Types and Factors of Student Difficulty Solving Algebra Problems Based on Polya Stages

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Abstract

The aim of this research is to map the types of difficulties of class VII students based on Cooney's Theory at each stage of Polya when solving algebra problems in the form of story problems, as well as the factors that cause them. The type of research used is qualitative with a descriptive approach. There were 6 subjects selected by *purposive sampling* from a population of 18 students divided into categories of high ability (KT), medium ability (KS), and low ability (KR). Instruments used in the form of algebra tests and interviews. The conclusions obtained: (1) students in the high category (KT) still experience the principle type of difficulty (P) at the stage of implementing the plan and at the stage of re-examining the solution results; (2) students in the medium category (KS) still experience conceptual difficulties (K) at the planning solution stage, and experience principle difficulties (P) at the next solving stage, and; (3) students in the low ability category (KR) still experience verbal difficulties (V) starting from the stage of understanding the problem. The causal factors are: (1) unable to understand the text of the story questions; (2) have not mastered the use of variables in creating mathematical models; (3) unable to utilize the information in the question text to create a mathematical model, and; (4) limited time to reread the problem text until you understand it and to recheck the results of problem solving.

Keywords: *Types of Difficulty According to Cooney; Polya Problem Solving Stages; Algebra Problems in the Form of Stories.*

Abstrak

Tujuan penelitian ini adalah untuk memetakan jenis-jenis kesulitan siswa kelas VII berdasarkan Teori Cooney pada setiap tahapan Polya ketika menyelesaikan soal aljabar berbentuk soal cerita, serta faktor penyebabnya. Jenis penelitian adalah kualitatif dengan pendekatan deskriptif. Subyek berjumlah 6 orang secara purposive sampling dari populasi 18 siswa yang dibagi dalam kategori kemampuan tinggi (KT), kemampuan sedang (KS), dan kemampuan rendah (KR). Instrumen yang digunakan berupa tes aljabar dan wawancara. Kesimpulan yang diperoleh: (1) siswa pada kategori tinggi (KT) masih mengalami jenis kesulitan prinsip (P) pada tahap pelaksanaan rencana dan pada tahap mengkaji ulang hasil penyelesaian; (2) siswa pada kategori sedang (KS) masih mengalami kesulitan konsep (K) pada tahap penyelesaian perencanaan, dan mengalami kesulitan prinsip (P) pada tahap penyelesaian selanjutnya, dan; (3) siswa pada kategori kemampuan rendah (KR) masih mengalami kesulitan verbal (V) mulai dari tahap memahami masalah. Faktor penyebabnya adalah: (1) tidak mampu memahami teks soal cerita; (2) belum menguasai penggunaan variabel dalam

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membuat model matematika; (3) tidak mampu memanfaatkan informasi dalam teks soal untuk membuat model matematika, dan; (4) terbatasnya waktu untuk membaca ulang teks soal hingga memahaminya dan memeriksa kembali hasil pemecahan masalah.

Kata Kunci: Jenis kesulitan; Teori Cooney; Pemecahan Masalah; Tahapan Polya; Soal Aljabar Berbentuk Cerita.

INTRODUCTION

Problem solving ability is the ability to find a way out of difficulties and to achieve certain goals which cannot be achieved immediately (Polya, 2014). It is important to improve students' problem-solving skills because this ability is a superior ability that will affect the way they solve everyday problems in the future (Cahyani & Setyawati, 2017; Nurhasanah & Luritawaty, 2021). Because of its important benefits, problem-solving abilities have been made the target of learning goals that must be achieved through the educational process in the 21st century (Cabahug et al., 2024; Sarigoz, 2024). The curriculum in Indonesia also includes this in the targets for achieving graduate competencies, and is part of efforts to prepare superior Indonesian human resources in the 21st century (Kurniawati et al., 2019). Mathematics teachers in Indonesia share responsibility for preparing superior human resources. The applicable curriculum emphasizes one of the aims of teaching mathematics since elementary education, namely to equip and train students' problem-solving abilities (Intan et al., 2022; Siswondo & Agustina, 2021).

