia's ranking in PISA 2022 rose 5 positions compared to PISA 2018, but Indonesia's score dropped 13 points, better than the international average which dropped 21 points (Silalahi & Deri Hendriawan, 2022). PISA is an international program that uses literacy as an evaluation measure to describe the quality of education, PISA issues its assessment results every three years and is carried out on students aged 15 years through random samples (Poernomo et al., 2021). The national assessment is different from the national exam because it consists of three parts, namely the minimum ability assessment, personality survey, and learning environment survey (Famela, Sulistyowati, Kusumaningrum, & Deshinta, 2023).

Numeracy literacy in AKM or national assessment is the ability to (1) apply mathematical concepts in everyday life, (2) interpret quantitative information around it, and (3) appreciate and understand information expressed mathematically, such as graphs, charts, diagrams, bar charts, pie charts, pie charts, bar charts, diagrams, and tables (Widarti, 2016). One aspect of AKM is measuring students' cognitive learning abilities and it is very important for students to understand the basic concepts of mathematics in the world of education (Yuliani, 2018). Students' cognitive abilities are assessed based on the results of the AKM test which measures literacy and numeracy abilities (Nurjanah, 2021). In solving AKM problems, they can be solved using several steps, one of which is the problem-solving method according to Polya. The problem solving method is a way of presenting learning materials by making problems the starting point for discussion to be analyzed, compared, and concluded in an effort to find solutions or answers by students (Kuncoro, Zakkia, Sulistyowati, & Kusumaningrum, 2021).

The problem-solving method according to Polya (1973) is to understand the problem, make a plan, implement the plan, and look back. In mathematics, students' ability to understand the problem is determined by how they write down the information contained in the problem (Harini et al., 2023). After understanding the main problem and the information provided, the next step is to plan what concepts and strategies will be used to solve the problem. Then check again whether their solution answers are correct or not (Leonisa & Soebagyo, 2022). However, based on the results of an interview with one of the elementary school mathematics teachers, field facts were found that students solved the problems without being well structured according to Polya's stages, so that the solutions were less precise and needed improvement and caused errors in drawing answers, especially in flat shape material. Therefore, an analysis of student errors in solving AKM problems is needed, one of which is based on the steps of solving according to Polya. The purpose of this study was to determine the errors in students' solving steps when solving AKM problems on the circumference and area of flat shapes.

METHOD

The method used in this research is a qualitative descriptive method. According to Sugiyono (2022), the descriptive qualitative research method is research based on postpositivist philosophy used to research the condition of natural objects where the researcher is the key instrument. This research was conducted in the even semester of the 2023/2024 academic year. The data source in this research is class V students at SDN Sumberingin Kulon Tulungagung for the 2023/2024 academic year, consisting of 14 students (6 boys and 8 girls) and 1 mathematics teacher. The research subjects chosen in this study were based on consideration of students' mathematical ability test results in the high (80 to 90), medium (65 to 80) and low (less than 65) categories (Rizqiani & Hayuhantika, 2020). Then, 3 students were randomly selected for each level of ability, with details of 1 students with high ability, 1 students with medium ability, and 1 students with low ability.

Table 1. AKM Components in Numeracy

Content	Cognitive Processes	Context
Numbers, including representations, sequence properties, and operations of various types of numbers (numeric, integer, fractional, decimal)	**Comprehension** means understanding facts, procedures as well as mathematical tools.	**Personal** relates to personal self-interest.
Measurement and geometry, ranging from recognizing flat shapes to using volume and surface area in everyday life.	**Application** means being able to apply mathematical concepts in real situations that are routine.	**Social Culture** is related to the interests of inter-individuals, cultures and societal issues.
Data and uncertainty, including understanding, interpreting and presenting data and opportunities. **Algebra**, including equations and inequalities, relationships and functions (including number patterns), and ratios and proportions.	**Reasoning** means reasoning with mathematical concepts to solve non-routine problems.	**Scientific** is related to issues, activities, and scientific facts both that have been carried out and *futuristic*.

Data collection techniques in this research consisted of tests, interviews and documentation. The tests in this study consisted of two tests, namely a mathematical ability test to classify high, medium and low levels of ability, apart from that, there was also a test on the AKM area and perimeter of flat shapes which consisted of 2 questions.

