



Profile of Social Arithmetic Problem Solving Ability of Grade VII Junior High School Students

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Abstract

The aim of this study is to describe the profile of social arithmetic problem-solving abilities of Grade VII students in one of the junior high schools in TTU Regency. The type of research used in this study is qualitative description, and the subjects of the study were 17 students, of whom six were selected for interviews. The six students included two high-ability, two moderate-ability, and two low-ability students. The data analysis model used in this study is the interactive data analysis model developed by Miles and Huberman. The results of the study show that: 1) Students in the high-ability category were able to fulfill all indicators of problem-solving, including understand the problem, devising a plan, carry out the plan, and look back; 2) Students in the moderate-ability category were able to meet the indicators of understand the problem, devising a plan, and carry out the plan, but were unable to meet the indicator of look back; 3) Students with low abilities were able to fulfill the steps of understand the problem, and devising a plan, but were unable to fulfill the steps of carrying out the the plan and look back.

Keywords: Problem-Solving Ability, Profile, Social Arithmetic.

1. INTRODUCTION

Education is very important for human survival. Education, in essence, is a planned basic effort to create a learning atmosphere and learning process so that learners actively develop their potential, become faithful and devoted to the Almighty God, have a noble character, are healthy, knowledgeable, capable, creative, independent, and able to respond as democratic and responsible citizens (Depdiknas, 2003). Developing the quality of education can be seen from the teaching activities applied in the teaching and learning process. Mathematics learning is one of the classrooms learning activities that has a significant influence on developing the quality of education.

Mathematics is one of the subjects that aims to enable students to understand, apply, and analyze factual, conceptual, and procedural knowledge, as well as to apply procedural knowledge in life to solve

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problems (Kemendikbud, 2016). One of the goals of mathematics learning is to develop students' problem-solving abilities and all mathematical abilities to achieve maximum learning outcomes in mathematics (Son & Fatima, 2020). An important target in achieving these learning outcomes is by maximizing mathematics learning.

Social arithmetic is one of the materials related to mathematical problem solving taught in grade VII of junior high school. Social arithmetic can be used in everyday life. This material can be practiced in daily life such as trade problems, sales, purchases, profits, losses, as well as the use of percentages and savings. Social arithmetic material can improve students' reasoning ability so that they can help students in problem-solving.

From the results of observations and interviews with subject teachers at one junior high school in the TTU Regency, it was found that students are still accustomed to memorization-based problems and have not been accustomed to problem-based problems that require higher-level thinking. This problem is supported by research results stating that the problem-solving ability of junior high school students in social arithmetic is still low (Gumilang, 2016). Therefore, the researcher is interested in conducting a test for social arithmetic problems to analyze the mathematics ability of grade VII students at one junior high school in the TTU Regency.

In this era of globalization, the development of science and technology has progressed rapidly, so problem-solving skills are highly needed. One of the steps used in problem-solving is the stages formulated by Polya (1973), namely understanding the problem, devising a plan, carrying out the plan, and looking back. By following these four steps, it is hoped that students will be able to map their thinking process, view problems based on their knowledge, and be able to solve problems given to them properly.

Based on the background, further research is needed to describe the mathematical problem-solving skills of high-ability, moderate-ability, and low-ability seventh-grade students, with the aim of knowing the profile of mathematical problem-solving of SMP seventh-grade students in solving word problems on social arithmetic material.

2. METHODS

This study is a qualitative descriptive study. Qualitative research aims to develop sensitivity to the problems faced, explain reality related to the exploration of theory from the bottom up, and develop understanding of one or more phenomena faced (Gunawan, 2013).

This research was conducted at one of the junior high schools in TTU Regency in the even semester of the academic year 2021/2022. The participants in this study were 17 seventh-grade students. The research instruments used were a problem-solving test consisting of 5 items and interviews. Six students were selected for interviews based on the test results, consisting of 2 high-ability students, 2 moderate-ability students, and 2 low-ability.

The results of the students' problem-solving ability test were analyzed based on the scoring guidelines. Then, the average percentage of students' problem-solving ability was calculated. Furthermore, the average percentage of each stage of the problem-solving test will be classified into three categories, namely high, moderate, and low, as shown in Table 1.

Table 1. Categorization of mathematical problem-solving ability.

Number	Value Intervals	Category
1	66-100	high
2	56-65	Moderate
3	0-55	Low

(Source: Adapted from Japan, 2008)

The data analysis technique used in this study is a qualitative approach. The data analysis technique used in this study is the interactive data analysis model by Miles and Huberman as described by Sugiyono (2015), which consists of 1) data reduction which means summarizing, selecting essential things, focusing on important things, and eliminating unnecessary things, 2) presenting data in the form of short descriptions, charts, relationships between categories, flowcharts, and the like, and 3) drawing conclusions which are new findings from a qualitative study.

