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Students' Heuristics in Solving Mathematical Literacy Problems on System of Linear Equations with Two Variables Topic

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Abstract— Heuristics are general steps that guide in solving problems to find the solutions, one of which is problems in mathematical literacy problems regarding Systems of Linear Equations in Two Variables (SLETV) topic. This qualitative descriptive research aims to describe students' heuristics in solving mathematical literacy questions on SLETV. Three subjects were selected through a mathematical literacy test, namely one student with high test result criteria, one student with medium test result criteria and one student with low test result criteria. The research instruments used were mathematical literacy tests, interview guides, and documentation. Data analysis was carried out in three stages, namely reducing data, presenting data, and make a conclusions. The research results showed that students with high and medium test result criteria used the same heuristics, namely `make suppositions', 'use a model', 'use an equation', 'simplify the problem', 'solve part of the problem', and 'restate the problem', while students with low test result criteria did not use any heuristics in solving mathematical literacy questions because still confused about the process of creating mathematical models. Even so, students with low test result criteria can write and mention the information they know and are asked about in the questions well.

Keywords—Heuristics; Mathematical Literacy; Problem Solving; SLETV.

I. INTRODUCTION

One of the abilities that students need to have in facing current developments and daily life problems is mathematical literacy. This is in line with the Organization for Economic Cooperation and Development (OECD) statement that mathematical literacy is important for every individual to help understand the uses of mathematics as well as to make appropriate and logical decisions in solving problems in everyday life. Therefore, individuals who have good mathematical literacy skills will find it easier to solve the problems they face. However, the survey results of one of the international assessments that Indonesia participated in, namely the Program for International Student Assessment (PISA) in 2022, show that the mathematical literacy of Indonesian students is still not getting good results and has even decreased from the score in 2018. Indonesia's mathematical literacy score in PISA in 2022 is 366 which is still below the international average score of 472 [5].

In school learning, students have experienced strategic operations, heuristic patterns, or problem-solving approaches that are underestimated or even prohibited because of traditional ideologies surrounding mathematics. This experience forces students to abandon their chosen mathematical solution [4]. This forced compliance can create an unfair learning environment for students. The key success factor that makes students dare to solve problems is by giving problems. Teachers need to illustrate the importance of heuristics for solving mathematical problems [11]. Therefore, teachers need to let their students choose their own way to solve problems without fear.

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Heuristic as an adjective which means "helping to find" [6]. In line with this, heuristics are general guidelines that help individuals to make progress towards a solution [8]. Furthermore, heuristics are a guide that is needed in solving a problem which can lead to problem solving to find solutions to existing problems [7]. Heuristics are strategies for solving complex problems in the form of stories or words [2]. Based on the description that has been explained, heuristics are a general step that guides in solving problems to find solutions. Heuristics do not guarantee the right solution, but only guide in finding solutions where the steps in the heuristic do not require sequential steps. Several types of heuristics according to Fan & Zhu (2007) that can help in the process of solving problems are presented in Table 1 below.

Table 1. List of Problem Solving Heuristics

Heuristics	Description
Act it out	Using objects or people to show what is actually being described in the problem.
Change the point of view	Approach the problem from another perspective when a previous approach is ineffective.
Draw a diagram	Create a sketch based on available information to represent the problem visually.
Guess and check	Make a reasonable guess at the answer and then check the results to see if it works. If necessary, repeate the procedure to find the answer, or at least a close approximation.
Logical reasoning	Demonstrate that if a statement is accepted as true, then other statements can be proven true based on that statement.
Look for a pattern	Identify given patterns based on careful observation of common features, variations, or differences in numbers, shapes, etc. in then problem.
Make a systematic list	Build an organized list of all the possibilities for a givens situation and finally to find the answer.
Make a table	Organizing data into a table and then using the entries in the table to solve the problem.
Make suppositions	Making a hypothesis, and then based on the givens and hypothesis, figuring out the relationship between the known and unknown, and finally solving the problem.
Restate the problem	Restating the original problem so that the problem statement becomes familiar and easier to understand.
Simplify the problem	Changing the complex numbers or situations in the problem to be simpler without altering the problem mathematically.
Solve part of the problem	Breaking a problem into several subproblems, then solving them one by one, and finally solving the original problem.
Think of a related problem	Using methods/results of a related problem, or recalling a related problem, or considering a similar problems that have been solved before to solve the problem.
Use a model	Creating visual representations (e.g., using points, lines, or other easily understood symbols) to model information about quantities or relationships or changes involved in the problem.
Use an equation	Using letters as variables to represent unknown quantities in a problem, and setting and solving equations or inequalities to get the answer.
Use before–after Concept	Listing information given before and after action, and observing how it change between the two situations (from before to after) to find the solution.
Work backwards	Approaching a problem from its results or solutions backwards to find what conditions must ultimately be met.