The data analysis techniques used in this research include: 1) data reduction, in this case the researcher categorizes students based on the level of mathematical ability through a mathematical ability test, and focuses attention, simplifying the information obtained from the AKM questions of area and perimeter of flat shapes, as well as recording the results of interviews, 2) presenting data, in this case in the form of information in the form of narrative text which is compiled, summarized and organized so that it is easy to understand and plan the researcher's further work. Researchers compile relevant data so that it becomes information that can be concluded and has a certain meaning, 3) draw conclusions. The following is a table of AKM components in numeracy according to PUSMENDIK (2022).

The context that will be used in this research question is the social and cultural context because it has a large percentage in the distribution of the questions (Mendikbud, 2020). Compared to other contexts, researchers have limitations to using social and cultural contexts for numeracy skills. In addition, questions with the cognitive process of application are chosen, because they are in accordance with the material to be given to students by applying concepts circumference and breadth of flat build. The forms of AKM type questions vary, such as multiple choice (PG), complex multiple choice, matchmaking, filling, and essays or descriptions (Wijaya, A., & Dewayani, 2021)

The form of questions that are suitable for this study is the form of essay or description questions so that researchers can more easily analyze and describe the ability of students in solving problems on AKM questions. The problems that will be chosen in this study are related to geometry materials, especially in the area and perimeter of flat buildings. It takes several steps to solve the problem. According to Wardhani (2020) students are said to be able to solve problems if they have the ability to understand problems, design mathematical models, solve models, and interpret the solutions obtained. According to Polya (1973) there are four steps in solving mathematical problems, namely: (1) understanding the problem, (2) making a problem-solving plan, (3) implementing the plan, and (4) re-examining the answer.

Table 2. AKM Numeration Question Form

Question Form	Rules for Question Preparation
Double Choice	Consists of a question with several answer choices with one correct answer. There are 4 answer choices (A, B, C, and D).
Matchmaking	There are two columns, the left column that is the question and the right column that contains the answer. The number of answers in the left column should be more than the number of statements in the right column. There are four statements
Complex multiple choice	There is a problem with some statements. There are 4 statement options
Fill in or short answer	Answers are short answers. Answers are phrases, words, numbers, and symbols. When it comes to fill, the subject of the question in the form of a sentence is incomplete. For short answers, the subject matter is in the form of a question sentence
Essay or description	Requires students to remember and express ideas in the form of written descriptions Learners' answers are suspended based on the complexity of the answers.

Here is an indicator of resolving the problem using the Polya step can be seen in table 3 (Polya, 1973). Based on the description of the problem resolution with the Polya stage, it can be concluded that the types of errors are: (1) misunderstanding the problem, (2) making an error in making a problem solving plan, (3) error in implementing the plan, and (4) error in rechecking the answer. The following error type indicator based on polya step can be seen in table 4 (Polya, 1973).

Table 3. Indicators of Resolving Problems Based on Polya Steps

Step Polya	Indicator
Understanding the Problem	Able to write the instructions from the question, namely writing down what is known and what is asked on the question correctly
Create a Troubleshooting Plan	a. Able to determine strategies, formulas, and ways to be used to make alternative solutions to solve problems correctly b. Able to apply problems in mathematical form to solve problems
Implement the Plan	a. Able to solve problems according to the chosen strategy and formula b. Able to execute pre-made plans correctly c. Able to operate the properties of addition, subtraction, multiplication and division operations d. Able to write the steps and stages of calculation correctly e. Able to write down the final results obtained
Recheck Answers	a. Able to re-examine the answers obtained related to the calculation results systematically b. Able to write down the conclusions of the answers obtained

Table 4. Error Type Indicators Based on Polya Steps

Error Type	Indicator
Misconception of the problem	Not writing down clues from what is known and what is asked on the question
Error creating a troubleshooting plan	a. Unable to determine the strategy, formula, and method that will be used to make alternative solutions to solve the problem correctly b. Unable to apply problems in mathematical form to solve problems
Error executing the plan	a. Unable to solve problems according to the chosen strategy and formula b. Not executing a plan that has been created correctly c. Incorrectly operate the properties of the operations of calculating addition, subtraction, multiplication and division d. Not writing the steps and stages of calculation correctly e. Did not get the final result from solving the problem
Error Rechecking Answers	a. Not checking back the answers obtained regarding the calculation results systematically b. Incorrect in performing calculations when re-examining the obtained solution.