Data on students' achievement of problem solving abilities after learning mathematics can be measured using story-shaped question instruments (Aini & Mukhlis, 2020; Fitriatien, 2019; Utami & Puspitasari, 2022; Vitaloka et al., 2020). As for indicators to measure achievement, the 4 stages of problem solving from Polya (2014) can be used as presented in Table 1.

The indicators above have been used in several measurements, the results show that students' problem solving abilities are still in the low category. Aini and Mukhlis (2020) measured students' problem-solving abilities through learning three-variable linear equations. Their findings stated that students with the quitter type were unable to fulfill the stages of implementing plans and re-examining the

results of problem solving. Meika et al. (2022) measured the problem solving abilities of students who had taken part in learning the concept of sets, their findings concluded that students with low levels of ability were unable to achieve all stages of Polya problem solving. Asri et al. (2023) measured students' problem solving abilities after learning a 2-variable linear equation system, which also found that students with low levels of motivation were unable to achieve all stages solution to problem.

Table 1. Problem Solving Stages and Their Indicators (Polya, 2014)

Problem Solving Stages	Indicator
Understand the problem	(1) identify what is known from the problem (2) identify what is asked in the question
Plan a solution	(1) create an appropriate mathematical model (2) using known information to adapt to new information
Implement the resolution plan	(1) substituting known values into a mathematical model (2) calculating problem solving
Check the solution results again	Students are able to check the correctness of the results or answers

The results of observations carried out by researchers at one of the junior high schools in the Depok-West Java area also obtained findings that were relevant to the results of the studies above. The achievement of problem solving abilities of class VII students at this school is relatively low, which was identified from the answers to the algebra test that the students completed in the previous school year. The teacher also acknowledged that there were weaknesses in the students in this class, especially when solving test questions in the form of stories. The process of practicing problem solving involving algebraic operations is generally expressed in mathematical problems in the form of stories (Putri et al., 2021).

Algebra material has become an important part of school mathematics material taught at every level, and can be used as a means of practicing solving everyday life problems (Citra et al., 2022). On the basis of the findings above, it is very important to carry out an analysis of algebra learning outcomes that are linked to the achievement of students' problem-solving abilities. On the other

hand, the findings above also confirm that algebra learning designed by teachers has not fully facilitated increasing students' problem solving abilities.

The use of certain learning methods and media has been believed to improve students' problem solving abilities at primary to secondary education levels (Hasanah et al., 2023; Ma'ruf et al., 2023; Manggarrani et al., 2024; Nasution et al., 2023; Triyono & Murdiasih, 2023). However, an analysis of the types of learning difficulties and the factors behind them is much more important before teachers determine the learning methods and/or media they want to use. This analysis is intended so that improvements to the problems of algebra learning can be addressed in more detail from the start. So the main aim of this research is to find out the types of student difficulties and the factors that cause them. The type of mathematics learning difficulty in question will be classified based on Cooney's Theory, which is presented in Table 2.

Table 2. Classification of Types of Learning Difficulties Based on Cooney's Theory (adapted from Akollo, 2023; Fadilah, 2024; Madilla, 2021)

Difficulty Type	Indicator
Concept Difficulty (K)	Students are not able to: (1) stating an object to represent a certain concept (2) remembering a certain condition expressed in terms that represent concepts (3) concluding information from several given concepts
Principle Difficulty (P)	Students are not able to: (1) carefully carry out calculations of algebraic operations (2) determine relevant data (3) apply a principle or formula
Verbal Difficulty (V)	Students are not able to: (1) knowing what is known (2) know what is being asked (3) change the question sentence into a mathematical sentence or vice versa