(Fan & Zhu, 2007)

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The content used in this study is System of Linear Equations in Two Variables (SLETV) which is one of the main subjects of Algebra in class VIII. The context used to prepare questions is personal and social context. SLETV is a challenging mathematics subject matter for students because it requires good reasoning skills and questions are often given in contextual form to make them relevant to the real world. However, in reality, some students still have difficulty learning SLETV. Based on research, there are students who do not understand the meaning of the problem, have difficulty converting the problem situation to a mathematical model, do not understand the concept, and are formula-oriented which results in not being able to reach the right solution [12]. To solve problems in SLETV topic, there are several processes that students go through. Some of these processes require heuristics that can make things easier for students. Several opinions state that heuristics need to be strengthened in mathematics learning [1], [9].

Based on the explanation that has been explained, this study aims to describe students' heuristics in solving mathematical literacy problems on SLETV topic. Research conducted by Ruliani, et al. (2022) obtained results that female students used several heuristics in solving number pattern problems, including making systematic lists, guess & check, and using models. Besides that, only a female student samples were used in the study used the topic of number patterns. Meanwhile, in this study a sample of female and male students was used, and the problems used were mathematical literacy questions on SLETV topic.

II. RESEARCH METHODS

This study aims to describe students' heuristics in solving mathematical literacy questions on SLETV topic, so the type of research used is qualitative descriptive research. In this method, research results emphasize meaning rather than generalization. This research was conducted at one of the secondary schools in Bantul Regency in the odd semester of the 2023/2024 academic year. The characteristics of the research sample are a class that is superior to other classes of the same level according to the mathematics teacher in charge. Research subjects were selected using a purposive sampling technique to select subjects based on certain criteria because they wanted to know more about certain aspects of the research topic. The subject criteria are students who have studied SLETV topic, are communicative and are willing to be subjects. The selection of research subjects was carried out after grouping the test results that had been carried out. The subjects in this study were 3 students in VIII F class, consisting of one student with high test result criteria, one student with medium test result criteria and one student with low test result criteria. The three subjects are given different labels to make it easier to understand the research results presented in Table 2 below.

Table 2. Selected Subject Labels and Categories

No	Subject Name Initials	Subject Label	Test Result Criteria
1.	NZR	S1	High
2.	FNT	S2	Medium
3.	ARP	S3	Low

The main instrument in this study is the researcher himself with supporting instruments, namely a test for completing mathematical literacy questions, interview guidelines, and documentation. This instrument was used because it was considered effective for obtaining the required data. The test is given in writing in the form of 2 descriptive questions which have gone through a validation process first by expert judgment because good measuring instruments can obtain good results. The mathematical literacy questions for the SLETV topic used in this research can be seen in Fig 1 below.

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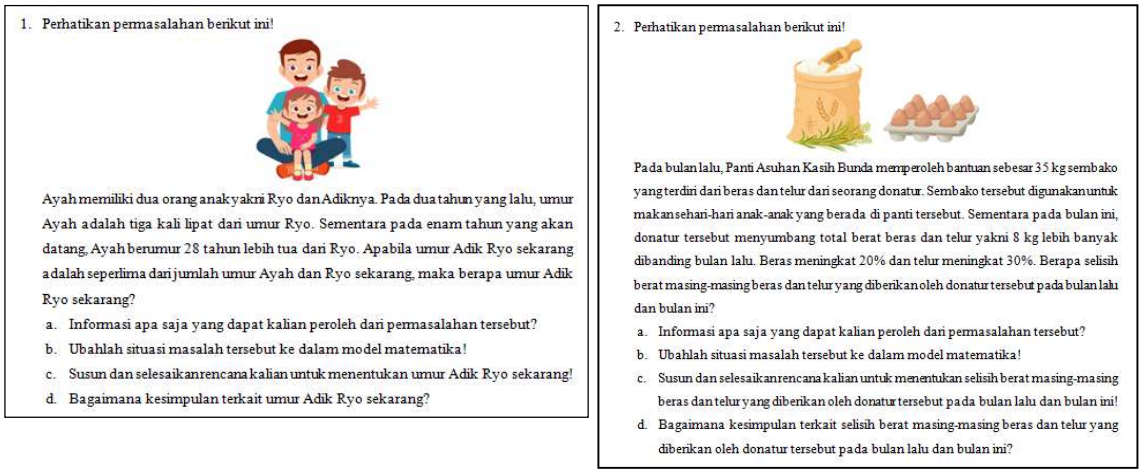

Fig 1. Mathematical Literacy Questions from SLETV Topic

III. RESEARCH RESULTS

Researchers collected data using mathematical literacy tests and interviews. The students' heuristic results in solving mathematical literacy questions on SLETV topic are as follows.

