# Mathematical Problem Solving Ability of SMP 1 Kelekar Students Analized Based on Student Learning Motivation

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## Abstract

This study aims to describe how the students 'mathematical problem solving abilities in SMP Negeri 1 Kelekar were reviewed from the students' learning motivation on the material of the flat side of the cubes and blocks. The method used in this research is descriptive quantitative. The subjects of this study were 24 students of class IX1 SMP Negeri 1 Kelekar. Data collection techniques in this study were a test of mathematical problem solving abilities and a questionnaire (questionnaire) student learning motivation. The data analysis technique used descriptive statistics. The results of the data analysis of this study indicate that: (1) students with a high learning motivation category obtained an average score of mathematical problem solving abilities, namely 70.00 in the moderate category; (2) students with the moderate learning motivation category obtained an average score of mathematical problem solving abilities, namely 60.66 in the moderate category; (3) Students with low learning motivation category obtained an average score of mathematical problem solving abilities, namely 41.00 in the low category.

## *Abstrak*

*Penelitian ini bertujuan untuk mendeskripsikan bagaimana kemampuan pemecahan masalah matematis aiswa SMP Negeri 1 Kelekar ditinjau dari motivasi belajar siswa pada materi bangun ruang sisi datar kubus dan balok. Metode yang digunakan dalam penelitian ini yaitu deskriptif kuantitatif. Subjek dari penelitian ini yaitu siswa kelas IX₁ SMP Negeri 1 Kelekar yang berjumlah 24 siswa. Teknik pengumpulan data dalam penelitian ini adalah tes kemampuan pemecahan masalah matematis dan kuesioner (angket) motivasi belajar siswa. Teknik analisis data menggunakan statistik deskriptif. Hasil analisis data penelitian ini menunjukan bahwa: (1) siswa dengan kategori motivasi belajar tinggi memperoleh nilai rata-rata kemampuan pemecahan masalah matematis yaitu 70,00 kategori sedang; (2) siswa dengan kategori motivasi belajar sedang memperoleh nilai rata-rata kemampuan pemecahan masalah matematis yaitu 60,66 kategori sedang; (3) siswa dengan kategori motivasi belajar rendah memperoleh nilai rata-rata kemampuan pemecahan masalah matematis yaitu 41,00 kategori rendah.*

***Kata Kunci****: Analisis Deskriptif Kuantitatif; Kemampuan Pemecahan Masalah Matematis; Motivasi Belajar Siswa.*

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## INTRODUCTION

Education is a step in creating a new generation that has the potential to have the knowledge to think critically and be able to adapt to environmental conditions and the times. Mathematics is a field of study taught in formal educational institutions and one of the most important parts of improving the quality of education (Novitasari, 2016).

The basic ability that students must-have during the learning process is a problem-solving ability (Hidayat & Sariningsih, 2018). Mathematical problem-solving ability is the ability to use mathematics to solve various problems of everyday life (Nasution et al, 2018). Problem-solving is a systematic approach to conceptualizing understanding a problem that must be resolved, designing strategies to solve problems, and evaluating the strategy applied (Albay, 2019). In another opinion, it is stated that problem-solving is a cognitive process that guides activity steps to find solutions to a problem by using and combining cognitive strategies that are applied in the right way (Haataja et al, 2019). This definition is in line that problem-solving is the process of finding answers by an individual by using their knowledge and skills to use tools and applications to achieve new conditions (Chao et al, 2017).

Furthermore, problem-solving is part of the mathematics curriculum, which is very important because, in the learning and completion process, students may gain experience using the skills they already have to be applied in problem-solving that is not routine (Widodo et al, 2018). Problem-solving is viewed as a process and is defined as using an individual's prior knowledge, skills, and understanding to meet demands from unfamiliar situations (Rochmad et al, 2016). Then, the mathematical problem-solving ability is a person's ability to solve mathematical problems in accordance with the set goals (Anisah & Lastuti, 2018). In a different research, it is stated that mathematical problem-solving ability is person' ability to understand a problem, prepare a solution plan, carry out the solution plan, and re-examine the problems (math problems) given (Ariani et al, 2017). This ability is measured through a problem-solving test and given a score for the answer.

From the various opinions above, it is concluded that mathematical problem-solving ability based on the description above is a person' ability to find a solution to solve the problems they faced, identify the problem, compile steps to solve it, and then carry out the solution.

