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Analysis of Students' Mathematical Literacy Ability in Solving Ethnomathematical Problems on SPLDV Material Judging from Student Learning Interests

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ABSTRACT

Interest in learning as a driving factor has an important role in improving students' mathematical literacy skills. One effort to attract students' attention is to make learning innovations such as incorporating ethnomathematics in learning. This study aims to describe students' mathematical literacy ability in solving ethnomathematical problems on spldv material in terms of student learning interests. This research is a qualitative research with a descriptive approach. The subjects of this study were 3 out of 29 grade VIIIB students who had been selected for high, medium and low learning interest categories. Data collection was carried out by questionnaires, tests and interviews. The main instrument in this study is an ethnomathematics-based mathematical literacy test. Data analysis techniques use interactive analysis. The results showed that the cause of students' low mathematical literacy ability was due to low interest in learning. Students with a high interest in learning are able to meet all indicators of mathematical literacy. Students with an interest in learning are having difficulty at number 1, but at question number 2 are able to meet all indicators of mathematical literacy. While students with low interest in learning for questions number 1 only meet indicators 1), 2), 3), 6) and at number 2 only meet indicators 1), 2), and 3) only. That is, students with high and moderate interest in learning have mathematical literacy skills that work well, while students with low interest in learning need teacher help to improve their mathematical literacy skills.
Keywords: *creative thinking process, problem-solving, numeracy, adversity quotient.*

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INTRODUCTION

Mathematics is an important subject to be given to students from elementary school to college, in order to equip students with several competencies in the field of education that can be used to solve problems in everyday life. Because mathematics has a relationship with its application in everyday problems, not only as a scientific discipline (Furqon et al., 2021). The National Council of Teachers of Mathematics (NCTM) in stating that the objectives of mathematics learning consist of five competencies, namely understanding mathematical concepts, mathematical reasoning, mathematical communication, mathematical connections, and solving mathematical problems. The ability that contains these five competencies is referred to as deep mathematical literacy ability (OECD, 2016) is the ability of students to formulate, use, and interpret mathematics into various contexts.

In mathematical literacy skills as well as research (Yuliyani & Setyaningsih, 2022), There are only six indicators that underlie the student literacy process to solve contextual problems mathematically, namely communication, mathematization, representation, reasoning and argumenation, designing strategies to solve problems, using symbolic, formal, and technical language and operations, because for indicators using mathematical tools are not related to the material of two-variable linear equation systems. As for (Hapsari, 2019) mentioned that the mathematical literacy ability of students in Indonesia is still relatively low. In line with this, the results of interviews in the field also showed the same results. This is because students still find it difficult to find the common thread or core of the problem at hand and very rarely try to solve problems with real context situations outside of classroom learning. In addition, students' ability to master mathematical concepts is still lacking so that students cannot solve complete and structured mathematical literacy problems. So there needs to be innovation in mathematics learning.

Innovation in mathematics learning can support students' mathematical literacy, for example by incorporating ethnomathematical elements into learning (Kehi, 2019). The use of ethnomathematics can be used as a new development in mathematics learning. It should be beneficial to students because it intends to provide a connection between the life around them and mathematical problems. (Ishartono & Ningtyas, 2021) Defining ethnomathematics as the study that explains the relationship between culture and mathematics or mathematics education. By involving culture, ethnomathematics becomes one of the studies that can be used to facilitate students in understanding mathematics (Maulana, 2022).

In addition, ethnomathematics can also be an alternative in creating fun and interesting learning because it allows contextual meaning based on students' experiences as members of cultural communities (Fajriyah, 2018). In this study, the two-variable linear equation system became a medium for the application of ethnomathematics to learning because its application is very close to students' daily lives. So it is expected to provide more understanding to students to be able to solve context problems around them.

In addition to students' problems in solving context problems, low interest in learning is also one of the internal problem factors that affect students' mathematical literacy skills

(Kenedi & Helsa, 2018). This is in line with the results of the study (Rodhi, 2021) which shows that the fundamental problem is still low mathematical literacy skills caused by low interest of students in learning mathematics. When students have a low interest in learning about mathematics, their mathematical literacy ability is also low, on the other hand, if students have a high interest in learning mathematics, their mathematical literacy ability is also high.

The results of interviews in the field show that interest in learning has an influence on students' mathematical literacy which is characterized by only some students who have the initiative to learn through other media that are not used by teachers such as YouTube and private tutoring. (Ricardo & Meilani R I, 2017) Defines interest in learning as a motivating factor for students in learning based on students' interest or liking and desire to learn. So that interest in learning is very important to be developed in students, so that students have a high interest in learning, it is necessary to build awareness to students that learning will bring improvement to themselves (Friantini & Winata, 2019). In this study, researchers used four indicators of interest in learning according to Slameto in (Azzaqi & Sutarni, 2017) Among others, 1) there is a feeling of liking for learning, 2) there is more attention from students to learning, 3) students are active and enthusiastic during learning, and 4) students feel happy with learning at school.

Based on the explanation above, researchers are interested in examining how students' mathematical literacy skills in solving ethnomathematical problems on two-variable linear equation system material in terms of student learning interests. The purpose of this study is to describe students' mathematical literacy ability in solving ethnomathematical problems on spldv material in terms of student learning interests.