RESULT AND DISCUSSION

The description of the results of this research is in the form of students' answers from the test given and researcher interviews with students, which were carried out 2 times meeting, namely June 20 2024 for the test and June 21 2024 for the interview. After the test activities are carried out, continue with correcting the answers students, namely matching each student's answer according to the guidelines scoring, which then selects several students to be interviewed regarding the results which he obtained.

Obtaining test results for class V students who have grouped based on level of mathematical ability and based on teacher recommendations, high, medium and low groups were obtained The results of the analysis of student test answers and interviews will be presented, with the initials S1, S2, and S3. In this study there are 2 AKM questions on the perimeter and area of a flat shape, all of which contain steps Polya. The following then, to make it easier for researchers in research analysis, Student answers based on Polya's steps are coded as follows:

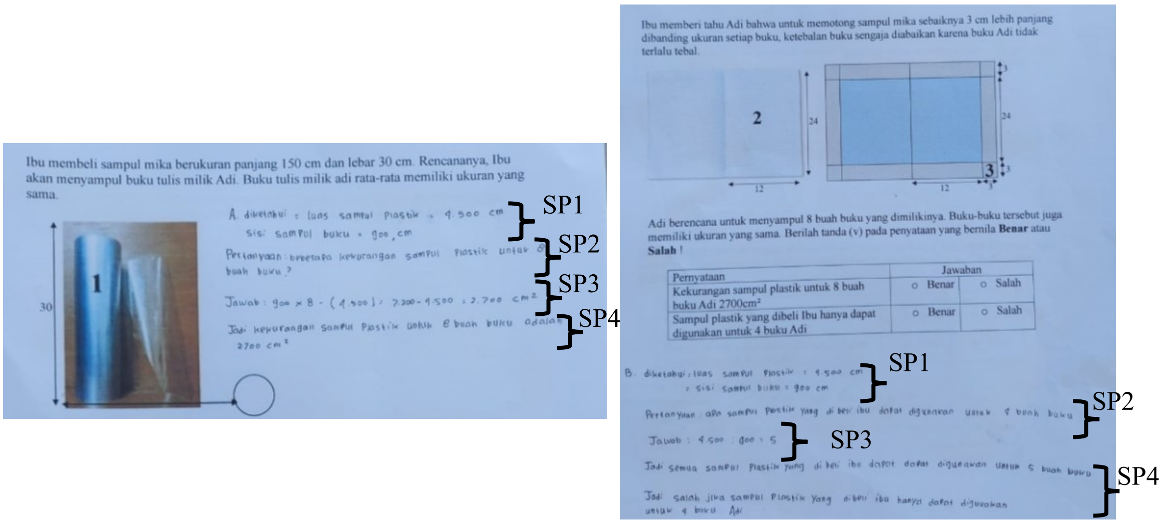
Table 5. Polya Steps Code and Error Type Student Answers

Step Polya	Code	Error Type	Code
Understanding the Problem	SP1	Misconception of the problem	ET1
Create a Troubleshooting Plan	SP2	Error creating a troubleshooting plan	ET2
Implement the Plan	SP3	Error executing the plan	ET3
Recheck Answers	SP4	Error Rechecking Answers	ET4

The results of this research are as follows:

Students with high mathematical abilities

The following are the results of the description of the research results of students' errors with high mathematical abilities in working on AKM questions. Perimeter and area of flat shapes based on solving problems using polya stages:



Picture 1. Results of work on AKM subject 1 questions

At the stage of understanding the problem, it is known that S1 wrote down what is known in the 2 AKM questions, namely the area of plastic waste is 4500 cm, the side of the book cover is 900 cm as written in the SP1 code in Figure 1 above. Based on the steps to understand the problem, it can be seen that S1 subjects can understand the conditions of the AKM questions given. This is supported by the researcher's interviews with students as follows:

Q: Explain the question again in your own words?

S1: Mother bought a mica cover measuring 150 cm long and 30 cm wide. She plans to cover Adi's book.

Q: What is known about this problem?

S1: it is known that the length is 150 cm, the width is 30 cm, Adi plans to cover 8 books, Adi cuts the mica 3 cm longer than the size of each book?