In mathematics learning, it develops cognitive aspects and affective aspects of supporting the success of the learning process at school, one of which affective aspects is student learning motivation. In learning activities at school, learning motivation has a relationship and influence on students' mathematical problem-solving ability with the emergence of learning motivation encourages students to have a desire for learning activities to encourage students to be serious when solving mathematical problems, and it is hoped that it can improve the quality of learning.

Motivation starts from the word "motive," which means propulsion in the form of a desire inside someone's body to carry out an activity in the form of certain activities which ultimately can be achieved (Winata & Friantini, 2019). Motivation is defined as something that offers strength, direction, and support to someone to achieve a goal (Misdalina et al, 2018). A similar opinion was conveyed that motivation is an affective aspect that must exist or arise when the learning process takes place, motivation in learning is

related to; (1) the direction of student behavior; (2) the response skills of students in choosing actions after learning; (3) how long is the consistency of the students' behavior (Kurniawan, 2019).

Learning motivation can be interpreted as something that encourages someone to desire to change behavior and follow the learning process according to their own desire without coercion from any party. Mathematics learning motivation also means a person's desire and encouragement in achieving success and having achievement in mathematics learning activities (Huriyanti & Rosiyanti, 2017). Motivation is the most important factor for educators in achieving targets that aim to improve learning (Siregar & Surya, 2017). Therefore, it can be concluded that learning motivation is a desire of a student who comes from within himself to carry out activities during learning activities to achieve the objectives of learning.

There are some of the previous research on the analysis of problem-solving abilities, namely research conducted by Meilani & Maspupah (2019) on grade VI students of Elementary School on the LCM and GCD material and research on the analysis of mathematical problem-solving abilities conducted by Kushendri & Zanthy (2019) on high school students with statistics material. Therefore, the researcher carried out a renewal research analysis of mathematical problem-solving abilities in terms of student learning motivation carried out at the junior high school education level material on the flat side space of cubes and cuboids.

Based on this description, the purpose of this study is to determine the analysis of the mathematical problem-solving abilities of students of SMP Negeri 1 Kelekar in terms of student learning motivation.

## METHOD

The method used in this research is descriptive quantitative research. The subjects of this study were 24 students of class IX 1 SMP Negeri 1 Kelekar. The data collection technique in this study was a mathematical problem-solving ability test consisting of 5 test questions and a student learning motivation questionnaire consisting of 12 questions.

The indicators used to measure mathematical problem-solving ability in this study are indicators that Kesumawati has suggested (2010), namely; (1) understanding the problem; (2) creating/ compiling mathematical models; (3) choosing a solution strategy; (4) explaining and checking the answer. While the indicators of student learning motivation used in this study are used as guidelines in making the questionnaire instrument grid that had been suggested by Uno (Huriyanti & Rosiyanti, 2017), the indicators are as follows: (1) the ambition and desire to succeed; (2) encouragement and need in learning; (3) hopes and aspirations for the future.

The data analysis technique used descriptive statistics in which the results are grouped based on the following category references.

Table 1. Reference Category Results of Mathematical Problem Solving Ability Tests and Students' Learning Motivation Questionnaire.

| Mean | Interpretation |
|---|---|
| $76 - 100$ | High |
| $51 - 75$ | Medium |
| $0 - 50$ | Low |

*Source :* (Rigusti & Pujiastuti, 2020)

## RESULT AND DISCUSSION

Learning motivation is known through the results of filling out a student learning motivation questionnaire containing 12 statements made based on indicators of

student learning motivation consisting of ambition and desire to succeed, encouragement and need in learning, and hopes and aspirations in the future. The results of the final score of the student learning motivation questionnaire can be seen in Table 2.

Table 2. Results of the Student Learning Motivation Questionnaire

| Category | The Number of Students | Percentage |
|---|---|---|
| High | 13 | 54,17% |
| Medium | 9 | 37,5% |
| Low | 2 | 8,33% |
| Total | 24 | 100% |

In Table 2, the student learning motivation questionnaire results in class IX1 SMP Negeri 1 Kelekar show that students with high learning motivation categories are 13 students with a percentage of 54.17%. Students with medium learning motivation category were 9 students with a percentage of 37.5%, and students with low learning motivation categories were 2 students with a percentage of 8.33%.