METHOD

This research is a descriptive type research with a qualitative approach. The focus of this study is to describe students' mathematical literacy skills in solving ethnomathematical problems in SPLDV material in terms of student learning interests. Correspondingly, (Moloeng, 2017) mentioned that the qualitative approach is oriented to describe and understand the phenomena that occur and is related to the actions, behaviors, perceptions and motivations of the research subject as a whole.

This research was carried out at SMP Negeri 16 Surakarta with the main subject being grade VIIIB students with a total of 29 people conducted in June 2023. In sample selection, researchers use purposive sampling, which is a sampling technique that is carried out based on certain characteristics. The research sample was determined based on the results of the learning interest questionnaire score. Data collection techniques were carried out through learning interest questionnaires, ethnomathematics-based mathematical literacy tests, and interviews. The learning interest questionnaire was analyzed using a Likert scale which is used to measure the attitudes, opinions, and perceptions of a person or group of people about social phenomena. After obtaining a learning interest score, then the value is grouped based on the categories presented in the table as follows:

Table 1. Learning Interest Categories

Category	Value Limit
High	$X \geq (\bar{x} + SD)$
Moderate	$(\bar{x} - SD) < X < (\bar{x} + SD)$
Low	$X \leq (\bar{x} - SD)$

(Arikunto, 2013).

Information:
X : Total score
$\bar{x}$: Average score
SD : Standard Deviation

The ethnomathematics-based mathematical literacy test with two-variable linear equation system material and interviews were conducted with subjects who had high, medium, and low interest in learning. The test instrument used is 2 questions in the form of a description containing 6 indicators of mathematical literacy as researched (Yuliyani & Setyaningsih, 2022) in (OECD, 2017) which are presented in the following table 2.

Table 2. Mathematical Literacy Test Assessmen

No.	Indicators	Assessment Aspect
1.	Communication	Students are able to write information that is known and asked appropriately and completely
2.	Mathematization	Students are able to create mathematical models and give explanations appropriately and completely
3.	Representation	Students are able to represent by using mathematical model design to get the right calculation results
4.	Reasoning and Argument	Students are able to read the context of the problem and do reasoning by checking the correctness of the solution to translate the calculation results into conclusions by providing arguments
5.	Designing strategies to solve problems	Students are able to design strategies in a structured manner to solve problems
6.	Using symbolic, formal, and technical language and operations	Students are able to read the context of the problem and use language and symbolic operations formally in accordance with the technicalities in solving the problem

To maintain the credibility of this study, researchers used triangulation of data sources conducted through questionnaires, tests, and interviews. The data analysis used is an interactive model of (Miles & Huberman, 1994) which has three components, among others: data reduction, data presentation, and conclusions.

RESULTS AND DISCUSSION

The following is a recapitulation of the questionnaire data with 30 statements that meet the 4 indicators of learning interest that have been presented in table 3.

Table 3. Results of Recapitulation of Questionnaire Data

No.	Category	Sum
1	High	4
2	Moderate	19
3	Low	6
	Sum	29

Based on table 3, it can be seen that there are 4 students with high learning interest category, 19 students with medium learning interest category, and 6 students with low learning interest category. In each category, one student was taken as a subject in this study. The results of mathematical literacy ability tests from students with high (S1), medium (S2), and low (S3) learning interests were analyzed using mathematical literacy ability indicators as follows.

Mathematical literacy skills for students with high interest in learning

The results of the work of students with the category of high learning interest (S1) related to ethnomathematics-based mathematical literacy skills will be presented in the discussion as follows.

Answer number 1

Based on figure 1 below, it can be seen that S1 is able to convey known and queried information from a given problem. S1 is also able to understand the context of the problem to make mathematical models and provide explanations. By using mathematical models, S1 can represent to produce precise calculations. In addition, S1 is able to design a structured solving strategy with a combined method and use symbolic operations that are in accordance with mathematical rules to solve problems. Despite errors in calculating, S1 can correct and produce the right solution. Because S1 is able to evaluate by re-examining the correctness of the solution it obtained. This shows that the reasoning ability possessed by S1 is very good, so it can provide conclusions with arguments.