Based on the answers written by subject S1 and the results of the interview above, S1 was able to understand the problem, namely the subject was able to identify the problem and state what was known and asked about the problem without making mistakes. So it is concluded that S1 can understand the problem and can write down instructions from what is known and what is asked in the question. At the stage of planning a problem solution, S1 can connect what is known with the picture in the problem in order to find the solution that is sought by writing down what is being asked as seen in the SP2 code in Figure 1 above, then S1 finds the area of the plastic cover.

Based on the activity of planning the solution problems in written test answers, it can be seen that undergraduate subjects can consider mathematical models to solve the given problems. As from the interview conducted with S1 below:

Q: How do you do the questions above?
S1: Determine the area of the cover and the width of the cover, calculate the plastic side and add the lack of plastic cover, calculate using a mathematical formula, and work according to the question.
Q: What mathematical formula did you use to solve this problem?
S1: Using the formula for area and perimeter of a square
Q: How do you write the mathematical formula for the problem?
S1: area of square s times side, perimeter of square 4 times side times side.

Based on the answers written by S1 and the results of the interview above, S1 was able to plan a solution to the problem, that is, students were able to create a mathematical model for the problem. So it can be concluded that S1 can plan problem solving and no errors occur when making problem solving plans. In the step of carrying out the solution, S1 first finds the area of the cover using the flat shape formula, then multiplies the cover by 8 books and reduces it by the area of the plastic cover ((900 ×8) – 4500 = 2700). equivalent to what is written in figure 1 code SP3. Based on the process of completing the written test answers, it can be seen that S1 solves the questions using the mathematical model that has been created. This is supported by the researcher's interviews with students as follows:

Q: Can you explain the steps you took to solve the problem?
S1: Calculate the area and perimeter of the cover by working carefully
Q: How do you make sure your steps are correct?
S1: Examine the completed answers again
Q: Have you had any difficulties?
S1: No

Based on the answers written by S1 and the results of the interview above, S1 was able to carry out the solution. S1 is able to solve problems using the plans that have been made. So it can be concluded that S1 can carry out the solution and no errors occur when carrying out the plan. At the re-checking stage, S1 can draw conclusions from the questions given by checking the answers again so that there are no errors, as written in Figure 1, SP4 code. Based on re-examining S1's written test answers, it can be seen that S1 can prove that the results have been carried out according to the calculations. As in the following interview:

Q: What is the final result you get from your work?
S1: Finding cover deficiencies and cover calculations.
Q: How do you check your work?
S1: check the calculation of the area and perimeter of a flat shape from the start

Based on the answers written by S1 and the results of the interview above, S1 is able to check again, by checking the calculations from the start, then can conclude the answer. So it was concluded that S1 could check again and no errors occurred when re-checking the answers.

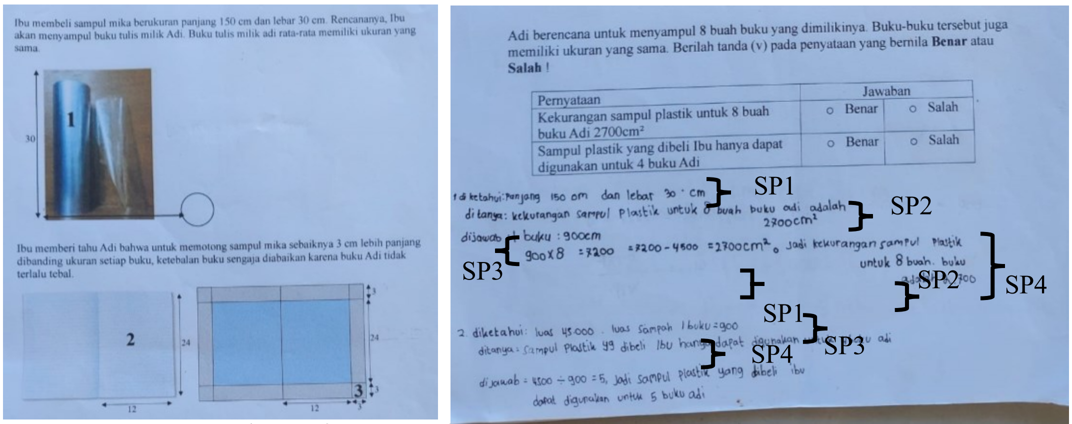
In solving the AKM questions, S1 follows c problem-solving theory, which consists of four steps: understanding the problem, devising a plan, carrying out the plan, and looking back (re-checking). In the understanding stage, S1 effectively identifies and articulates the known information and what is being asked, as demonstrated in written responses and interviews. S1 accurately restates the problem, including the dimensions and requirements for covering Adi's book with mica. This clarity reflects S1's strong grasp of the initial step in Polya's framework, emphasizing the importance of fully understanding the problem before proceeding. In the planning stage, S1 shows the ability to connect known data with relevant mathematical concepts and formulas. S1 outlines a clear plan involving the calculation of the cover's area and perimeter, then applies these calculations to determine the necessary mica cover, in line with Polya's second step. S1's use of the correct mathematical formulas indicates that S1 can translate the problem's requirements into a structured mathematical model, demonstrating high competence in planning problem solutions without errors.