Test of mathematical problem-solving ability in the form of essays consisting 5 questions. The question was based on problem-solving indicators consisting of 1 problem understanding the problem, 1 problem creating/ compiling a mathematical model, 1 question choosing a solution strategy, and 2 questions explaining and verifying the answer. The description of mathematical problem-solving ability in terms of learning motivation from the essay test results of 5 question items for 24 students of SMP Negeri 1 Kelekar will be explained in Table 3 (see Appendix).

**High Learning Motivation**

Students with a high learning motivation category obtained an average score

(mean) of mathematical problem-solving ability, which is included in the medium category. In students with high learning motivation, which provides for categories of the high, medium, and low mathematical problem-solving abilities in answering the questions, the indicators of mathematical problem-solving abilities have been able to answer all indicators very well. However, when the students answered questions on indicator 3, on choosing the solution strategy, the students did not careful enough to choose the solution strategy. Therefore, they got the wrong results. According to Dwianjani et al (2018) choosing a solution strategy is the most dominant factor in influencing students' problem-solving abilities.

The following are the high learning motivation students' answers on understanding the problems, creating/ compiling mathematical models, choosing solution strategies, explaining and checking the answers.
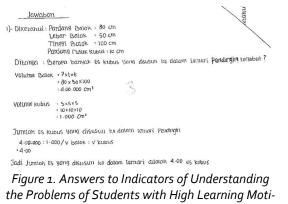
*Understanding the Problem*

On the indicators of understanding the problem, students with high learning motivation can understand the problems contained in the questions where students can identify and write down the elements that are given and asked in the questions and get the correct results. The following are students' answer with high learning motivation on indicator questions of understanding the problem (see Figure 1).

Figure 1. Answers to Indicators of Understanding the Problems of Students with High Learning Motivation

### Creating / Compiling a Mathematical Model

Students with high learning motivation on the given questions have been able to create/ compile a mathematical model on these questions. Students can determine the formula for the surface area of the cube if the base and topsides are removed correctly. Students' answer with high learning motivation on the indicators of creating/ compiling a mathematical model can be seen in Figure 2 (**see Appendix**).

### Choosing a Solution Strategy

In this indicator, students with high learning motivation / have chosen the right solution strategy, but because they are not careful enough that makes them get wrong results, in using the formula for the surface area of the bath using the $6s^2$ formula, even though for the formula for the surface area of the bath the upper side is not calculated or removed then the correct formula for the surface area of the bath is $5s^2$. The following are students' answers with high learning motivation on indicator questions of choosing a solution strategy:



Figure 3. Answers to Indicators of Choosing Solution Strategies of Students with High Learning Motivation

### Explaining and checking the answers

In the last mathematical problem-solving indicator, students with high learning motivation have done it very well. This question provides the correct explanation and verifies the answer to the question. Students' answers with high learning motivation on the indicator questions of explaining and verifying the answers can be seen in Figure 4 (**see Appendix**).

### Medium Learning Motivation

Furthermore, students in the category of medium learning motivation are obtained the mean of mathematical problem-solving abilities which is included in the medium category. The students' ability to answer questions on indicators of mathematical problem solving in students who have medium learning motivation and have high, medium, and low mathematical problem-solving abilities in answering the indicators of mathematical problem solving abilities is good enough, but students get difficulties and get the lowest percentage in answering the indicator 2 where students do not understand enough to create/ compile a mathematical model contained in the problem. According to Utami & Wutsqa (2017) the inability of students to create/ compile a mathematical model can be seen when students choose the wrong math-

ematical formula or concept that is relevant so that students incorrectly transform the problem into a mathematical model.

The following are the answers of K-5 students on the indicators of understanding the problem, creating/ compiling mathematical models, choosing solution strategies, explaining and verifying the answers.

*Understanding the Problem*

In the indicator questions of understanding the problem, students with medium learning motivation is be able to identify and write down the elements that are given and asked in the questions and get the correct results. Students' answers with medium learning motivation on the indicators of understanding the problem can be seen in Figure 5 (see Appendix).