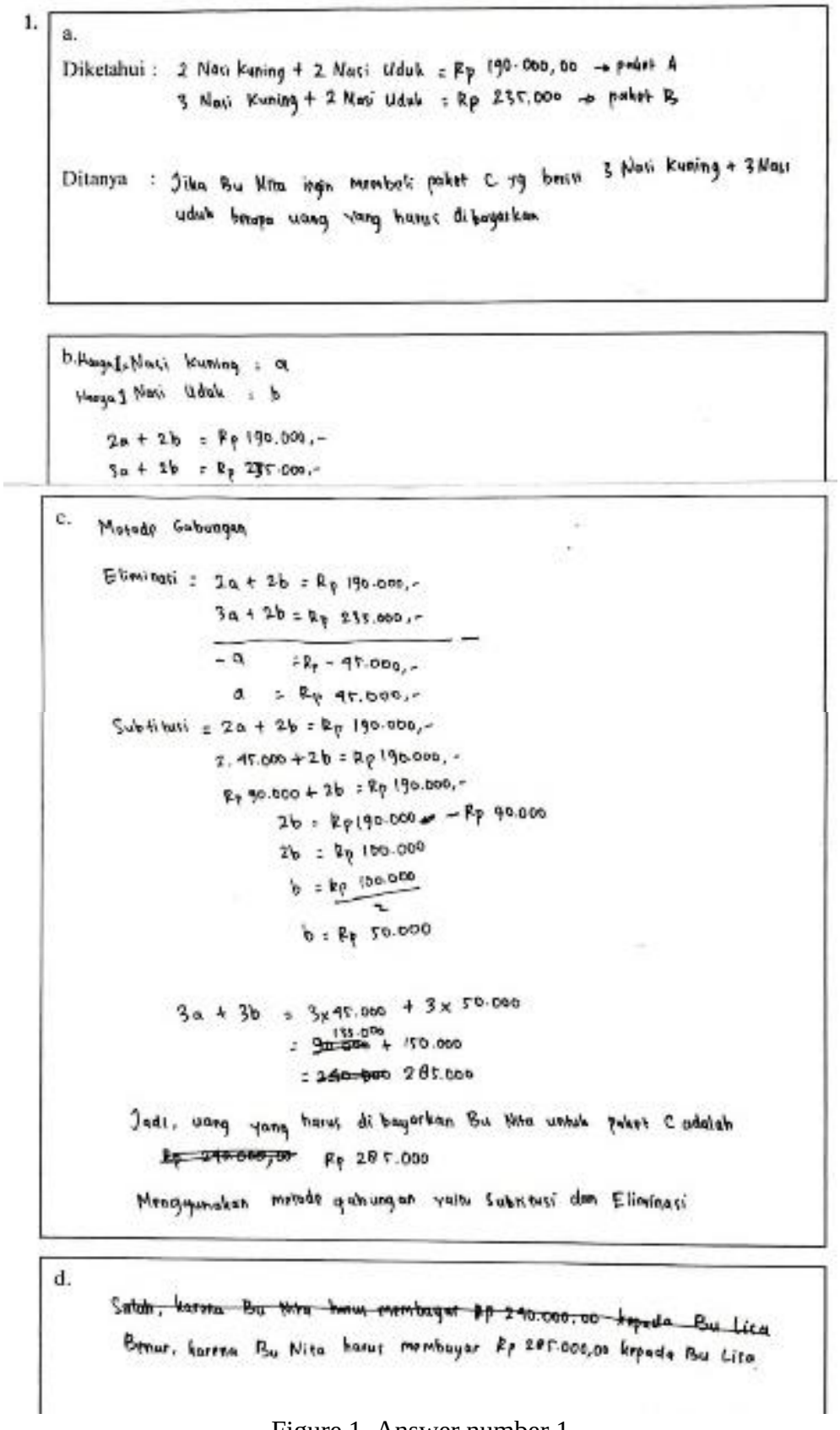


Figure 1. Answer number 1

Thus, it can be concluded that S1 in solving ethnomathematics-based mathematical literacy problems in number 1 can meet all mathematical literacy indicators. This conclusion is reinforced by the results of the interview with S1 below.

P : "How do you turn the problems you read into mathematical models?"
S1:" First suppose yellow rice is a, uduk rice is b, the mathematical model is 2a plus 2b equals 190,000, then make the equation that both 3a plus 2b equal to 235,000."
P :"What representation do you apply? Include the reason!"
S1:"Equations, because the mathematical model takes the form of equations"
P :"Whether the solution you wrote earlier already uses language, symbolic operations, and processes according to mathematical definitions and rules.?"
S1:"Already, using the operations of addition, subtraction, multiplication and there is also kak division, and the process is also appropriate."

Answer number 2

Based on figure 2 below, it can be seen that S1 has no difficulty in solving the questions given where S1 is able to describe the information known and asked completely and is able to understand the problems given so that it can make mathematical models and provide appropriate information. S1 can also represent with mathematical models that have been made to produce precise calculations. As for using the combined method, S1 is able to design a solution strategy in sequence and use symbolic operations to obtain solutions. In addition, S1 is able to ascertain the correctness of the solutions it obtains with its reasoning ability, so that it can provide conclusions with its own arguments. This can happen because S1 has high confidence in the completion step he chooses.

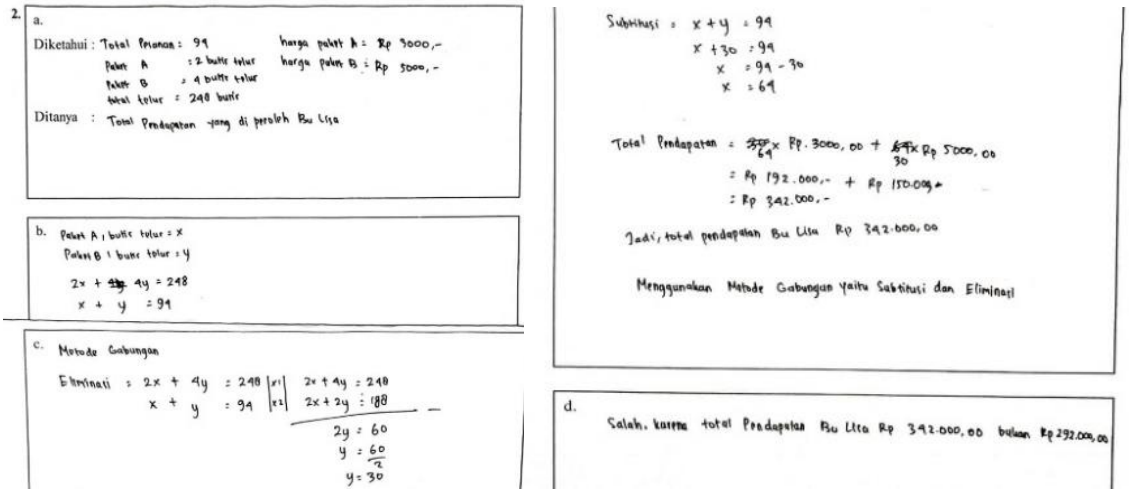


Figure 2. Answer number 2

Thus, it can be concluded that S1 in solving ethnomathematics-based mathematical literacy problems can meet all indicators of mathematical literacy. This conclusion is reinforced by the results of the interview with S1 below.