Similar studies have been conducted previously, but with different subjects and subject matter. The results of the study by (Maulani & Zanthy, 2020) concluded that grade XII students still predominantly experience conceptual errors, due to their discontinuous learning methods and lack of effort in solving problems presented in the Geometry Transformation Test. Research by (Trizulfanto et al., 2017) analyzed students' difficulties in solving linear

programming problems in terms of their learning styles, the results concluded that grade X students with different learning styles generally still have difficulty in changing problem sentences into mathematical sentences. Research conducted by (Dwidarti et al., 2019) concluded that grade VIII students with low abilities still experience conceptual, principle, and skill difficulties when trying to solve story problems on set material. Similar studies as explained above have not focused on finding out the types of difficulties experienced by grade VII students based on Cooney's Theory and Polya's problem-solving stages, especially in algebraic problems in the form of stories. In addition, this study will explore further the causal factors. This research is certainly important to conduct, because the results of this research can later be used as the main basis for teachers to determine the most appropriate learning methods or media, as an effort to improve the problem-solving abilities of grade VII students through algebra learning.

RESEARCH METHODS

The research carried out is included in the type of qualitative research with a descriptive approach. The aim is to determine the types of student difficulties and the factors causing difficulties based on the stages and indicators of problem solving from Polya (in Table 1). Data was collected using the Algebra Test instrument in the form of story questions and through interviews. The test instrument given consists of 5 questions that meet the valid criteria. The data analyzed is in the form of test answers and verbal statements from research subjects. Test answers are used to determine the type of difficulty, and verbal statements are used to determine the factors causing the difficulty. The types of difficulties experienced by students will be classified based on Cooney's Theory (in Table 2). Research subjects were determined using purposive sampling after collecting test data. The sample population is class VII students from one of the junior high schools in Depok-West Java, totaling 18 students.

Data analysis was carried out using procedures from Miles & Huberman, (1984) as presented in Figure 1.

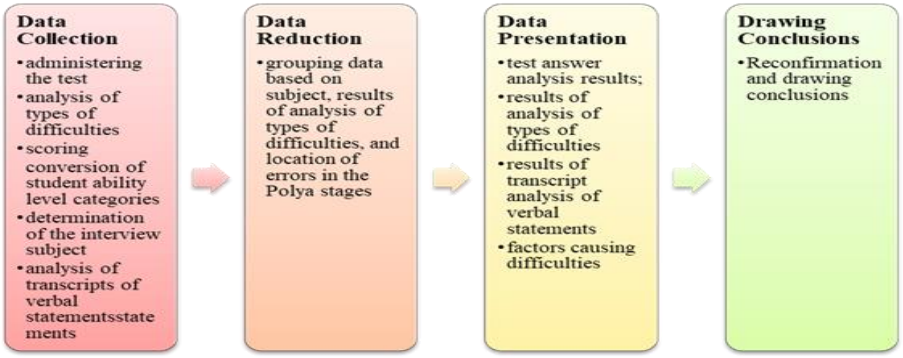

Figure 1. Data Analysis Procedure (Adapted from Miles & Huberman, 1984)

The data collection stage begins with giving an Algebra Test in the form of a story. The test answers are reviewed for errors at each stage of Polya's problem solving, and the types of difficulties experienced by students are identified. Apart from identifying the type of difficulty, the test answers are also given a score according to the scoring rules specified in the assessment rubric. The final scores are converted into categories of student ability levels, with the conditions and limitations in Table 3.

Table 3. Category of Student Ability Level (adapted from Arikunto, 2021)

Final Score	Student Ability Category
$80 \leq \text{Score} \leq 100$	High Ability (KT)
$60 < \text{Score} < 80$	Medium Ability (KS)
$0 < \text{Score} < 60$	Low Ability (KR)

Table 3 shows that students will be divided into 3 categories, namely: high ability (KT); medium ability (KS), and; low ability (KR). The research subjects were 2 students taken by purposive sampling from each category, so that the total was 6. The data in the form of verbal statements were transcribed with a number of grammatical corrections. At the data reduction stage, research subjects were grouped based on: (1) level of ability and type of difficulty; (2) the location of the error in the Polya stage and the type of difficulty, and; (3) test answers and transcripts of verbal statements that support the analysis process. At the data presentation stage, the data is presented in the form of tables, pictures of test answers, and transcripts of verbal statements from the subject. Before conclusions are drawn, students' answers are confirmed by comparing test answers and interview results. The aim of this research was answered after the researcher

concluded the types of student difficulties that were reviewed based on the Polya stages and the causal factors.