During the execution stage, S1 accurately follows the devised plan and successfully performs the necessary calculations to find the cover's area, multiply it for several books, and subtract the plastic waste area. The detailed and error-free calculation process reflects adherence to the established plan, illustrating Polya's third step. In the re-checking stage, S1 verifies the calculations and results by reviewing the work from start to finish. This thorough review process confirms the correctness of the solution and highlights S1's diligence in ensuring accuracy. S1's problem-solving process, which aligns closely with steps, demonstrates the effectiveness of structured problem-solving strategies in achieving accurate and reliable results in mathematics.

High mathematical ability is closely related to problem solving ability. Students with this ability tend to have a deep understanding of basic mathematical concepts, which allows them to identify problems quickly and accurately and understand what is known and what is being asked (Mulyadi & Manoy, 2022). They are able to plan solutions effectively, choose and use appropriate formulas and methods, and outline solution steps systematically and logically. In execution, they execute plans with high accuracy, have strong calculation skills, and pay attention to details to minimize errors. In addition, students with high mathematical abilities tend to double-check their work, re-verifying each step to ensure the solution is correct and error-free. This habit not only improves the accuracy of results, but also strengthens understanding of concepts. Overall, high mathematical ability provides a strong foundation for students in solving mathematical problems effectively and efficiently, demonstrating the importance of mastery of mathematics for academic success and the development of problem-solving skills in everyday life.

Students with moderate mathematical abilities

Perimeter and area of flat shapes based on problem solving using polya stages:



Picture 2. results of work on AKM subject 1 questions

The following are the results of the description of the research results of students' errors with moderate mathematical abilities in working on AKM questions. At the stage of understanding the problem, it is known that S2 wrote down what is known in the 2 AKM questions, namely the book cover is 150 cm long, 30 cm wide and the plastic cover area is 4500 cm, the side of the book cover is 900 cm as written in the SP1 code in Figure 2 above. Based on the steps to understand the problem, it can be seen that the S2 subjects can understand the conditions of the AKM questions given. This is supported by the researcher's interviews with students as follows:

Q: Explain the question again in your own words?
S2: Mother bought a mica cover measuring 150 cm long and 30 cm wide. She plans to cover Adi's book.
Q: What is known about this problem?
S2: it is known that the length is 150 cm, the width is 30 cm, Adi plans to cover 8 books, Adi cuts the mica 3 cm longer than the size of each book?

Based on the answers written by subject S2 and the results of the interview above, S1 was able to understand the problem, namely the subject was able to identify the problem and state what was known and asked about the problem without making mistakes. So it can be concluded that S2 can understand the problem and can write down instructions based on what is known and what is asked in the problem.

At the stage of planning a problem solution, S2 can connect what is known with the picture in the problem to find the solution that is sought by writing down what is being asked as seen in the SP2 code in Figure 2 above, then S2 looks for the area of the plastic cover... Based on the activity of planning the solution problems in written test answers, it can be seen that S2 subjects can consider mathematical models to solve the given problems. As from the interview conducted with S2 below:

Q: How do you do the questions above?
S2: Determine the area of the cover and the width of the cover, calculate the plastic side and add the lack of plastic cover, calculate using a mathematical formula, and work according to the question.
Q: What mathematical formula did you use to solve this problem?
S2: Using the formula for area and perimeter of a square
Q: How do you write the mathematical formula for the problem?
S2: area of square s times side, perimeter of square 4 times side times side.