P : "How do you turn the problems you read into mathematical models?"
S1:"For example, package A is x, package B is y, so the mathematical model is 2x plus 4y equals 248 gitu, then package A plus package B so x plus y equals a total order of 94."
P : "What method do you use? Explain the stages!"
S1:" Emimination and substitution, the stage is the first equation multiplied by 1 and the second multiplied by 2 so that the coefficient of x is equal, then subtracted obtained 2y equals 60, then y equals 60 divided by 2 equals 30. Continuously substituted to the second equation obtained x equals 94 minus 30 equals 64."

Based on the results of the analysis supported by the interview results above, it can be seen that S1 has met all mathematical literacy indicators. Seen in the interview session, S1 without hesitation can answer clearly and completely where S1 can verbally convey what is known and asked, and is able to explain the process of making mathematical models and the stages of the strategies they use in detail and clearly. In addition, S1 can use symbolic operations and representations in the form of equations to generate appropriate solutions. S1 can explain the conclusions obtained accompanied by arguments. Thus, students with high interest in learning also have high mathematical literacy skills. As the results of research (Saraswati et al., 2023) which states that there is an influence of interest in learning on mathematical literacy skills.

Mathematical literacy skills for students with moderate interest in learning

The results of the work of students with moderate learning interest (S2) categories related to ethnomathematics-based mathematical literacy skills will be presented in the following discussion.

Answer number 1

As for figure 3 below, it can be seen that S2 is able to write down the information known and asked, but there is an error in writing the information asked, which should be Mrs. Nita, not Mrs. Lisa. However, in formulating a mathematical model of a given problem, S2 has no difficulty. S2 can understand problems by doing representations to get solutions and are able to solve problems with appropriate and coherent methods using symbolic operations that are in accordance with mathematical rules. In summing up the problem, S2 still has typos. S2 can provide conclusions with arguments based on reasoning ability. S2 is not aware that it has a typographical error even until a conclusion is found.

