Analysis of Problem-Solving Ability of Junior High School Students in the New Normal Era

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Abstract

Students' mathematical problem-solving ability is one of the 21st century skills that are useful in everyday life, especially in the new normal era. This descriptive qualitative research aims to analyse the problem-solving ability of seventh grade students of SMPN 4 Ngaglik in the new normal era. The instruments in this study were observation sheets, math problem solving ability tests, documentation, and interview guidelines. Interactive analysis was used in the data analysis technique of this research with the stages of data collection, data reduction, data presentation, and making overall conclusions. Data analysis of test results plays a role in determining the level of students' problem-solving ability, documentation results as material for analysis and to be observed, and interviews to strengthen test results and information on student learning constraints. The results of this study show that students who have math problem solving skills with very high result categories are 7%, high 14%, medium 10%, low 14%, and very low dominate with 55%. This shows that there are 31% of students who can solve math problems well.

Keywords: *Analysis; Problem-Solving Ability; New Normal Era*

Introduction

Education is an inseparable part of human life where education is a deliberate and planned effort to create learning situations and conditions and the learning process so that students actively develop their potential to have strength in religion, self-management, personality, intelligence, noble character, and skills that are beneficial to themselves, society, nation, and state. This is written in the Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System.

However, Covid 19 which infected the whole world in many important aspects of life spread so fast and uncontrollably at first. Based on data from the World Health Organization (WHO), nearly 7 million people died from Covid-19 from 2019 to 2022. This can happen because this virus is easily spread through the air. Various efforts to reduce the rate of spread of covid-19 are carried out starting from wearing masks when traveling to limiting interactions between individuals by limiting activities outside the home.

Covid-19 has not only affected the world in terms of health and finance, but also education. During Covid-19, all activities cannot be carried out optimally because face-to-face activities related to

interactions between individuals must be limited. As a result, learning and teaching activities in schools are also limited in order to prevent the transmission of Covid-19 (Kemendikbud, 2020).

One of the countries affected by Covid-19 and implementing PJJ math is Indonesia (Ministry of Education and Culture, 2020). However, starting in 2023, Indonesia began to apply new habits, namely activities outside the home as before Covid-19 by implementing strict health protocols or commonly called the new normal era.

As an effort to overcome the obstruction of learning during the Covid 19 pandemic, in the new normal era, Permendikbudristek Number 7 of 2022 concerning Content Standards began to be enforced, namely the formulation of the appropriate scope of learning material as a form of developing student competencies and in line with graduate competency standards, adjusting student learning progress at each level, the scope of learning material is formulated to be flexible for educators so that the development of student competencies can be facilitated, and developing the scope of learning material with the principle of differentiation.

Since 2022 the Merdeka Curriculum in driving schools has been implemented and this year community activities have also adapted to the Covid 19 pandemic. The decision to implement the Merdeka curriculum is stated in the Ministry of Education and Culture Number 56 / M / 2022 concerning Guidelines for Implementing the Curriculum in the Context of Learning Recovery. The Merdeka Curriculum applies the concept of Merdeka Belajar with the aim that teachers and students can carry out fun teaching and learning activities. Through the application of this independent learning concept, students can learn according to their own characteristics, one of which aims to improve their ability to solve problems in accordance with 21st century skills.

The low level of students' mathematical problem solving is due to factors of initial knowledge, gender, reading, writing, discussion, assignments, and strategies used by teachers in the teaching and learning process (Winarni et al., 2021). Attitude factors, family environment, and school environment also affect students' low mathematical problem-solving ability (Apriliana et al., 2021; Sari et al., 2020).

In addition, the results of research (Haryono et al., 2021) show that students with high learning interest have difficulty in checking back, students with moderate learning interest have difficulty in completing the solution plan and checking back, and students with low learning interest have difficulty in developing a solution plan, completing the plan, and checking back.