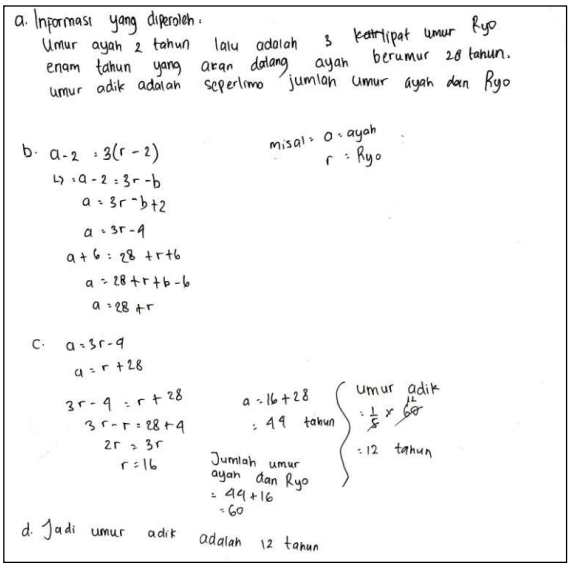

Fig 2. Answer Sheet for Mathematical Literacy Questions on SLETV Topic Number 1 by S1

Based on Fig 2, S1 can write down the known and important information on the problem completely and correctly. Furthermore, S1 makes an example to help in making a mathematical model using the known information with the substitution method. The mathematical model is then used to find the age of Father and Ryo using the substitution method. After that, S1 finds the age of Ryo's younger sibling using the known information, which is one-fifth of the sum of the ages of Father and Ryo, then S1 contains the related conclusions asked in the question. To find out more about the heuristics of subject S1 in solving problems, the following interview was conducted.

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Table 3. Results of S1 Interviews related to Mathematical Literacy Questions on SLETV Topic Number 1

Label	Interview Transcript
P	What information is known from the question?
S1	The information known is that Father's age 2 years ago was 3 times Ryo's age, 6 years from now Father's age will be 28 years older than Ryo, and the age of the younger sibling is one-fifth the sum of Father's and Ryo's ages
P	Then what is asked from the question?
S1	What is asked is Ryo's younger sibling's age now
P	To find Ryo's younger sibling, what steps do you take?
S1	The first step is to find Father's age, the second is to find Ryo's age by knowing Father's age, then adding Father's age and Ryo's age and the last step is to find Ryo's younger sibling's age which is one-fifth the sum of Father's and Ryo's ages
P	Before finding Father's and Ryo's ages, what do you do?
S1	Entering the previous assumption into the equation or making a mathematical model from what is known
P	Are you sure about the answer?
S1	I am sure about the answer

Based on the interview results, S1 can mention the information known and asked in the question correctly. S1 explained that to find the age of Ryo's younger sibling, the first step that must be taken is to make an assumption that is included in the heuristic 'make suppositions'. Then make a mathematical model of what is known which is included in the heuristic 'use a model'. After that, find the father's age, then find Ryo's age after knowing the father's age which is included in the heuristic 'use an equation'. The last step is to find the age of Ryo's younger sibling by adding the age of the father and the age of Ryo, then the total is divided by five. Furthermore, S1 makes a conclusion about the solution related to the problem in the question which is included in the heuristic 'restate the problem'. In general, S1 uses heuristics 'solve part of the problem' by finding the age of the father and the age of Ryo first before finding the age of Ryo's younger sibling.