*Creating / Compiling a Mathematical Model*

In answering the questions on indicators of creating/ compiling a mathematical model, the students with medium learning motivation have not been able to make a complete mathematical model in determining the formula for the surface area of the cube if the base and top sides of the cube are removed. The following are students' answers with medium learning motivation on the indicator questions of creating/ compiling a mathematical model:



*Figure 6. Answers to Indicators of Creating / Compiling a Mathematical Model of Students with Medium Learning Motivation*

*Choosing a Solution Strategy*

In this indicator it is the same as students with high learning motivation where students with medium learning motivation already choosing the right solution strategy but because they are not careful enough so that students get wrong results, in using the formula for the surface area of the bath the students use the $6s^2$ formula, even though for the formula for the surface area of the bath the upper side bath is not calculated or removed, the correct formula for the surface area of the bath is $5s^2$. The following are students' answers with medium learning motivation on indicator questions of choosing a solution strategy:



*Figure 7. Answers to Indicators of Choosing a Solution Strategy of Students with Medium Learning Motivation*

*Explaining and checking the answers*

In the last mathematical problem-solving indicator, students with medium learning motivation are not able to answer the indicator questions explaining and verifying the answers correctly. On that indicator questions, students do not explain and verify the correctness of the answers that they have answered. The following are students' answers with medium learning motivation on indicator questions of explaining and checking the answers:
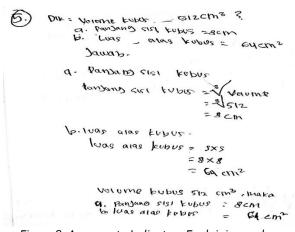
*Figure 8. Answers to Indicators Explaining and checking the answers of Students with Medium Learning Motivation*

**Low Learning Motivation**

Then for students with a low learning motivation category obtained the mean of mathematical problem-solving abilities, including the low category. The students' ability to answer questions on indicators of mathematical problem solving in students who have low learning motivation and have low mathematical problem-solving abilities also get the lowest percentage. On indicator 4 explaining and verifying the answers, students do not explain and re-check the answers' results. According to Netriwati (2016), students with low solving abilities are unable to explain the calculation process they have made and have not been able to mention and write down how to check the answers obtained on the questions given.

The following are the answers of K-2 students on the indicators of understanding the problem, creating/ compiling mathematical models, choosing solution strategies, explaining and verifying the answers.

*Understanding the Problem*

On the indicators of understanding the problem, students with low learning motivation can write down the information given and asked in the questions and get the correct results. The following are the students' answers with low learning motivation on the indicator questions of understanding the problem can be seen in Figure 9 (see Appendix).

*Creating / Compiling a Mathematical Model*

In answering the indicator questions of creating/ compiling a mathematical model, students with low learning motivation are less careful in understanding the meaning of the question to understand to answer the question to be wrong. The following are students' answers with low learning motivation on the indicator questions of creating/ compiling a mathematical model:



*Figure 10. Answers to Indicators of Creating / Compiling a Mathematical Model of Students with Low Learning Motivation*

*Choosing a Solution Strategy*

Based on the results of students' answers with low learning motivation in answering the indicator questions of choosing a solution strategy, students with low learning motivation have not been able to answer these indicators correctly where in solving the problems, students use solution strategies that are not appropriate and also irrelevant. The following are students' answers with low learning motivation on indicator questions of choosing a solution strategy:

*Figure 11. Answers to Indicators of Choosing a Solution Strategy of Students with Low Learning Motivation*

*Explaining and checking the answers*

In the 2 questions of the indicator explaining and checking the answer, the students with low learning motivation cannot yet be able to answer the 2 questions. Students only write down the elements that are given and asked without answering the question. The following are students' answers with low learning motivation on indicator questions of explaining and checking the answers:



*Figure 12. Answers to Indicators Explaining and checking the answer of Students with Low Learning Motivation*

From the results of the analysis that the mathematical problem-solving ability of students of SMP Negeri 1 Kelekar in terms of learning motivation, students who have high learning motivation mean of the mathematical problem-solving ability which is classified as in the medium category, namely 70.00 with a percentage of the number of students 54.16% tends to already able to answer the 4 indicators of mathematical problem solving very well. Still, in the 3rd indicator students are not careful in answering the questions even though they have chosen the right solving strategy. Meanwhile, students who have medium and low learning motivation in answering the problem-solving indicator questions have the most difficulty answering indicator 2, namely creating/ compiling a mathematical model. Then students who have medium learning motivation have a mean of problem-solving ability classified in the medium category, namely 60.66 with a percentage of the total number of students 37.5%. Meanwhile, students with low learning motivation have a mean of problem-solving ability that is classified in the low category, namely 41.00 with a percentage of the number of students 8.33%.