In the mathematics curriculum, the learning process by applying the concept of problem solving is very important to do. This is because students will gain experience through theoretical knowledge and skills that have been obtained to be applied to problem solving cases (Marlissa & Widjajanti, 2015). Problem solving has the main goal of supporting students to become independent learners (Syukriani et al., 2017). According to NCTM, problem solving skills will provide students with experience about the usefulness and importance of mathematics (The National Council of Teachers of Mathematics, 2000). The stages in solving problems can be adapted from Polya's stages, namely: understanding the problem, planning, implementing the plan, and looking back (Setyaningsih & Firmansyah, 2022). These stages will be used as a reference in this study.

From the above introduction, students' problem-solving skills are an important aspect in learning mathematics. However, SMP N 4 Ngaglik is one of the secondary schools that implements an independent curriculum with admission pathways for grade VII students in the 2022/2023 school year in the form of pathways with KKM, radius zoning, achievement pathways, and with combined scores and ASPD. Students' math problem solving skills have not been measured simultaneously. According to the interview results, the affective (attitude, learning motivation, learning independence, and curiosity) of SMP Negeri 4 Ngaglik grade VII students is good. The teacher explained that the students' learning outcomes were also quite good if seen from the formative assessment. However, the teacher stated that students' problem-solving skills had never been examined. Based on this background, the researcher is

interested in analyzing and describing the problem-solving skills of seventh grade students of SMP N 4 Ngaglik in the new normal era.

Method

This research is descriptive qualitative research. The research stages used are making a research design and determining the research subject. Then, making instruments, namely problem-solving skills test questions, observation sheets, interview guideline sheets and documentation. After that, the validity and reliability of the instrument were tested. Data validity was ensured by triangulating techniques by checking data from the same source with different techniques, namely data from cognitive test results, documentation, and interviews (Mawaddah & Mahmudi, 2021). Meanwhile, Cronbach Alpha was used to check reliability. Furthermore, data collection is carried out in the field. The last stage is to analyze the data and draw conclusions.

This research was conducted in class VII-A of SMP Negeri 4 Ngaglik in the 2022/2023 academic year in the even semester of mathematics subject matter of social arithmetic on March 6-27, 2023. Samples were taken from VII grade students of SMP Negeri 4 Ngaglik. The sample was taken using purposive sampling technique, to obtain extensive, detailed, and accurate data about students' mathematical problem-solving skills.

The participants in this study were 32 students. The cognitive ability test as many as 4 items, documentation, interviews, and observations were carried out classically, but interviews were only selected 7 students who represented to confirm students' mathematical problem solving. The students who represented the interview were coded as S3, S6, S12, S13, S23, S30, and S31.

The steps taken in data analysis used the interactive analysis model of Miles & Huberman (Nangim & Hidayati, 2021) in this study are as follows: data collection, data reduction, data presentation, and conclusion/verification. All data that has been collected is analyzed according to the indicators and criteria and has gone through the data reduction and presentation stages. All data that has been analyzed is drawn qualitatively and a conclusion can be obtained. The data obtained is grouped based on the indicators. The test results of each student are calculated for each problem based on each indicator of mathematical problem solving. After obtaining the score, students are grouped into math ability groups with benchmark reference assessment conversion guidelines that convert raw scores into 5-scale absolute norms shown in the following table:

Table 1. Student Scores and Categorization

No.	Score	Category
1	90-100	Very high
2	80-89	High
3	70-79	Medium
4	60-69	Low
5	<59	Very low

Source: (Elsa, 2020)

The interview data was used to match and clarify the test data. In addition, interviews are also used as validity for written test answers. Documentation results as support and reinforcement of the data that has been obtained.

Results and Discussion

Result

The mathematical problem-solving ability of students in class VII A SMP N 4 Ngaglik can be said to be low. Students provide answers to mathematical problems without accompanying information, mathematical symbols/models, and the answers given are less understandable. In Table 2, a description of students' problem-solving skills in solving social arithmetic problems is shown.