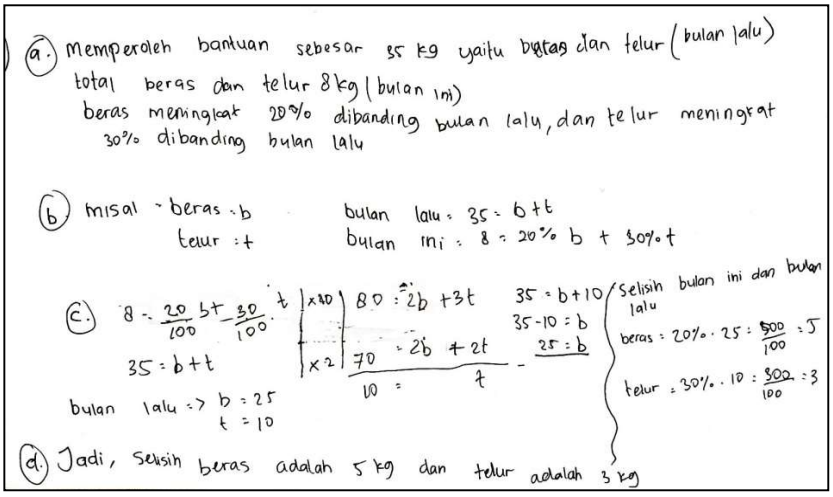

Fig 3. Answer Sheet for Mathematical Literacy Questions on SLETV Topic Number 2 by S1

Based on Fig 3, S1 can write down the known and important information on the problem completely and correctly. Furthermore, S1 makes an analogy to help in making a mathematical model using similar known information. The mathematical

model is then used to find the weight of rice and eggs this month using the elimination and substitution methods. After that, S1 finds the difference between each rice and egg last month and this month using the known information, namely the increase information, then S1 makes a conclusion related to the matter asked in the question. To find out more about the heuristics of subject S1 in solving the problem, an interview was conducted as follows.

Table 4. Interview Results of S1 related to Mathematical Literacy Questions on SLETV Topic Number 2

Label	Interview Transcript
P	What information is known from the question?
S1	The information known from the question is that the Kasih Bunda Orphanage received assistance of 35 kg, namely eggs and rice for last month, and this month received a total of rice and eggs that increased by 8 kg from last month, namely for rice increased by 20% and eggs increased by 30% compared to last month
P	Then what is asked from the question?
S1	What is being asked is the difference in weight of each rice and egg given last month and this month
P	What steps did you take to find the weight of each rice and egg last month and this month?
S1	For the first step, namely finding the assumption for rice and eggs, namely rice is said to be 'b' and eggs are said to be 't'. For the second step, namely creating a mathematical model by entering the known information. The third step is to solve the formula or mathematical model with what is known. The fourth step is to conclude the results of the calculation of the difference in rice and eggs for this month and last month
P	After you find the weight of rice and eggs, you look for the difference using the increase information this month, why?
S1	To be able to compare with the acquisition of rice and eggs obtained last month
P	Does the increase mean the difference?
S1	Yes
P	Are you sure about your answer?
S1	I am sure about my answer

Based on the interview results, S1 can mention the information known and asked in the question correctly. S1 explained that to find the difference between rice and eggs last month and this month, the first step that must be taken is to make an assumption that is included in the heuristic 'make suppositions'. Then make a mathematical model of what is known that is included in the heuristic 'use a model'. After that, find the weight of rice and eggs this month which is included in the heuristic 'use an equation'. In the elimination step, S1 also uses the heuristic 'simplify the problem' by changing from a fractional number to a regular number. The last step is to find the difference between rice and eggs last month and this month using the increase information. Furthermore, S1 makes a conclusion regarding the solution to the problem in the question that is included in the heuristic 'restate the problem'. In general, S1 uses the heuristic 'solve part of the problem' by finding the weight of rice and eggs this month first before finding the age of the difference between each rice and egg last month and this month.

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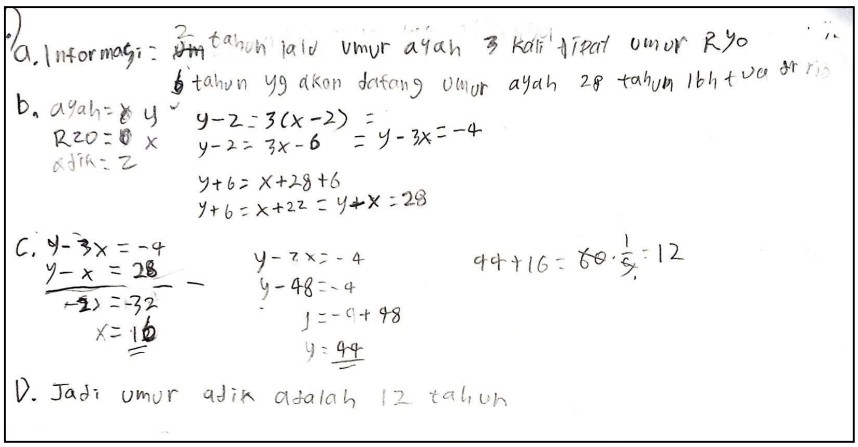

Fig 4. Answer Sheet for Mathematical Literacy Questions on SLETV Topic Number 1 by S2

Based on Fig 4, S2 can write down the known and important information on the problem completely and correctly. Furthermore, S2 makes an example to create a mathematical model using the known information. The mathematical model is used to find the age of Father and Ryo using the substitution and elimination methods. Then S2 finds the age of Ryo's younger sibling and concludes the results according to what is asked in the question. To find out more about the heuristics of subject S2 in solving problems, an interview was conducted as follows.