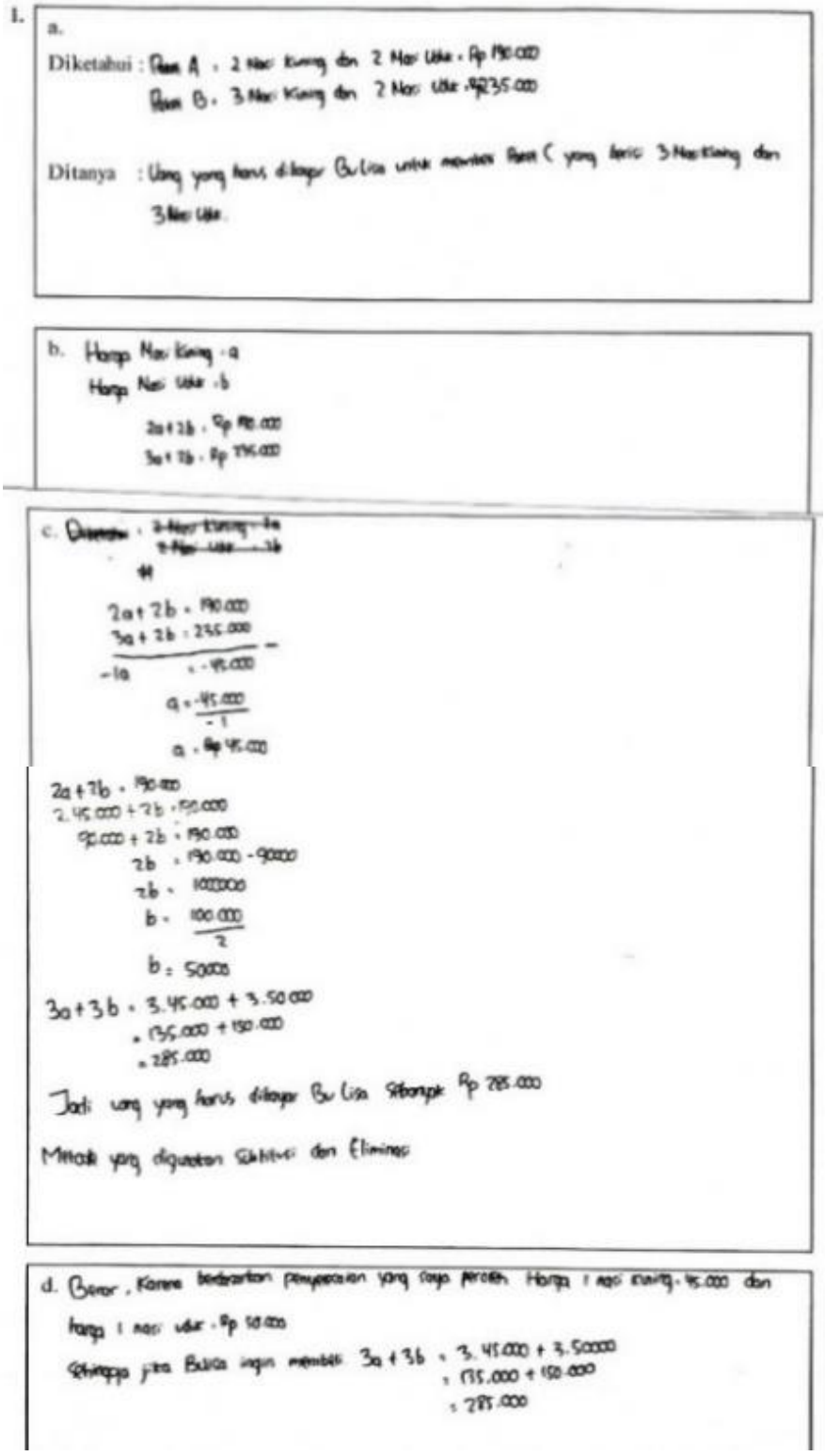


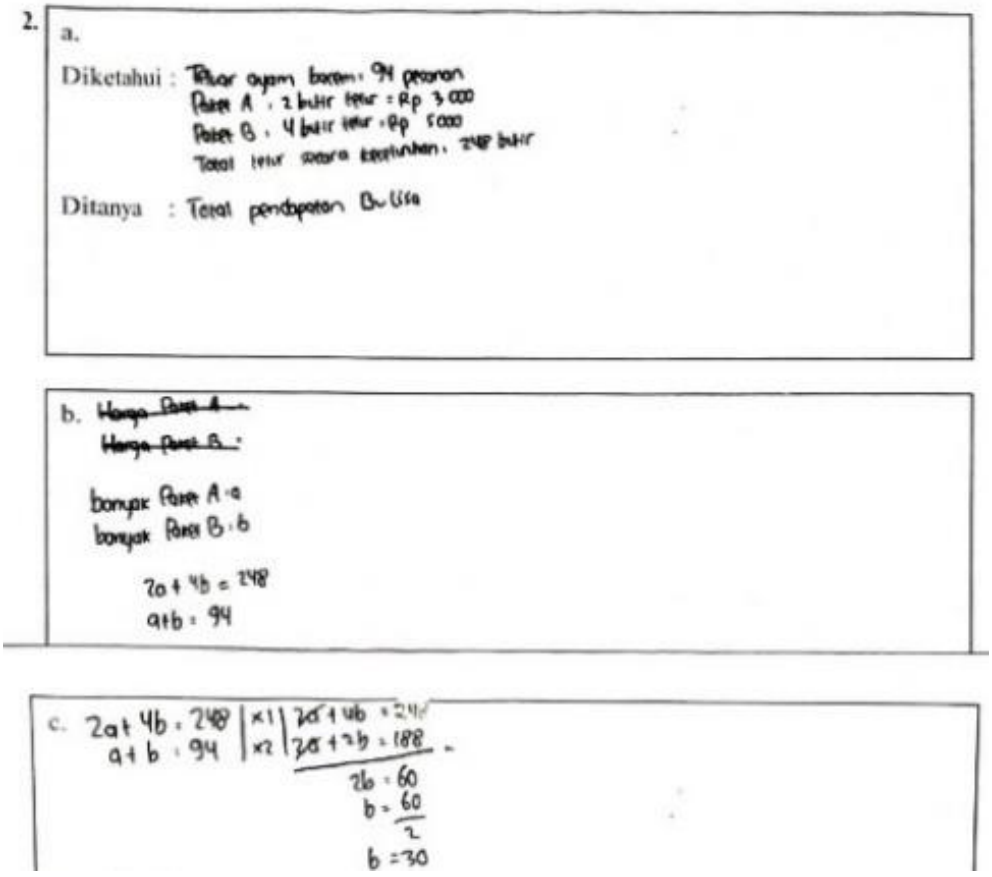
Figure 3. Answer number 1

Thus, it can be concluded that S2 in doing ethnomathematics-based mathematical literacy problems only has difficulties in indokator 1). This conclusion is reinforced by the results of the interview with S2 below.

P : "What information do you know and ask from the questions you read?"
S2:" What is known, package A contains 2 Yellow Rice and 2 Uduk Rice costs IDR 190,000, then package B contains 3 Yellow Rice and 2 Uduk Rice costs IDR 235,000. The question was the money that Mrs. Lisa had to pay to buy package C which contained 3 yellow rice and 3 uduk rice"
P :"What conclusions did you get after getting a solution??"
S2:"In conclusion, it is true that Mrs. Lisa paid IDR 285,000 because the price of 1 yellow rice is IDR 45,000 and uduk rice is IDR 50,000, if 3 yellow rice and 3 uduk rice are IDR 285,000"
P :"Whether the solution you wrote earlier already uses language, symbolic operations, and processes according to mathematical definitions and rules.?"
S2:"Already, use language and mathematical operations as well as process the same rules"

Answer number 2

Based on figure 4 below, it can be seen that S2 is able to understand the problem by writing down the information that is known and asked completely. S2 has no difficulty in formulating mathematical models and representing problems to get the right solution and is able to design structured strategies using language, operations and processes that are in accordance with mathematical rules. In providing conclusions, S2 is able to answer by including arguments according to their reasoning abilities. That is, S2 can re-check the correctness of the solution so as to get the right results.