3. RESULTS AND DISCUSSION

Based on the test results and interviews, the students' problem-solving abilities in solving problems based on Polya's theory were obtained and categorized into high mathematical ability, medium mathematical ability, and low mathematical ability. The percentage of each category can be seen in Figure 1.

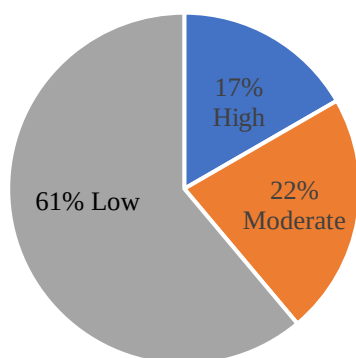


Figure 1. Percentage of students' problem-solving ability categories

Figure 1 shows that the percentage of students with high mathematical ability is 17%, students with moderate mathematical ability is 22%, and students with low mathematical ability is 61%. The average score of students' problem-solving ability overall is still considered low.

The results of the test above were then confirmed through interviews. Six students were interviewed, consisting of 2 high-ability students, 2 moderate-ability students, and 2 low-ability students, as shown in Table 2.

Table 2. Interview subjects

Name	Test Score	Ability Category
MMP	77	High
GSN	67,5	
SE	65	Moderate
MSN	57,5	
LN	52,5	Low
YMN	51,5	

The following section describes the results of the test and interview with the students, particularly those selected as interview subjects. There were 6 students interviewed and 5 problem-solving test items, but

in this section, only one person represents each category, and one solution to one test item will be presented.

Description of Test Results and Interviews with High-Ability Students

The following is an explanation of the high-ability student's problem-solving process for question number 1.

diketahui: harga beli = Rp. 600.000
 keuntungan: 8%
 ditanya: harga jual = ? 4
 jawab:
 untung = harga beli x keuntungan
 = Rp. 600.000 x 8% 4
 = Rp. 600.000 x $\frac{8}{100}$
 = Rp. 48.000
 harga jual = harga beli + keuntungan
 = Rp. 600.000 + Rp. 48.000 4
 = Rp. 648.000
 jadi: harga jual seekor kambing adalah: Rp. 648.000 4

Figure 2. Student MMP's answer in solving problem number 1.

Furthermore, the researcher conducted an interview with the MMP student to confirm the written test answers. Below is a quote from the interview between the researcher (R) and the MMP student.

R : Do you understand problem number 1?

MMP : Yes. I understand question number 1.

R : Okay, then can you tell me what you understand from the question?

MMP : It is known that Mrs. Oswin bought a goat for Rp. 600,000 and obtained a profit of 8% of the purchase price.

R : Can you mention what is known from the question?

MMP : It is known that the purchase price is Rp. 600,000 and the profit is 8%.

R : Okay, what is the question asking for?

MMP : Determine the selling price of a goat.

R : Okay. What steps did you use to solve the problem?

MMP : First, I related what was known and what was asked, then I multiplied the purchase price and profit per 100 and obtained the result of $\text{Rp. } 600,000 \times 8\% = \text{Rp. } 48,000$.

R : Is the step you used, correct?

MMP : Yes, Mrs.

R : Okay, good. So, you understood this question.

MMP : Yes, Mrs.

Based on the student's answer and interview results, it can be concluded that MMP, who has a high problem-solving ability, is able to use the complete Polya problem-solving steps, which include understanding the problem, planning the solution, implementing the problem-solving plan, and checking the solution for arithmetic social story problems. This is in line with Thursina & Sutriyono's (2018) findings that high-ability students are able to understand the problem, plan the problem-solving steps, implement the problem-solving plan, and check the solution. The results of this study are also consistent with the research findings by Sanjaya, Johar, Ikhsan & Khairi (2018) that high-ability math students are able to analyze information and determine what is known and what is being asked in the problem, able to solve the problem correctly, including explaining the problem-solving steps verbally.

Description of Test Results and Interview of Students with Moderate Abilities.

The following is the explanation of student SE in solving problem number 3.

Handwritten student work for problem 3:

$$\begin{aligned}
 \text{dik: diskon} &= 12.5\% \\
 1 \text{ celana} &= 80.000 \\
 1 \text{ baju} &= 72.000 \\
 \text{dit: berapa ya harus dibayar bu?} \\
 \text{Jawab:} \\
 2(80.000) + 3(72.000) \\
 = 160.000 + 216.000 \\
 = 376.000
 \end{aligned}$$

Figure 3. Student SE' answer in solving problem number 3.