Table 5. Interview Results of S2 related to Mathematical Literacy Questions on SLETV Topic Number 1

Label	Interview Transcript
P	What information is known from the question?
S1	Father's age 2 years ago was 3 times of Ryo's age, 6 years from now Father's age is 28 years older than Ryo, and the age of the younger sibling is 1/5 of the age of Father and Ryo
P	Then what is asked from the question?
S1	Ryo's younger sibling's age now
P	To find Ryo's younger sibling, what steps did you take?
S1	Find Ryo's age and find Ryo's father's age, then find Ryo's younger sibling's age
P	Before finding the age of Father and Ryo, what did you do?
S1	Problem analysis
P	What did you do in part b?
S1	Make analogies and make equations from the problem information
P	What is the equation called?
S1	I don't know
P	It's called a mathematical model, are you sure about the answer?
S1	Not sure because I usually miscalculate

Based on the interview results, S2 can mention the information known and asked in the question correctly. To find the age of Ryo's younger sibling, S2 explained that the steps that must be taken are to make an analogy that is included in the heuristic ‘make suppositions’. Then make an equation from the information in the question that is included in the heuristic ‘use a model’. After that,

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find the age of Father and Ryo which is included in the heuristic 'use an equation'. Finally, find the age of Ryo's younger sibling. Next, S2 makes a conclusion about the solution related to the problem in the question that is included in the heuristic 'restate the problem'. In general, S2 uses heuristics 'solve part of the problem', before finding the age of Ryo's younger sibling, S2 finds the age of Father and Ryo first.

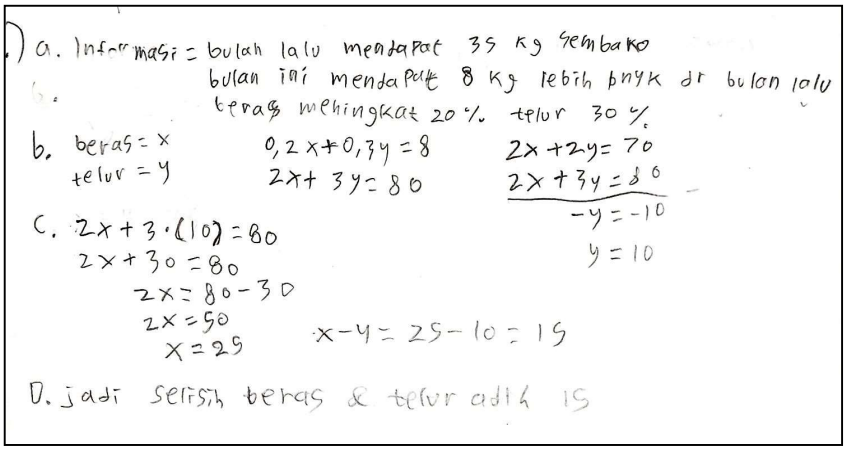

Fig 5. Answer Sheet for Mathematical Literacy Questions SLETV Topic Number 2 by S2

Based on Fig 5, S2 can write down the known and important information on the problem completely and correctly. Then S2 makes an analogy to help in making a mathematical model using the known information. The mathematical model is then used to find the weight of rice and eggs this month using the substitution and elimination methods. Furthermore, S2 finds the difference between rice and eggs last month and this month using the results of the weight of rice and eggs this month which does not match what was asked. After that, S2 makes a conclusion of the solution but it is still not right. To find out more about the heuristics of subject S2 in solving problems, the following interview was conducted.