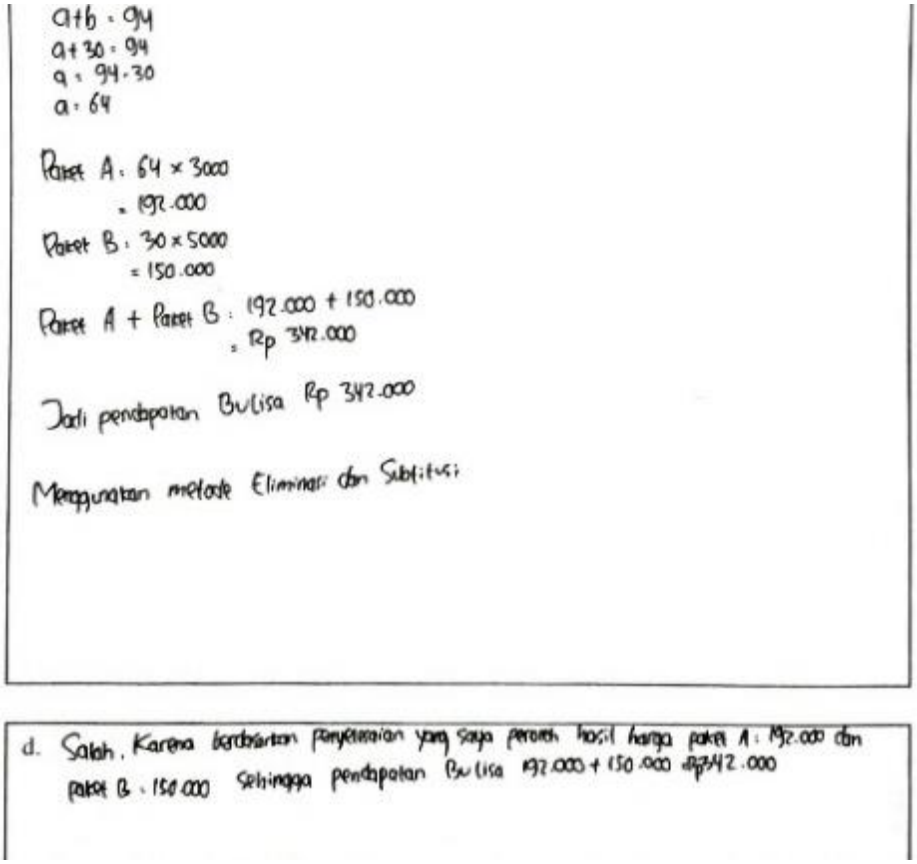


Figure 4. Answer number 2

Thus, it can be concluded that S2 in solving ethnomathematics-based mathematical literacy problems in number 2 is able to meet all mathematical literacy indicators. This conclusion is reinforced by the results of the interview with S2 below.

P :"What representation do you apply? Include the reason!"
S2:"Equations, because the problem is converted to a mathematical model in the form of equations"
P : "What method do you use? Describe the stages!"
S2:"Substitution and elimination. The stage, equation 1 is also minus equation 2, the result is 2b equals 60, so b equals 60 divided by 2 equals 30. Continue to put into equation 1, so a plus 30 equals 94, well a equals 94 subtracted 30 equals 64."
P :"Whether the solution you wrote earlier already uses language, symbolic operations, and processes according to mathematical definitions and rules.?"
S2:"Already, use language and mathematical operations as well as process the same rules"

Based on the results of analysis and interviews with S2, it can be seen that S2 meets most of the indicators of mathematical literacy and only has difficulty for indicator 1) in number 1. It can also be seen in the interview session, S2 is still based on the answer. In the process, S2 can mention what is known and asked in full. In addition, S2 can explain the stages in turning problems into mathematical models and formulate structured strategies using language and symbolic operations according to mathematical rules, and can provide conclusions accompanied by arguments. As the results of research