Based on the answers written by S2 and the results of the interview above, S2 was able to plan a solution to the problem, that is, students were able to create a mathematical model for the problem. So it can be concluded that S2 can plan problem solving and no errors occur when making problem solving plans.

In the step of carrying out the solution, S2 first finds the area of the cover using the flat shape formula, then multiplies the cover by 8 books and reduces it by the area of the plastic cover ((900 ×8) – 4500 = 2700). As written in Figure 2, SP3 code. Based on the process of completing the written test answers, it can be seen that S2 solves the questions using the mathematical model that has been created. This is supported by the researcher's interviews with students as follows:

Q: Can you explain the steps you took to solve the problem?
S2: Calculate the area and perimeter of the cover by working carefully
Q: How do you make sure your steps are correct?
S2: Examine the completed answers again
Q: Have you had any difficulties?

S2: There is no hassle

Based on the answers written by S2 and the results of the interview above, S2 was able to carry out the solution. S2 is able to solve problems using the plans that have been made. So it can be concluded that S2 can carry out the solution and no errors occur when carrying out the plan.

At the re-checking stage, S2 can draw conclusions from the questions given by checking the answers again so that there are no errors, as written in figure 2 of the SP4 code. Based on re-examining S2's written test answers, it can be seen that S2 can prove that the results have been carried out according to the calculations. As in the following interview:

Q: What is the final result you get from your work?

S2: Finding cover deficiencies and cover calculations.

Q: How do you check your work?

S2: check the calculation of the area and perimeter of a flat shape from the start

Based on the answers written by S2 and the results of the interview above, S2 is able to check again, by checking the calculations from the start, then can conclude the answer. So it was concluded that S2 could check again and no errors occurred when re-checking the answers.

The analysis of S2's problem-solving approach aligns well with The analysis of S2's problem-solving approach aligns well with George Polya's four stages of problem-solving: understanding the problem, devising a plan, carrying out the plan, and reviewing the solution. In the first stage, understanding the problem, S2 demonstrated proficiency by accurately identifying and summarizing the key elements of the problem, such as dimensions and requirements for covering multiple books. This initial clarity laid a solid foundation for subsequent stages, ensuring that S2 comprehended the problem contextually and could articulate it effectively.

Moving to the planning stage, S2 successfully transitioned from understanding to devising a plan. This involved mapping out a strategy to solve the problem, which included applying appropriate mathematical models and formulas. S2's ability to connect the given data with mathematical concepts like area and perimeter exemplifies Polya's emphasis on the importance of planning as a structured approach to problem-solving. The interviews revealed S2's methodical approach in formulating and explaining these steps, underscoring a systematic strategy to tackle the problem.

In the execution stage, S2 implemented the planned solution with accuracy and precision. By calculating the required measurements and verifying each calculation step-by-step, S2 ensured the integrity of the solution process. This aligns closely with Polya's third stage, where executing the plan involves careful application of methods and techniques developed during planning. S2's confidence in managing the solution process and absence of noted difficulties further highlight competence in executing the solution effectively.