RESULTS AND DISCUSSION

Identification of the type of student difficulty is carried out for each algebra test number written on the answer sheet. The identification process refers to indicators in Cooney's Theory (Table 2). The identification results are given the following information: "B" for students who can complete all stages of problem solving; "K" for students who experience conceptual difficulties; "P" for students who experience principle types of difficulties; "V" for students who experience any type of verbal difficulty, and; "X" for students who do not provide an answer. During the process of identifying types of difficulties, researchers also give scores to answers that reflect each stage of problem solving. The results of the score calculations are then converted into 3 categories of student ability levels (Table 3), namely high ability (KT), medium ability (KS), and low ability (KR).

The results of the analysis of types of difficulty, score calculations and conversion of student ability level categories are presented in Table 4.

Table 4. Results of Identification of Types of Difficulty, Score Calculation and Conversion of Students' Ability Level Categories

No	Student	Type of Difficulty of Each Algebra Problem					Score	Category
		1	2	3	4	5		
1	AAZ	K	K	P	P	P	47,5	(KR)
2	ALS	B	P	P	P	P	53,75	(KR)
3	AJ	B	K	P	P	P	47,5	(KR)
4	AS	K	P	P	P	P	46,25	(KR)
5	DVA	V	V	P	P	P	40	(KR)
6	DA	V	K	P	P	P	41,25	(KR)
7	F	B	P	B	B	P	85	(KT)
8	KSP	B	B	B	P	B	83,75	(KT)
9	JC	B	K	B	P	P	71,25	(KS)
10	LSA	B	P	P	X	X	51,25	(KR)
11	MF	V	X	P	P	P	50	(KR)
12	MI	V	V	X	X	K	21,25	(KR)
13	RAY	V	K	K	P	P	40	(KR)
14	RP	K	P	P	P	P	53,75	(KR)
15	MW	B	P	B	P	B	70	(KS)
16	US	V	K	P	X	X	40	(KR)
17	SPR	V	P	K	X	X	43,75	(KR)
18	W	V	V	X	X	X	25	(KR)

Based on Table 4, it was found: 2 students in the high ability category (KT); 2 students in the medium ability category (KS), and; 14 students in the low ability category (KR).

By purposive sampling, 2 students were selected from each category by considering the final scores they obtained and suggestions from the teacher. The teacher's suggestion was to select students who were deemed more capable of communicating and expressing their thoughts, and who were willing to participate in the entire data collection process in this research. The total number of subjects was 6 students.

At the data reduction stage, subject group data was grouped based on: (1) categories of ability level and type of difficulty, and; (2) location of errors in the Polya stage and type of difficulty; (3) test answers and transcripts of verbal statements. Data and other statements that are not related to the conclusion drawing process are not continued to the data presentation stage.

Table 5 presents data on groups of research subjects based on categories of ability level and type of difficulty.

Table 5. Grouping of Research Subjects Based on Level of Ability and Type of Difficulty

Kelompok Subjek	Student	Score	Type of Difficulty of Each Algebra Problem				
			1	2	3	4	5
High Ability (KT)	KSP	83,75	B	B	B	(P)	B
	F	85	B	(P)	B	B	(P)
Medium Ability (KS)	MW	70	B	(P)	B	(P)	B
	JC	71,25	B	(K)	B	(P)	(P)
Low Ability (KR)	MF	50	V	X	(P)	(P)	(P)
	AJ	47,5	B	K	(P)	(P)	(P)

Six students in the 3 subject categories in Table 5 above were interviewed to ascertain the factors causing the difficulties they experienced. Apart from that, researchers can find out how students think until the final answer is produced. The response that the subject conveys will also be reinforcing information about the test results they achieved.

The following will present an analysis of test answers and interview results with research subjects. Afterwards, conclusions can be drawn regarding the

factors that cause difficulties experienced by students at each stage of Polya's problem solving.