Table 6. Interview Results of S2 related to Mathematical Literacy Questions on SLETV Topic Number 2

Label	Interview Transcript
P	What information is known from the question?
S1	Last month's aid was 35 kg and this month's aid is 8 kg more with rice increasing by 20% and eggs increasing by 30%
P	Then what is asked from the question?
S1	Difference in weight of rice and eggs
P	What steps did you take to find the weight of each rice and egg last month and this month?
S1	Make an equation, but first make an example, for example 'x' is rice and 'y' is eggs. Then solve the equation that has been made
P	After you find the weight of rice and eggs, you immediately find the difference using the results of the weight of rice and eggs this month, why?
S1	Because it is the difference in weight of rice and eggs
P	That is the difference in weight of rice and eggs this month while what is asked is the difference of each rice and egg last month and this month
S1	Oh yeah, I was not careful in reading the question
P	Are you sure about the answer?
S1	Same as before, not sure

Based on the interview results, S2 can mention the information known and asked in the question correctly. To find the difference between rice and eggs last month and this month, S2 explained that the steps that must be taken are to create an

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example that is included in the heuristic 'make suppositions'. Then create a mathematical model that is included in the heuristic 'use a model'. In creating a mathematical model, S2 also uses the heuristic 'simplify the problem' by changing from a fractional number to a decimal number. Next, find the weight of rice and eggs this month which is included in the heuristic 'use an equation'. Finally, find the difference between rice and eggs last month and this month but it is not right. After that, S2 concludes the solution related to the problem in the question that is included in the heuristic 'restate the problem'. In general, S2 uses heuristics to 'solve part of the problem'.

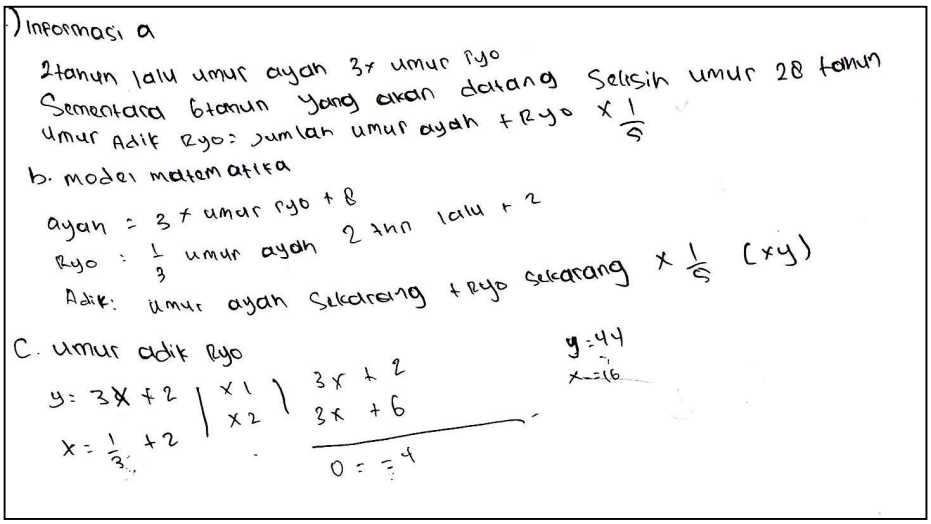

Fig 6. Answer Sheet for Mathematical Literacy Questions on SLETV Topic Number 1 by S3

Based on Fig 6, S3 can write down the known and important information on the problem completely and correctly. Furthermore, S3 creates a mathematical model using the known but less precise information. After that, S3 tries to do elimination using the mathematical model that was created but was not continued. To find out more about the heuristics of subject S3 in solving the problem, an interview was conducted as follows.

Table 7. Interview Results S3 related to Mathematical Literacy Questions on SLETV Topic Number 1

Label	Interview Transcript
P	What information is known from the question?
S1	Two years ago, Father's age was 3 times of Ryo's age, while in the next 6 years the age difference will be 28 years, and Ryo's younger sibling's age is the sum of Father's age and Ryo's age then multiplied by 1/5
P	Then what is asked from the question?
S1	Ryo's younger sibling's age
P	To find Ryo's younger sibling, what steps did you take?
S1	Make an equation first but I'm still confused about how to make it
P	The equation is called a mathematical model. Therefore, you only repeat the information known in the question in part b?
S1	Yes
P	Does that mean you are not sure about the answer?
S1	Yes, not sure

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Based on the interview results, S3 was able to mention the information known and asked in the question correctly. S3 explained that he was still confused in making his mathematical model, therefore S3 only repeated the information known in the question in the mathematical model section. Therefore, S3 did not continue his steps to find a solution to the problem in the question. So in general, S3 did not use any heuristics in solving the question.