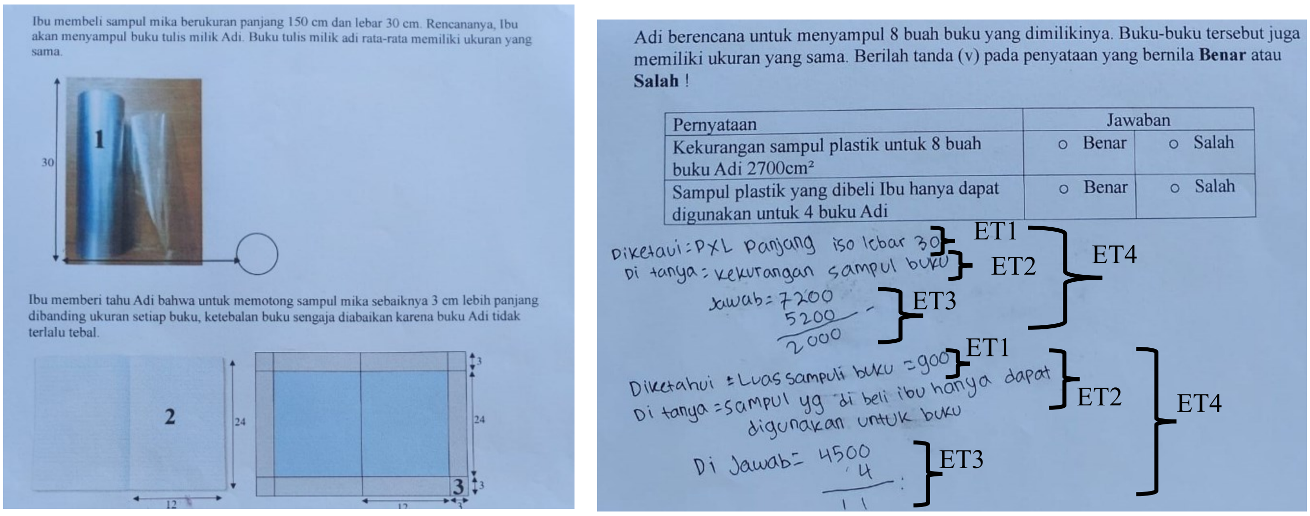
Lastly, the reviewing stage, as observed in S2's approach, encompassed checking the solution for correctness and coherence. S2's thoroughness in re-examining calculations and confirming the final results through a comprehensive review process demonstrates adherence to Polya's fourth stage of problem-solving. By validating the entire process from start to finish, S2 exemplified a critical aspect of problem-solving competence—ensuring that the solution aligns with the problem's requirements and is free from errors.

In conclusion, S2's problem-solving patterns align closely with Polya's stages, showcasing a structured and systematic approach that integrates understanding, planning, execution, and review. This analysis not only highlights S2's proficiency in mathematical problem-solving but also underscores the importance of methodical thinking and validation throughout the problem-solving process. four stages of problem-solving: understanding the problem, devising a plan, carrying out the plan, and reviewing the solution. In the first stage, understanding the problem, S2 demonstrated proficiency by accurately identifying and summarizing the key elements of the problem, such as dimensions and requirements for covering multiple books. This initial clarity laid a solid foundation for subsequent stages, ensuring that S2 comprehended the problem contextually and could articulate it effectively.

The relationship between students' moderate mathematical abilities and their ability to solve problems using the Polya approach can be complex but can be overcome with the right approach. Students who have moderate mathematical abilities may need extra focus in understanding basic mathematical concepts as well as developing analytical skills in formulating and evaluating solutions (Azhar, Saputra, & Nuriadin, 2021). Support from teachers in providing appropriate guidance and structured practice is also important in helping students adopt Polya strategies effectively, thereby enabling them to build better problem-solving skills.

Students with low mathematical abilities

The following are the results of the description of the research results of students' errors with low mathematical abilities in working on AKM questions. Perimeter and area of flat shapes based on solving problems using polya stages:



Picture 3. results of work on AKM subject 2 questions

At the stage of understanding the problem, it was discovered that S3 did not write down what was known in the 2 AKM questions correctly as written in the ET1 code in figure 2 above. Based on the steps to understand the problem, it can be seen that the S3 subjects cannot understand the conditions of the AKM questions given. This is supported by the researcher's interviews with students as follows:

Q: Explain the question again in your own words?
S3: as asked ma'am
Q: What is known about this problem?
S3: wide and 30 cm wide

Based on the answers written by subject S3 and the results of the interview above, S3 was unable to understand the problem, namely the subject was unable to identify the problem and state what was known and asked about the problem correctly. So it was concluded that S3 could not understand the problem and could not write down instructions from what was known and what was asked in the question.

At the stage of planning to solve the problem, S3 cannot connect what is known with the image in the problem as seen in the ET2 code in Figure 3 above so he cannot work on the problem correctly. Based on the activity of planning problem solving in written test answers, it can be seen that S3 subjects cannot consider mathematical models to solve the problems given. As from the interview conducted with S3 below:

Q: How do you do the questions above?
S3: reduce ma'am
Q: What mathematical formula did you use to solve this problem?
S3: addition and subtraction ma'am
Q: How do you write the mathematical formula for this problem?
S3: arranged ma'am.