High Ability Category (KT) Research Subject Group

Figure 2 presents examples of algebra test answers from Subject-KSP.

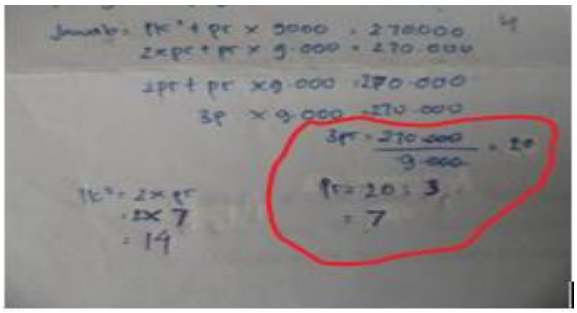

Figure 2. Subject-KSP Answers to Algebra Question Number 4

Figure 2 shows that Subject-KSP made mistakes at the stage of implementing the solution plan. Errors occur when the subject tries to complete the mathematical model he has created. It says: : $3pr = \frac{270000}{9000} = 20$, this is wrong and has an impact on the results of the next operation, namely: $pr = 20:3 = 7$ which is also wrong. This error indicates that Subject-KSP is experiencing a type of principle difficulty (P).

A summary of the location of errors in the Polya stage and the types of difficulties experienced by subjects in the high ability (KT) category is presented in Table 6.

Table 6. Location of Errors in the Polya Stages and Types of Difficulties Experienced by Subjects in the High Ability Category (KT)

Subject	Question Number	Location of Errors in Polya Stages	Difficulty Type
Subject-KSP	4	implement the solution plan	Principle (P)
Subject-F	2	carry out a solution plan	Principle (P)
	5	implement the solution plan	Principle (P)

Table 8 shows that subjects in the high ability category (KT) experienced a type of principle difficulty (P) at the stage of implementing the solution plan. Difficulties at this stage will also have an impact on the stage of re-examining the solution results.

Based on the results of the interview, the factors causing the difficulties experienced by the subject can be identified. The following is an example of a transcript of a verbal statement from the Subject-KSP.

Researcher : *"If you are carrying out a solution plan, or when you are doing calculations, what part of the difficulty do you experience?"*
Subject-KSP : *"Sometimes I calculate wrongly, or write down the numbers incorrectly."*
Researcher : *"Then, there are some answers that you didn't double check, what's the problem?"*
Subject-KSP : *"There was not enough time available, so I was in a hurry and didn't have time to check the answers again."*

The answer from the KSP Subject above stated the difficulties he experienced, namely: (1) difficulty implementing the solution plan due to incorrect calculations, and; (2) difficulty checking the solution results due to insufficient time.

Research Subject Group Medium Ability Category (KS)

Figure 3 is an example of an algebra test answer from Subject-MW.

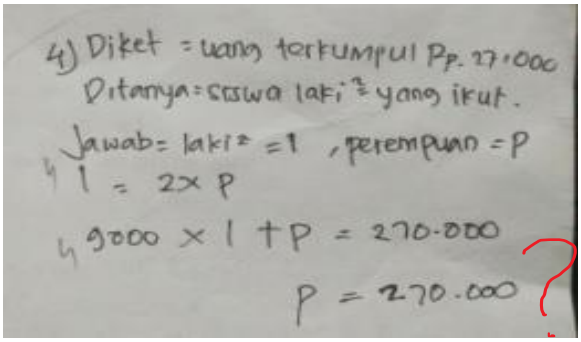

Figure 3. Subject-MW's answer to Algebra Question Number 4

Figure 3 shows that Subject-MW was able to go through the stages of understanding the problem correctly, namely by writing $l = 2 \times p$. Subject-MW also succeeded in stating what was asked, namely the number of male students, and was able to create a mathematical model correctly, namely $900 \times l + p = 270.000$. Up to this stage, Subject-MW has successfully gone through the stages of planning a solution. An error occurred when Subject-MW carried out a

calculation operation following the mathematical model he had created. Subject-MW was unable to carry out the arithmetic operation to completion, so it could be said that Subject-MW experienced a type of principle difficulty (P).