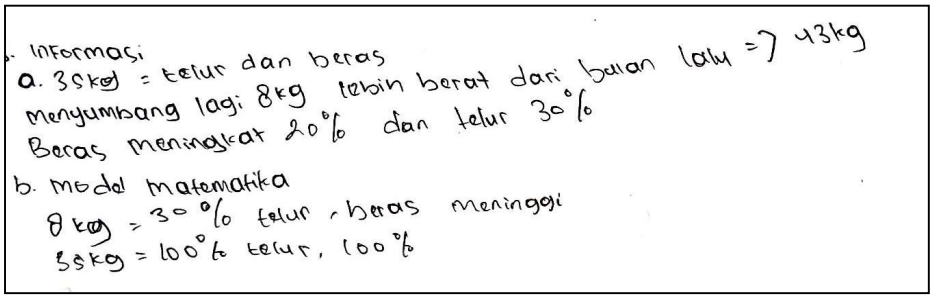

Fig 7. Answer Sheet for Mathematical Literacy Questions on SLETV Topic Number 2 by S3

Based on Fig 7, S3 can write down the known and important information on the problem correctly. Then, S3 creates a mathematical model using information that is known but not quite right. To find out more about the heuristics of subject S3 in solving the problem, the following interview was conducted.

Table 8. Results of S3's Interview related to Mathematical Literacy Questions on SLETV Topic Number 2

Label	Interview Transcript
P	What information is known from the problem?
S1	Rice and eggs are 35 kg and contribute another 8 kg heavier than last month, rice increased by 20% and eggs increased by 30%
P	Then what is asked from the problem?
S1	Difference between rice and eggs this month
P	What steps did you take to find the weight of each rice and egg last month and this month?
S1	Same as the previous question, I'm still confused on how to make the equation
P	Okay, so you're not sure about the answer?
S1	Yes, I'm not sure

Based on the results of the interview, S3 was able to mention the information known and asked in the question correctly. Similar to the previous question, S3 explained that he was still confused in the process of making a mathematical model. Therefore, S3 did not continue his steps to find the answer to what was asked in the question. So in general, S3 did not use any heuristics in solving the question.

IV. DISCUSSION

This study aims to describe students' heuristics in solving mathematical literacy questions on SLETV topic. Based on the results of the study that has been conducted, S1 who has high test result criteria can write and mention the information known and asked completely and correctly, which means that S1 can understand the problem well. In general, according to Fan & Zhu's (2007) heuristics, S1 uses heuristics to solve part of the problem by solving the problem one by one to find information that is not yet known and finally solves the original problem. Before finding information that is not yet known, S1 first uses the heuristic ‘make suppositions’ by using letters as variables that represent unknown quantities or information in the problem to help create a

mathematical model. Then S1 uses the heuristic 'use a model' by creating an equation representation to model information about the quantities or relationships involved in the problem.

After creating a mathematical model, S1 uses the model or equation to find unknown information. In this case, S1 performs a heuristic 'use an equation' by solving the equation or mathematical model that has been created to get the answer using the elimination and substitution methods. In this process, S1 also uses a heuristic 'simplify the problem' by changing the form of a fraction to a regular number in the elimination process to facilitate the calculation process. Finally, S1 uses a heuristic 'restate the problem' by restating the initial problem to draw conclusions related to what is asked in the question.

Based on the details that have been described, it can be concluded that S1 can solve mathematical literacy problems on SLETV topic well using several heuristics such as 'make suppositions', 'use a model', 'use an equation', 'simplify the problem', 'solve part of the problem', and 'restate the problem'. In general, S2 who has moderate test result criteria also uses the same heuristics as S1 in solving mathematical literacy problems on SLETV topic. The difference is in the heuristic 'simplify the problem', S2 uses the heuristic in the process of making a mathematical model, while S1 in the elimination process.

Furthermore, S3 who has low test result criteria can write and mention the information that is known and asked completely and accurately, but S3 is still confused in the process of making a mathematical model. What should be done before making a mathematical model is to make an suppositions, but S3 did not do that either. Therefore, S3 did not continue his steps to find a solution to the problem in the question. Based on these details, it can be concluded that S3 did not carry out any heuristics in solving mathematical literacy problems on SLETV topic. Several heuristics according to Fan & Zhu (2007) carried out by students in solving mathematical literacy problems on SLETV topic can be seen in Table 9 below.