Table 2. Description of Students' Problem-Solving Skills in Solving Social Arithmetic Problems

Size	Test Result
Mean	55.9
Max.	95
Min.	0
standard deviation	23.1

Based on the test results consisting of 4 description questions, there were 15 out of 32 students who scored above the average or 46.875% and 17 out of 32 students scored below the average or 53.125%. This shows that 46.875% of students have been able to solve social arithmetic math problems. However, the average score of 55.9 shows that students who have not been able to solve social arithmetic math problems are more dominant. In addition, the indicators of students' mathematical problem-solving have not been achieved properly. Figure 1 below illustrates students' overall mathematical problem-solving ability with the categories of very high, high, medium, low, and very low.
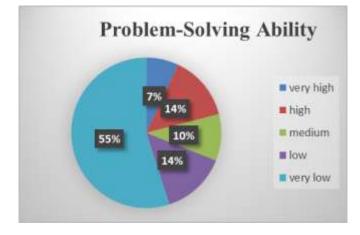

Figure 1: Math Problem-Solving Ability Diagram

From Figure 1 above, students who have math problem solving skills with very high results are 7%, high 14%, medium 10%, low 14%, and very low dominate with 55%. This shows that there are 31% of students who can solve math problems well. Based on the data from Table 3, students' mathematical problem-solving skills in each aspect can be observed. Problem number 1 in the aspect of understanding the problem there are 75% of students who can mention what is known and asked correctly, 34.3% of students are able to write the solution plan correctly, 28.1% of students are able to write answers completely and correctly, and 46.9% of students are able to provide the right conclusion. In question item number 2 on the aspect of understanding the problem, 28.1% of students were able to mention what was known and asked correctly, 18.8% of students were able to write the solution plan correctly, 9.4% of students were able to write the answer completely and correctly, and 12.5% of students were able to provide the right conclusion. Item number 3 on the aspect of understanding the problem,

50% of students were able to mention what was known and asked correctly, 28.1% of students were able to write the solution plan correctly, 34.4% of students were able to write answers completely and correctly, and 37.5% of students were able to provide the right conclusion. Item number 4 on the aspect of understanding the problem, 71.9% of students were able to mention the known and asked correctly, 50% of students were able to write the solution plan correctly, 46.9% of students were able to write the answer completely and correctly, and 46.9% of students were able to give the right conclusion.

Table 3. Achievement of Students' Problem-Solving Skills in Each Aspect

No. Aspects	Assessed aspect	Score	Number of students				Percentage			
1	**Understanding problem**		1	2	3	4	1	2	3	4
	Mentioned what is known and asked correctly	3	24	9	16	23	75%	28.1%	50%	71.9%
	Mentioning what is known and asked less precisely	2	2	1	1	0	6.2%	3.1%	3.1%	0
	Mentioned what is known without stating what is asked or vice versa	1	3	7	7	3	9.4%	21.9%	21.9%	9.4%
	Does not mention what is known and asked correctly	0	3	15	8	6	9.4%	46.9%	25%	18.7%
2	**Planning**									
	wrote the problem-solving plan correctly	2	11	6	9	16	34.3%	18.8%	28.1%	50%
	wrote the problem-solving plan less precisely	1	18	15	16	12	56.3%	46.8%	50%	37.5%
	Did not write down the problem-solving plan	0	3	11	7	4	9.4%	34.4%	21.9%	12.5%
3	**Implementing the Plan**									
	Write the answer correctly and completely	3	9	3	11	15	28.1%	9.4%	34.4%	46.9%
	Write answers with most of the answers correct	2	12	3	2	5	37.5%	9.4%	6.3%	15.6%
	Write the answer with a small part of the correct answer	1	9	13	13	8	28.1%	40.6%	40.6%	25%
	Did not write the answer	0	2	13	6	4	6.3%	40.6%	18.7%	12.5%
4	**Looking Back**									
	Write the correct conclusion	2	15	4	12	15	46.9%	12.5%	37.5%	46.9%
	Writing inaccurate conclusion	1	10	8	8	8	31.2%	25%	25%	25%
	Did not write the conclusion	0	7	20	12	9	21.9%	62.5%	37.5%	28.1%

In detail, the following are the results of the math problem solving ability test and student interviews.

Discussion

1) Understanding the Problem

Students have been able to understand the problem shown in Figure 2. In line with research (Arifin et al., 2021), question number 1 and able to write it in mathematical symbols and models.