Figure 4 presents examples of algebra test answers from Subject-JC

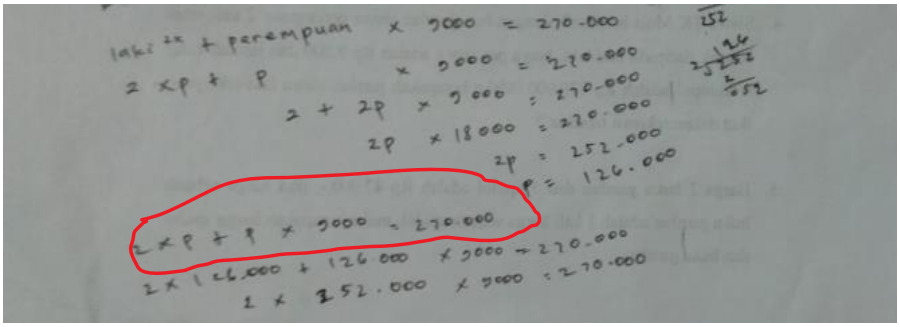

Figure 4. Subject-JC's answer to Algebra Question Number 4

Figure 4 shows that Subject-JC is not precise in making problem solving plans. The answer should be: $(p \times l)9.000 = 270.000$ with $l = 2p$ or equivalent to: $(p \times 2p)9.000 = 270.000$. On the answer sheet it was written: $2 \times p + p \times 9.000 = 270.000$, which caused Subject-JC to incorrectly conclude the final result. At this stage it can be said that Subject-JC experiences a type of conceptual difficulty.

A summary of the location of errors in the Polya stage and the types of difficulties experienced by the group of subjects in the medium ability (KS) category is presented in Table 7.

Table 7. Location of Errors in the Polya Stages and Types of Difficulties Experienced by Subjects in the Medium Ability Category (KS)

Subject	Question Number	Location of Errors in Polya Stages	Difficulty Type
Subjek-MW	2	implement the solution plan	Principle (P)
	4	implement the solution plan	Principle (P)
Subjek-JC	2	implement the solution plan	Principle (P)
	4	plan a solution	Concept (K)
	5	Check the solution results again	Principle (P)

The factors causing the difficulties of subjects with moderate ability (KS) categories can be analyzed from the results of interviews with Subject-MW and

Subject-JC. Below is an example of a transcript of a verbal statement from Subject-MW.

Researcher : *"Next, when you carry out a problem solving plan, or when you do calculations, what are the obstacles?"*
Subject-MW : *"I have difficulty calculating and sometimes rush."*

Subject-MW answer above states the factors causing the difficulties he experienced at the stage of implementing the solution plan because he was in a hurry to carry out calculations. The following is an example of a transcript of a verbal statement given by Subject-JC.

Researcher : *"When you make a solution plan or type a mathematical model, it turns out that there are things you can do correctly, but there are still things that are wrong. What's the difficulty?"*
Subject-JC : *"I often have difficulty in the part that contains variable X. And often think about it for a long time."*
Researcher : *"For example, what number has the variable X in it, and do you find it difficult?"*
Subject-JC : *"Question number 4"*

Subject-JC answer above states the factors causing the difficulties experienced during the solution planning stage, namely because they have not yet mastered the use of variable concepts in creating mathematical models. In question number 5, Subject-JC also experienced principle (P) difficulties at the stage of re-checking the solution results, the cause of which was because the subject did not know what method to use to re-check the answer.

Low Ability Category (KR) Research Subject Group

Figure 5 is an example of an algebra test answer from Subject-MF.