This research is in line with the findings of research conducted by Agsya et.al (2019) that students who have high learning motivation have good problem-solving abilities that can answer 4 indicators of mathematical problem solving according to Polya, namely (1) understanding the problem, (2) making plans, (3) implementing the plan, (4) checking again. Students with medium and low learning motivation are unable to determine the completion plan to be selected. When students solve problem-solving questions, they make many mistakes due to several things, as stated by Akbar et.al (2018), namely students do not write down the elements contained in the problem because students are not used to it, students still do not understand when changing or substituting elements when the problem is in the mathematics operational form, students do not know the correct settlement strategy plan, when substituting data into the formula students get difficulty and are less precise in the calculation process. When the results or answers to problems have been obtained, students no longer check again because they think the answer is correct. Davita & Pujiastuti (2020) In learning

mathematics, it is necessary to increase students' problem-solving abilities. Therefore, students can answer all problem-solving indicators correctly.

Learning motivation is one aspect that needs to be considered when the learning process takes place, which is very important in supporting the intellectual development of students (Fadillah & Baist, 2017). It is in line with Regusti & Pujiastuti (2020) state that students who have high learning motivation have high problem-solving ability scores, students who have medium learning motivation and low learning motivation get medium and low problem-solving ability scores. Therefore, in the learning process, student learning motivation is very important and affects students' mathematical problem-solving abilities.

## CLOSING

### Conclusion

Based on the results of the analysis and discussion of the research above, the following conclusions were drawn: (1) Students with high learning motivation categories obtained mean of mathematical problem solving abilities, namely 70.00 in a medium category; (2) Students with medium learning motivation category obtained mean of mathematical problem solving abilities, namely 60.66 in a medium category; (3) Students with low learning motivation category obtained mean of mathematical problem solving abilities, namely 41.00 in low category.

### Sugesstion

Based on these conclusions, the following are some suggestions from researchers conveyed in this study: (1) Teachers are expected to be able to provide questions during the learning process in the classroom that can train and improve

students' mathematical problem-solving abilities; (2) To students to always be sincere in learning activities and play an active role accompanied by high learning motivation in learning mathematics; (3) To researchers, increase experience and insight in the field of research and writing, and in the future, this research can become input and reference for similar or advanced research.

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## APPENDIX

Table 3.Data Description of Students' Mathematical Problem Solving Ability

| Learning Motivation | | Percentage | N | Mean | Minimum Value | Maximum Value |
|---|---|---|---|---|---|---|
| High | Indicator 1 | 79,48% | 13 | 70,00 | 41 | 94 |
| | Indicator 2 | 64,10% | | | | |
| | Indicator 3 | 56,41% | | | | |
| | Indicator 4 | 74,03% | | | | |
| Medium | Indicator 1 | 81,48% | 9 | 60,66 | 35 | 88 |
| | Indicator 2 | 40,74% | | | | |
| | Indicator 3 | 62,96% | | | | |
| | Indikator 4 | 59,72% | | | | |
| Low | Indicator 1 | 83,33% | 2 | 41,00 | 41 | 41 |
| | Indicator 2 | 33,33% | | | | |
| | Indicator 3 | 50,00% | | | | |
| | Indicator 4 | 25,00% | | | | |
| Total | | | 24 | 57,22 | 35 | 94 |



Figure 2. Answers to Indicators of Creating / Compiling a Mathematical Model of Students with High Learning Motivation



Figure 4. Answers to Indicators Explaining and checking the answer of Students with High Learning Motivation

*Figure 5. Answers to Indicators of Understanding the Problems of Student with Medium Learning Motivation*
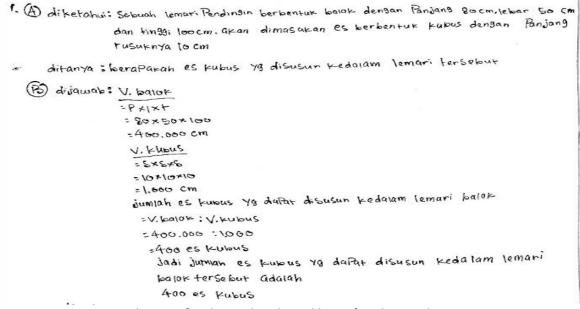


*Figure 9. Answers to Indicators of Understanding the Problems of Students with Low Learning Motivation*