Figure 2: S12's answers

Figure 2 shows that students still do not mention the rupiah unit in the purchase price. Research conducted by (Amaliah, Fitri, Sutirna, Zulkarnaen, 2021) and (Fitriyana & Sutirna, 2022), sometimes students do not write units and elements. In addition, there are students who cannot understand the problem (Rahmawati & Warmi, 2022). Based on the analysis of students' ability tests, there are still many students who do not write what is known from the problem. This is in line with the results of research conducted by (Vahlia et al., 2022) that there are still students who miss in writing the question and questionable information.

2) Planning

Students can plan for solving math problems according to the given concepts and context. However, there are still students who guess the concept to be used (Vahlia et al., 2022), are wrong in planning (Setiawan et al., 2021), and some students do not even write a plan (Arifin et al., 2021). The following are the results of interviews with S1 students who have been able to make plans appropriately.

G　: *How did you get the answer? Can you tell me?*

S3　: *purchase price 1,500,000, selling price 65,000 per kilo times 30 kg equals 1,950,000. 1,950,000 minus 1,500,000 equals 450,000. profit 450,000 divided by 1,500,000 multiplied by 100% equals 30%.*

3) Implementing the Plan

Students can carry out plans and use mathematical symbols and models but are not accompanied by information but sometimes students forget to write units (in this case rupiah units).

Figure 3: Answers of S12 and S3

In carrying out the plan, students sometimes skip one of the steps in the calculation (Amaliah, Fitri, Sutirna, Zulkarnaen, 2021).

4) Looking Back

Students have been able to look back at the answers given and provide conclusions, but in interpreting the answers, students are still in the low category (Damayanti & Kartini, 2022). At the looking back stage, there are still students who make conclusions less organized (Kintoko & Hendrianus, 2021). In addition, some students do not check the results of their solutions (Rinawati & Ratu, 2021).

The following are the results of interviews with S12 students who have been able to carry out the stages of looking back well.

G　: What information did you get from the question?

S12 : the purchase price is 1,500,000, the weight is 30 kg, the selling price is 65,000 per kilo.

G　: What is the question?

S12 : the percentage of profit or loss?

G　: how do you find it?

S12 : profit divided by purchase price multiplied by 100%

G　: how do you get the profit?

S12 : selling price minus buying price

G　: It is known that the selling price is 65,000 per kilogram, here you wrote 1,950,000. how do you do that?

S12 : selling price per kilogram multiplied by its weight.

In the new normal era, seventh grade students of SMP N 4 Ngaglik have diverse problem-solving abilities. Students with very high mathematical problem-solving ability can complete all stages in solving problems. When students with a very high ability category can understand the given math problem, then the other stages in solving the problem can be done easily and even the student can represent it in another form and communicate it.

This also happens to students with high category problem solving abilities. Students with high category problem solving abilities can complete all stages in solving math problems without problems. The difference with very high category students, high category students may not be able to represent it both orally and visually.

Students with medium ability can solve problems according to the problem-solving steps. This student often does not realize that he forgot to write down the unit so that the final answer becomes less precise. In terms of making plans, sometimes middle category students are still confused. This makes middle category students hesitant about the completion of each step.

Unlike the middle category students, students in the low category could not plan so that they only guessed at the steps of solving the problem. At all steps of problem solving, almost cannot be completed or finished in the middle of the step or the conclusion is not correct. Students in the very low category, almost unable to solve the entire problem.

Conclusion

In this new normal era, the seventh-grade students of SMP N 4 Ngaglik can solve math problems. Students who have mathematical communication skills with very high results are 4%, high 11%, medium 7%, low 14%, and very low dominate with 64%. This shows that there are 32% of students who can communicate mathematically.

Limitation

This research is limited to the ability to solve math problems in social arithmetic material in the new normal era, so that other materials cannot be known. The presentation of students' mathematical problem-solving skills in social arithmetic is only done in general and no more detailed and in-depth observations are made on each indicator and student activity. This research was only conducted on seventh grade students of SMP N 4 Ngaglik, so it is not yet known to analyze students' mathematical problem-solving skills in the new normal era in other schools.

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