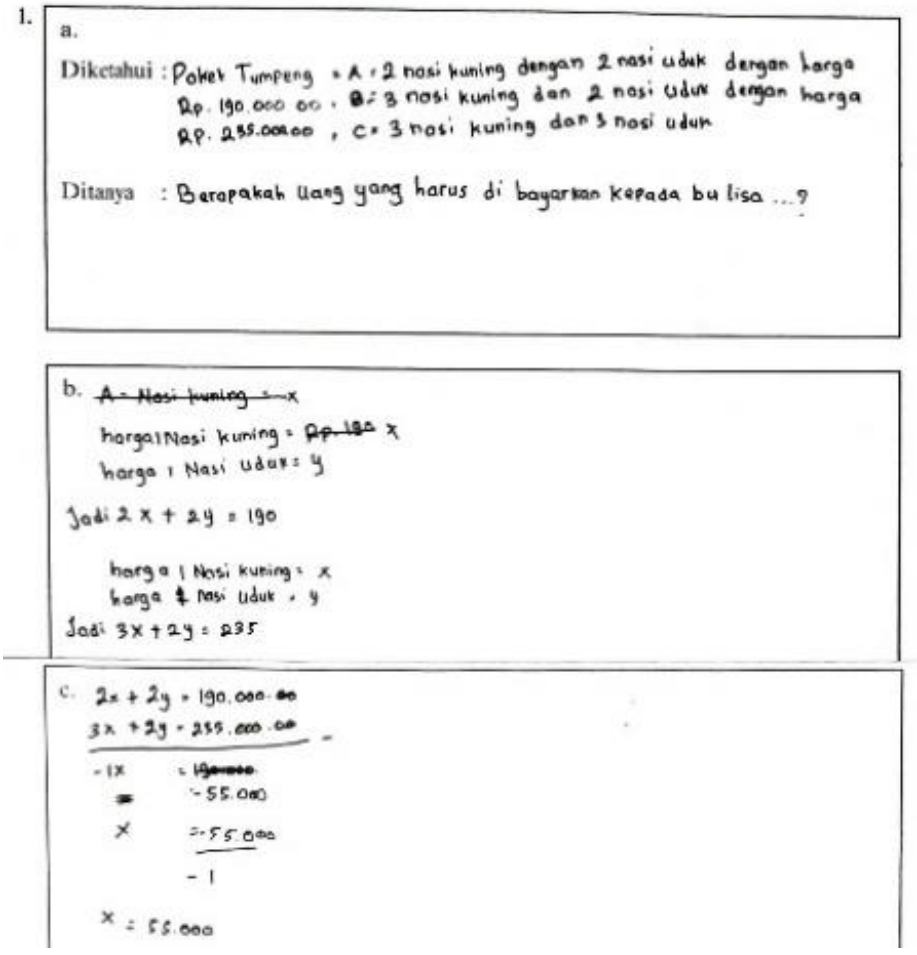
(Kasyadi & Virgana, 2018) which states that interest in learning has an influence on improving students' mathematical literacy skills.

Mathematical literacy skills for students with low interest in learning

The results of the work of students with low learning interest (S3) related to ethnomathematics-based mathematical literacy skills will be presented in the following discussion.

Answer number 1

Based on figure 5 below, it can be seen that S3 can understand the meaning of the problem by mentioning the information known and asked. S3 has an error in modeling the problem into a mathematical model where S3 only writes 190 and 235 without the nominal thousands behind it. However, in the interview session, S3 can explain the stages of formulating mathematical models correctly. S3 can also represent by incorporating mathematical models to obtain solutions, although it cannot communicate orally. In formulating the strategy, S3 experienced an error, namely in the second elimination stage where S3 only multiplied the equation by the coefficient in one of the segments, so S3 tried to answer using the concept it had. In addition, S3 can use symbolic operations that conform to mathematical rules and infer the resulting solution by using arguments. However, the resulting solution is not appropriate because S3 does not reconfirm the correctness of the resulting solution. That is, the S3's saddle ability is still lacking.



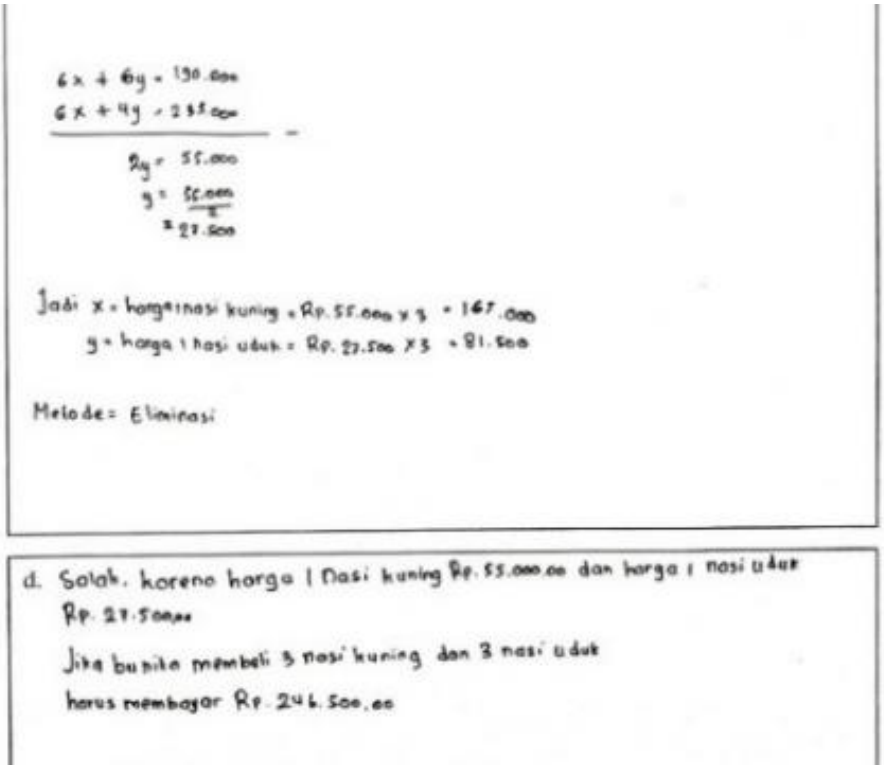


Figure 5. Answer number 1

Thus, it can be concluded that S3 in solving mathematical literacy problems in number 1 has not met indicators 4) and 5) mathematical literacy, namely reasoning and argument, and designing strategies to solve problems. This conclusion is reinforced by the following interview with S3.