Based on the answers written by S3 and the results of the interview above, S3 was unable to plan a solution to the problem, that is, the student was unable to create a mathematical model of the problem. So it can be concluded that S3 was unable to plan problem solving and an error occurred when making a problem solving plan

In the step of implementing the solution, S3 was unable to resolve the problem properly. As written in Figure 3, code ET3. Based on the process of completing the written test answers, it can be seen that S3 cannot solve the questions using the mathematical model that has been created. This is supported by the researcher's interviews with students as follows:

Q: Can you explain the steps you took to resolve the issue?
S3: subtracting and adding
Q: How do you make sure your steps are correct?
S3: reread ma'am
Q: Did you experience any difficulties?
S3: yes ma'am

Based on the answers written by S3 and the results of the interview above, S3 was unable to carry out the solution. S3 was unable to solve the problem using the plan that had been created. So it can be concluded that S3 was unable to carry out the solution and an error occurred when carrying out the plan.

At the re-checking stage, S3 cannot draw conclusions from the questions given and cannot check the answers again, as written in Figure 3, ET4 code. Based on re-examining S3's written test answers, it cannot be seen that S3 cannot prove that the results of the completion have been carried out according to the calculations. As in the following interview:

Q: What is the end result you get from your work?
S3: the rest of the mica ma'am
Q: How do you check your work?
S3: read the question again

Based on the answers written by S3 and the results of the interview above, S3 was unable to re-examine the answers to the problems in the questions, and was also unable to conclude the answers. So it was concluded that S3 could not recheck and an error occurred when rechecking the answer.

An analysis of errors in problem-solving stages for students with low mathematical abilities reveals significant challenges at each phase of the Polya problem-solving process. In the initial stage, student S3 struggles to clearly understand what is known and what is being asked in the problem. This difficulty is reflected in their responses, indicating a fundamental misunderstanding that hinders their ability to progress to subsequent stages effectively.

During the planning stage, S3 faces additional challenges. Despite attempts to engage with the problem, they fail to connect known information with the problem's representation and struggle to form a suitable mathematical model. A lack of strategic thinking in selecting appropriate mathematical tools, evident in their reliance on basic operations without a clear conceptual plan, further complicates their ability to design effective steps toward a solution.

Throughout the implementation phase, S3 continues to struggle, failing to execute the planned strategies effectively. They tend to rely on simple arithmetic operations without integrating them into a structured approach, highlighting deficiencies in procedural skills and confidence in applying mathematical models. Difficulties in verifying solution steps or identifying errors underscore their challenges in effectively utilizing mathematical models in problem-solving contexts.

Overall, this analysis illustrates a pattern of fundamental errors at each stage of the Polya problem-solving process for student S3. They encounter difficulties in understanding problem conditions, planning strategies effectively, executing plans accurately, and verifying and reflecting on solutions adequately. Addressing these challenges requires interventions focused on strengthening fundamental mathematical understanding, enhancing strategic thinking skills, and developing metacognitive awareness to support improved problem-solving abilities for students with low mathematical proficiency.

Students with low mathematical ability often make mistakes in solving mathematical problems due to several factors. These include a lack of understanding of basic concepts, difficulty in developing effective problem-solving strategies, limitations in reading and comprehending mathematical problems, challenges in interpreting data or graphical information, and the influence of low motivation and self-confidence (Azhar et al., 2021). The combination of these factors often leads to difficulties in applying mathematical concepts accurately and effectively in the context of given problems.

CONCLUSION

Based on the research results, it can be concluded that students with high and moderate mathematical abilities are able to understand problems well, and are able to plan problem solving systematically. Students in the low category have not been able to fulfill every indicator of solving mathematical problems, and have not been able to solve the problems given correctly. In overcoming this problem, it is important to consider a learning approach that is more structured and focused on understanding basic concepts. Students need to be encouraged to improve their ability to read and understand math problems carefully, as well as develop more effective problem solving strategies. In addition, support is needed in interpreting data and graphical information appropriately. Apart from that, efforts to increase students' motivation and self-confidence in facing mathematics problems must also be strengthened. Thus, it is hoped that this holistic approach can help students apply mathematical concepts more accurately and effectively in solving geometric problems such as calculating the perimeter and area of flat shapes.

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