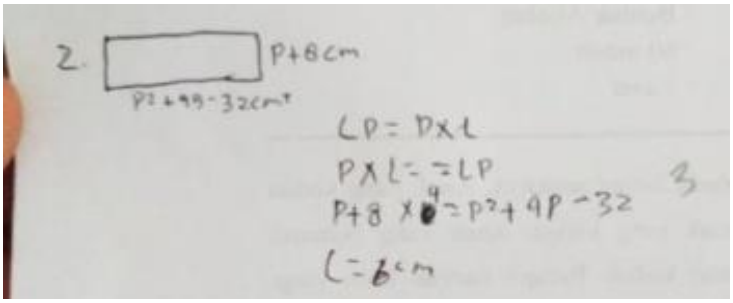

Figure 5. Subject-MF Answers to Algebra Question Number 2

Figure 5 shows Subject-MF trying to write down what he knows through a rectangular sketch but it is not correct. The measurement on the long side is written on the wide side. So it can be said that Subject-MF experienced verbal difficulties (V) at the stage of understanding the problem, where the subject did not understand the problem presented. At the next stage, Subject-MF was also unable to write down the problem he had to solve. So it can be said that Subject-MF experienced a type of conceptual difficulty (K) at the problem planning stage. At the stage of carrying out the solution plan and re-examining the results of the solution, Subject-MF was unable to carry it out.

A summary of the results of the analysis of the types of difficulties at each stage of Polya experienced by the group of subjects in the low ability (KR) category is presented in Table 8.

Table 8. Location of Errors in the Polya Stages and Types of Difficulties Experienced by Subjects in the Low Ability Category (KR)

Subject	Question Number	Location of Errors in Polya Stages	Difficulty Type
Subjek-MF	1	understand the problem	Verbal (V)
	2	No answer	X
	3	implement the solution plan	Principle (P)
	4	implement the solution plan	Principle (P)
	5	implement the solution plan	Principle (P)
Subjek-AJ	2	implement the solution plan	Concept (K)
	3	plan a solution	Principle (P)
	4	implement the solution plan	Principle (P)
	5	check the solution results again	Principle (P)

Factors causing difficulties experienced by subjects in the low ability category (KR) can be analyzed from the results of interviews. The following is a transcript of the verbal statement from Subject-MF

Researcher : *"What makes you difficult when trying to understand the questions?"*
Subject-MF : *"I don't understand, because the question text uses long sentences, and sometimes after reading I don't understand at all."*
Researcher : *"Next, when you make a solution plan or when writing a formula, what are the difficulties?"*
Subject-MF : *"I don't know how to make a mathematical model"*

Researcher : *"Next, when you carry out the solution plan or when doing calculations, what are your difficulties?"*
Subject-MF : *"The difficulty was because I didn't know how to do it, so the next step I just wrote down the answer."*
Researcher : *"When you do calculations, do you often make mistakes or not?"*
Subject-MF : *"Yes, often"*
Researcher : *"Did you double-check the answers you wrote?"*
Subject-MF : *"Didn't have time, and didn't know how to check the answers again."*

The Subject-MF answers above state the factors causing the difficulties experienced, namely: (1) difficulty understanding the problem because they do not understand the meaning of the sentences in the question text; (2) difficulty planning solutions because they do not know the appropriate formula for creating a mathematical model; (3) difficulty implementing the solution plan due to lack of understanding regarding the use of variables in mathematical models, and; (4) difficulty re-examining the solution results because they do not know how to carry out the inspection process.

The answers submitted by the subject, both in the form of test answers and verbal statements, have been reconfirmed by the researcher. Based on the results of re-confirmation, the answers given by students are valid and researchers can proceed to the stage of drawing conclusions.

Based on the analysis of the types of difficulties in algebra test answers, it can be shown the types of difficulties experienced by students at each stage of Polya problem solving. Based on analysis of transcripts of verbal statements from the subject, it has also been shown the factors causing the difficulties experienced by students. It has been shown that students in the high ability (KT) category successfully passed the stages of understanding the problem and the stages of planning solutions well. These results are in line with the conclusions of Mahardhikawati et al. (2017), who stated that students with high logical-mathematical intelligence will be able to understand problems well, which he proved by writing down what is known and what is asked. Apart from that, he is able to reveal information that is not yet contained in the question text to help