P : "How do you turn the problems you read into mathematical models?"
S3:"The price of 1 yellow rice is x, the price of 1 uduk rice is y, the mathematical model is 2x plus 2y equals 190,000. Then the second, 3x plus 2y equals 235,000"
P :"What representation do you apply? Include the reason!"
S3:"I don't know."
P :"What conclusion did you come to?"
S3:"In conclusion, it was wrong because Mrs. Nita had to pay Rp 246,500"
P :"Whether the solution you wrote earlier already uses language, symbolic operations, and processes according to mathematical definitions and rules.?"
S1:"Don't know."

Answer number 2

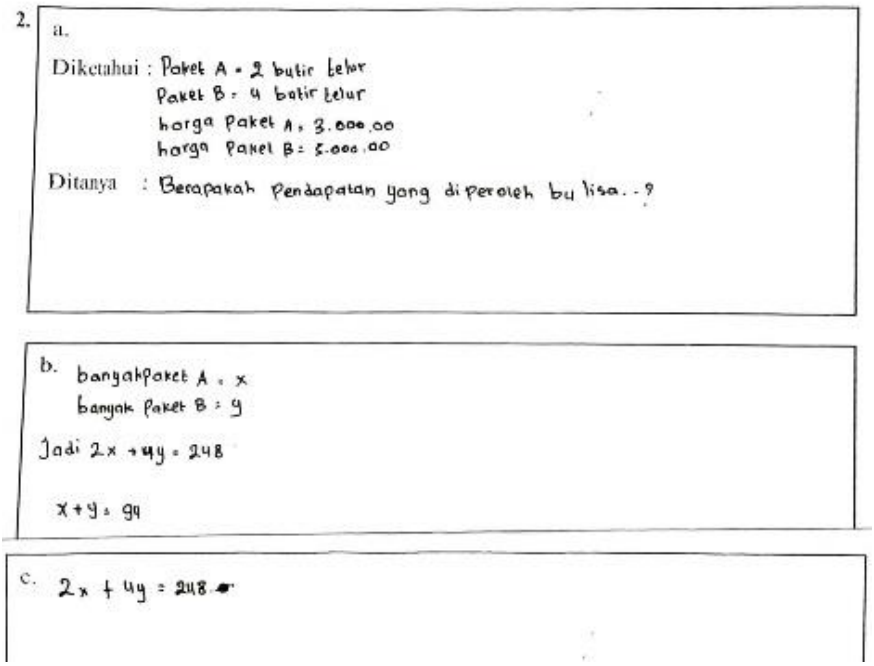


Figure 6. Answer number 2.

Based on figure 6, it can be seen that S3 can mention information that is known and asked but is still incomplete. In addition, S3 can create mathematical models and use them as representations for calculation results. In formulating strategies, S3 is only able to write down the completion plan because it runs out of time. Thus, it cannot continue its completion. Thus, it can be concluded that S3 in solving ethnomathematics-based mathematical literacy problems in number 2 cannot meet the mathematical literacy indicators, namely indicators 4), 5) and 6).

This conclusion is reinforced by the following interview with S3.

P :"What information do you know and ask from the questions you read?"
S3:"Information that is known, package A contains 2 eggs, package B contains 4 eggs, the price of package A is IDR 3,000 and package B is IDR 5,000, if asked is the income obtained by Mrs. Lisa."
P :"How do you turn the problems you read into mathematical models?"
S3:"Package A is x and package B is y, so the mathematical model is 2x plus 4y equals 248, the other x plus y equals 94."
P :"What representation do you apply? Include the reason!"
S3:"I don't know sis.."
P :"What method do you use? Explain the stages yes!"
S3:"Elimination strategy, but not yet completed".

Based on the results of analysis and interviews, it can be seen that S3 only mastered some mathematical literacy indicators. Precisely in mentioning the information known and asked, as well as explaining the stages in formulating mathematical models and solving strategies applied. It's just that S3 has an error in solving the problem, so the calculation results and

solutions obtained are not right which can have an impact on the next stage. However, S3 can explain conclusions by giving arguments. As for some questions, S3 cannot explain and give arguments. Thus, there is a need for teacher affirmation related to improving mathematical literacy skills, for example through the use of ethnomathematics. As (Astuti et al., 2022) mentioned that the use of ethnomathematics for learning should be beneficial for students because it has the purpose of providing a bond between mathematical problems and the life around them. Because ethnomathematics plays an important role in supporting literacy, especially in mathematical literacy (Prayitno, 2018).

Ethnomathematics is very possible to be integrated as an innovation in mathematics learning considering that ethnomathematics is very relevant to formal mathematics taught in the classroom. Meanwhile, (Saputri et al., 2023) mentioned that learning that is associated with culture can be at the same time an innovation in learning. As research (Darmayasa, 2018) which states that teachers are expected to be able to prepare learning motivation materials such as making ethnomathematics as a real example of the benefits of teaching material applications and using ethnomathematics as the context of a mathematical problem.

CONCLUSION

Based on the description above, it can be concluded that interest in learning has an influence on mathematical literacy skills. Students with a high interest in learning are able to meet all indicators of mathematical literacy. Students with an interest in learning are experiencing difficulties in number 1, namely in indicator 1) but in question number 2 are able to meet all indicators of mathematical literacy. While students with low interest in learning for questions number 1 only meet indicators 1), 2), 3), 6) and at number 2 only meet indicators 1), 2), and 3) only. That is, students with high and moderate interest in learning have mathematical literacy skills that work well, while students with low interest in learning need teacher help to improve their mathematical literacy skills.

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