Next, the researcher conducted an interview with student SE to obtain confirmation regarding the answers given during the written test. Here is a quotation from the interview between the researcher (R) and student SE.

R : Do you understand the given problem?

SE : Yes, I understand it.

R : What do you know from the given problem?

SE : It is known that the purchase price of one pair of pants is Rp. 80.000, and the price of one shirt is Rp. 72.000.

R : Okay. What is being asked?

SE : It is asking for the amount of money that Mrs. Candra has to pay after getting the discount.

R : Alright. What steps did you take to answer the problem?

SE : I directly calculated the price of the pants and the price of the shirt, then added them together to obtain the total payment.

R : How did you calculate it?

SE : Firstly, $2(80.000) + 3(72.000) = 160.000 + 216.000$, to obtain the total payment.

R : Are you confident that your answer is correct?

SE : I'm not confident yet, ma'am.

R : Why aren't you confident?

SE : Because I haven't checked it again to make sure it's correct.

The results of the students' answers in the moderate-ability group indicate that they are capable of understanding the problem, planning the problem, and executing the problem, but they are unable to draw conclusions. As a result, these students also have difficulty in reviewing their work due to the inconsistency of the plan used to solve the story problems. Despite these challenges, students in the moderate-ability group still make efforts to solve all the given problems by describing their answers according to their understanding. Consistent with the findings of this study, Sari (2012) suggests that students with moderate abilities are considered proficient in problem-solving as they are able to state what is known from the problem and write down their answers on the answer sheet.

Description of Test Results and Interview of Students with Low Abilities.

The following is the explanation of student LN in solving problem number 5.

5. dit: Harga beli: Rp 9.600.000 + 200.000
 $= 9.800.000$ 4
 Harga jual = Rp 7.800.000
 dit = persentase kerugian?
 Jawab: HB x % Rugi
 $HB = 9.800.000 - 7.800.000$ 3

Figure 4. Student LN' answer in solving problem number 5.

Next, the researcher conducted an interview with student LN to obtain confirmation regarding the answers given during the written test. Here is a quotation from the interview between the researcher (R) and student LN.

- R : Do you understand the content of the problem?
 LN : Yes, I understand it.
 R : What do you know from this problem?
 LN : It is known that the purchase price of the motorbike is Rp. 9.600.000, the selling price is Rp. 7.800.000, and the repair cost is Rp. 200.000.
 R : Okay. What is being asked in the problem?
 LN : It is asking for the percentage of loss.
 R : Alright, what steps did you take to solve the problem?
 LN : I wrote down the formula.
 R : Okay, can you write down the formula you used?
 LN : Buy Price x % Loss.
 R : Alright, why didn't you continue solving it?
 LN : I encountered difficulties.
 R : Where did you face difficulties?
 LN : I couldn't solve the problem.

The answers from students with low ability only mentioned the information known from the given problem, both on the answer sheet and during the interview session. The results obtained in this study are also in line with the description of students with low mathematical ability provided by Sanjaya et al. (2018; Son & Ditasona, 2020) that with low ability as tending to forget the concepts required to answer questions. This study's findings are also consistent with the research conducted by Sari (2012), which stated that students with low ability are categorized as less proficient in problem-solving as they only read the problem without further analysis. Research subjects among students with low ability also stated that the math problems they encounter usually involve calculations and the use of formulas only.

Overall, students' problem-solving abilities are still categorized as low. The low problem-solving ability of the students indicates that they are not yet able to solve story problems that require higher-level thinking skills. This is a contributing factor as students are not accustomed to non-routine problem types, as mentioned by Hadi et al. (2018), who stated that one of the factors causing students to struggle in problem-solving is their lack of familiarity with non-routine problems.

4. CONCLUSION

Based on the findings of this study, it can be concluded that the mathematical problem-solving abilities of 7th-grade students in one of the junior high schools in North Central Timor Regency can be categorized into three groups: 17% of students in the high category, 22% of students in the moderate category, and 61% of students in the low category. Students with high problem-solving abilities are able to solve social arithmetic problems through the Polya's problem-solving stages, which include understanding the problem, devising a plan, executing the solution, and checking their work. Students with moderate problem-solving abilities only go through the stages of understanding the problem, making a plan, and executing the solution, but they have not fully reached the stage of checking their work. On the other hand, students with low problem-solving abilities are only able to understand the problem but struggle with planning the solution, executing the solution, and checking the process and results.

It is recommended for future researchers to conduct studies that apply models, methods, techniques, approaches, or teaching strategies that have the potential to facilitate students' mathematical problem-solving abilities.

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