Table 9. Student Heuristics in Solving Mathematical Literacy Problems on SLETV Topic

Heuristics	Subject 1	Subject 2	Subject 3
Make suppositions	Using letters as variables that represent unknown quantities or information in a problem to help create a mathematical model	Using letters as variables that represent unknown information in a problem to help create a mathematical model	-
Use a model	Creating equation representations to model information about quantities or relationships involved in a problem	Creating equation representations to model information known in a problem	-
Use an equation	Solving equations or mathematical models that have been created to get answers using the elimination and substitution methods	Solving equations or mathematical models to find solutions using the elimination and substitution methods	-
Simplify the problem	Changing the form of fractional numbers to ordinary numbers in the elimination process to facilitate the calculation process	Changing the form of fractional numbers to decimal numbers in creating mathematical models to facilitate the calculation process	-
Solve part of the problem	Solve problems one by one to find unknown information and finally solve the original problem	Solve problems one by one to find unknown information and then solve the original problem	-
Restate the problem	Restate the initial problem to make a related conclusion that is asked in the question	Restate the initial problem to conclude the solution to the problem in the question	-

V. CONCLUSION

Overall, some students can solve mathematical literacy problems on SLETV topic well. Students can write and mention information that is known and asked well. Students with high and medium test result criteria tend to be systematic in solving problems and understand the problems asked well. In solving mathematical literacy problems on SLETV topic, students with high and medium test result criteria use heuristics 'make suppositions', 'use a model', 'use an equation', 'simplify the problems', 'solve part of the problem', and 'restate the problem'. In contrast, students with low test result criteria do not use any heuristics in solving mathematical literacy problems on SLETV topic because still confused in the process of making mathematical models. Even so, students with low test result criteria can write and mention information that is known and asked in the problem well.

After knowing the heuristics carried out by students in solving mathematical literacy problems on SLETV topic, this can then be used as a reflection for teachers to emphasize the process of changing problem situations into mathematical models. This is because there are still students who are confused about the process of making mathematical models, thus hindering the process of solving problems on SLETV topic. One way that can be done is to accustom students to solving non-routine problems that contain contextual problems. For further research, it is expected to use different types of questions with different class levels to find out what heuristics students use in solving these problems.

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REFERENCES

[1] R. R. Andrade, E. C. Fortes, and R. A. Mabilangan, "Problem solving heuristics and mathematical abilities of heterogeneous learners," Universal Journal of Educational Research, vol. 8, no.11, pp. 5114–5126, 2020.

[2] M. Ang,, and E. Lau, How to raise an intelligent child (M. Ang (ed.)). Seriously Addictive Mathematics, 2019.

[3] L. Fan, and Y. Zhu, "Representation of problem-solving procedures: A comparative look at China, Singapore, and US mathematics textbooks," Educational Studies in Mathematics, vol. 66, no. 1, pp. 61–75, 2007.

[4] J. S. Kozlowski, and S. Si, "Mathematical Sreativity: A Vehicle to Foster Equity," Thinking Skills and Creativity, vol. 33, pp. 1-8, 2019.

[5] OECD, Programme For International Student Assesment (PISA) Result From PISA 2022. Paris: OECD Publishing, 2023.

[6] G. Polya, How to Solve it. New Jersey: Princeton, 1973.

[7] D. Pramita, and M. Rusmayadi, "Pengaruh strategi heuristik pada pendekatan pemecahan masalah dalam pembelajaran matematika kelas VIII SMP," JTAM (Jurnal Teori dan Aplikasi Matematika), vol. 2, no. 2, pp. 157–161, 2018.

[8] A. H. Schoenfeld, Mathematical Problem Solving. USA: Academic Press, Inc, 1985.

[9] J. W. Son, and M. Y. Lee, "Exploring the Relationship Between Preservice Teachers' Conceptions of Problem Solving and Their Problem-Solving Performances," International Journal of Science and Mathematics Education, vol. 19, no. 1, pp. 129–150, 2021.

[10] I. D. Ruliani, Y. Fuad, and R. Ekawati, "Heuristik Siswa Perempuan SMP dalam Memecahkan Masalah Pola Bilangan," JPMI – Jurnal Pembelajaran Matematika Inovatif, 5 (3), 625-638, 2022.

[11] A. Vongyai, and T. Noparit, "Using Heuristic Strategies to Promote Mathematics Problem Solving Ability of Grade 10 Students," PEOPLE: International Journal of Social Sciences, vol. 5, no. 1, pp. 952-968, 2019.

[12] A. Yusuf, and N. Fitriani, "Analisis Kesalahan Siswa SMP dalam Menyelesaikan Soal Persamaan Linear Dua Variabel di SMPN 1 Campaka Mulya Cianjur," JPMI – Jurnal Pembelajaran Matematika Inovatif, vol. 3, no. 1, 2020.