solve the problem presented. At the stage of planning a solution, subjects with the high ability (KT) category are also able to find concepts or theories that support each other, and are able to find the necessary formulas, which has also been concluded by Indrawati et al. (2019). At the stage of carrying out the solution plan, it has been shown that the subject can substitute what is known into the mathematical model that he has created. However, in algebra questions number 2 and 4 the subject was not precise when carrying out the calculations, so the final answer was wrong. Inaccuracy in carrying out arithmetic operations still often occurs, including among students with high abilities (KT), this has been researched by Runtukahu and Kandou (2016). At this stage it can be said that the subject experiences a type of principle difficulty (P). Meanwhile, at the stage of re-examining the solution results, the subject experienced principle difficulties (P) in questions number 2 and 5. Through the transcript of the verbal statement, the factors causing the subject's difficulties could be identified, namely: (1) difficulty implementing the solution plan due to incorrect calculations, and; (2) difficulty re-checking the solution results due to insufficient time.

In subjects with the medium ability (KS) category, it has been shown that the subject is able to go through the stages of understanding the problem well. However, the subject began to experience difficulties at the stage of planning the solution, namely experiencing a type of conceptual difficulty (K) in algebra problem number 2. At the stage of carrying out the solution plan and checking the results of the solution again, the subject experienced a type of principle difficulty (P), especially in algebra questions number 2, 4, and 5. The factors causing difficulties in: (1) the planning solution stage because the subject has not yet mastered the use of variable concepts in mathematical models; (2) the stage of implementing the solution plan because the subject is in a hurry to carry out calculations and takes a long time to re-read the question sentence, and; (3) the stage of re-checking the results of problem solving because the subject does not know what method to use to re-check the answer. At this stage it can be said that students with a moderate level of ability (KS) can still understand problems in

algebra questions in the form of stories well, as concluded by the results of Kairuddin and Sinaga (2023)

Based on the results of the analysis of test answers in the group of subjects in the low ability category (KR), it has been shown that the subjects experienced a type of verbal difficulty (V) at the stage of understanding the problem. The subject was unable to understand the meaning of the sentences in the text of the algebra questions in the form of a story. The difficulties he experienced continued in the next stages of problem solving. This condition is very visible when the subject is unable to write answers on the sheet provided. The results of previous research also reached similar conclusions, namely that students in the low ability (KR) category had difficulty interpreting sentences in story problem texts, so they were unable to pass the problem solving stages of (Asri et al., 2023; Meika et al., 2022). Meanwhile, if he is able to pass the stages of understanding the problem, the subject tends to experience the type of concept difficulty (P) and the type of principle difficulty (P) at the stage of planning a solution and the stage of implementing the solution plan. The causal factor is because the subject failed to utilize the available information to design a mathematical model.

The results of this research only focus on findings regarding the types of difficulties experienced by students and the causal factors that occur at each stage of Polya's problem solving. As for responding to the difficulties experienced by students, teachers can implement recommended improvements. Teachers train students to solve algebra problems in the form of stories by displaying or integrating them into learning media in the form of concrete objects (Utari et al., 2019), so that those with low mathematical abilities find it easier to understand the problems. The learning model that can be recommended is based on a realistic mathematical approach (Idris & Silalahi, 2016; Ma'ruf et al., 2024).

CONCLUSION

Based on data analysis and discussion, it can be concluded: first, students with high category (KT) still experience principle difficulty (P) at the stage of

implementing the plan and at the stage of re-checking the results of the solution; second, students with medium category (KS) still experience concept difficulty (K) at the stage of planning the solution, and experience principle difficulty (P) at the next stage of solving, and; third, students in the low ability category (KR) still experience verbal difficulty (V) starting from the stage of understanding the problem. The factors that cause students' difficulties are: (1) unable to understand the text of the story problem; (2) not yet mastering the use of variables in making mathematical models; (3) unable to utilize information in the text of the problem to make mathematical models, and; (4) limited time to re-read the text of the problem until understood and to re-check the results of the problem solving. To address the difficulties experienced by students, the researcher suggests the use of learning media in the form of concrete objects and the implementation of a realistic mathematics learning model.

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