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Analysis of Student Difficulties in Mathematics Problem Solving Ability at MTs SWASTA IRA Medan

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Abstract

This study aims to describe the analysis of student difficulties in solving math problems class VIII MTs SWASTA IRA Medan. Research instruments used tests and interviews. The type of research is qualitative descriptive. The subjects of this study are students of class VIII MTs SWASTA IRA Medan academic year 2016/2017 which amounted to 39 people. The results showed that the percentage of problem solving ability of students in the indicators of problem understanding of problem solving was 84.62%, indicator planning was 61.54%, the indicator of performing the plan was 39.74%, and the confirmation of the answer indicator was 32.05%. And students' difficulties in solving such problems 1) students have difficulty solving mathematical problems in reading text or questions, 2) students always misinterpretation the problem, 3) If students don't understand the problem then they will guess the answer from the problem, 4) the students do not want to find out the solution of the problem given, 5) the students have difficulty in understanding the problem so can't interpreted it into symbol form.

Keywords: Mathematical difficulties; mathematical problem solving.

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1. Introduction

Education is a human need throughout life, without human education will be difficulties to develop and education plays an important role in life. According to [1] the purpose of mathematics education is surely to make students actualize learning in the highest level. However, the fact that the vast majority of the students experience difficulties while a few of them actualize learning is considered a reality of life. That is the importance of mathematics education, so that the knowledge gained makes it easy to apply it into the life of the day.

Reference [2] States that mathematics is a way of expressing certain ideas, opinions, and concepts that math can be said as a communication tool, or a tool to make it easier for someone to convey ideas, opinions, and concepts to be understood by others. Some students claim that mathematics is a difficult subject to the statement Cooney & Cotton [3] Say some students view mathematics learning as interesting, others may believe that it is a form of tedious and monotonous work. Students who like mathematics and have a high ability must say mathematics is an interesting lesson, otherwise low ability students say mathematics is a tedious and difficult job in solving the problems. Reference [3] Say some student see mathematics as a subject that causes their fear, anxiety, and anger during lesson. Students who say mathematics as a subject that makes them afraid, anxious and even hate mathematics that this is because the students are not able to follow the lessons of mathematics or have a low ability and do not want to dig the low ability in order to improve the lessons of mathematics, especially in solving the question problem solving.

Mathematics is an important science but in fact mathematics lessons are less desirable, feared, and boring for students. This can be seen from the students' weak math skills. One of the weaknesses among students is the weakness of students in solving math problems. Where students complain and find difficulties in solving problems in math so that students look less able to solve math problems.

According to [4], Problem is a work in which an individual who is facing it feel the need for solving or want to solve it, she/he does not have a way how to solve it and she/he tries to solve it. It is therefore very important as a human being to solve the problem. Likewise with students, every student must have certain problem solving skills in solving problems or questions given by the teacher. Because in mathematics is very synonymous with the problem and in the process of completion needed problem solving skills. But most of what happens in the field, students are not able to solve math problems in everyday life. Students find it difficult to solve them if given a problem. Students always say that the problems in mathematics are difficult to resolve, so there is no effort to solve them.

Though the development of problem solving mathematics students at the school level into educational goals. However, the students' skills in developing problem solving are so low that they become a major dilema in education.

Therefore, this study was conducted to analyze students' difficulties in math problem solving skills in schools. Solving mathematical problems is essential to the general purpose of learning mathematics, even as the heart of

mathematic, it is prioritized rather than the process and as a result the focus of school mathematics and aims to help develop mathematical thinking.

2. Mathematic Problem Solving Ability

The ability to solve problems is needed by students in understanding concepts, relationship between concepts, and relationship between concepts and other fields [5]. According to [6] That good problem solving generally builds representations of problems to facilitate understanding. This is confirmed by [7]. Assertion that problem solving is the basic skills required by today's learners and problem solving to be the main focus of the mathematic curriculum.

Reference [8]. Defined mathematical problem solving as the process of interpreting a situation mathematically, which usually involves several iterative cycles of expressing, testing, and revising mathematical interpretation and of sorting out, integrating, modifying, revising or refining clusters of mathematical concepts from various topics within and beyond mathematic. Reference [9] Defined problem solving as one as the effort to find out from difficulty to achieved one aim which is not easy to achieve.

In solving problems, students are expected to understand the process of solving the problem, identifying relevant conditions and concepts, seeking generalizations, formulating a plan of completion and organizing previously owned skills. It will be seen that mathematical problem solving has an important function in teaching and learning activities in mathematic. The teacher presents the problem, because through problem solving students can practice and interpreted the concepts that have been learned.

Step known mathematical problem solving proposed by [9], in his book "How to Solve It". Four step mathematical problem solving by [9] are: "(1) Understanding the problem, (2) Devising a plan, (3) Carrying out the plan, (4) Looking Back". Problem solving is categorized into two aspects; i) how the problems are delivered linguistic (using words) or non linguistic (using graphic or problem based); ii) the illumination of the problem structure information, objective and action plan (Zhining and his colleagues [10]). Reference [11] Stated that problem solving is a process starting from the minute students is faced with the problem until the end when the problem is solved. There are many problem solving models (Table 1).

Table 1: Problem solving models

Polya (1981)	**Krulick & Rudnick (1996)**	**Zalina (2005)**
4 - hierarchy phase i) nderstanding problem; ii) lanning; iii) erforming the plan; iv) onfirmation the answer.	5 - hierarchy phase i) eading and thinking; ii) nalyze and planning iii) rganizing strategy; iv) etting the answer; v) onfirmation the answer.	3- hierarchy phase i) nderstanding problem; ii) olving the problem; iii) tating the answer.

Reference [12] Suggests that problem solving is a process that uses certain measures (heuristic) that help in resolving the problem. Furthermore, NCTM added that the term refers to problem solving mathematical tasks that have the potential to provide intellectual challenge and improve the understanding of students' mathematical development.

From the opinions above, can be concluded that the mathematic problem solving ability is ability of the student to solve problems by observing the process of finding answers based on the step by step problem solving: 1) understand the problem, 2) planning, 3) performing the plan, and 4) confirmation the answer.

3. Difficulties in Mathematics Problem Solving

In school students learn mathematics as a useful knowledge for life, but in learning mathematics students not only learn to count but also students also learn mathematics related to everyday life, but students often have difficulty. (Martin and his colleagues [13]) Suggests that children who have difficulty actually have the potential for success, but because an academic achievement of children's performance may decrease on certain subjects such as reading or learning mathematics. According to [14]. Mathematical difficulties in elementary school will continue into secondary school, even affecting subsequent adult life. Mathematical difficulties have certain characteristics, namely difficulties in processing information, difficulties related to language and reading skills, and mathematical anxiety [14].

Reference [15] Difficulties affecting mathematical problem solving can be classified as:

1. Students can't understand the whole or some parts of the problem due to the lack of imagination and experience needed to consider the problem.
2. Students have difficulties in reading and comprehension, unable to understand what important information is in a problem and organize it accordingly. Thus they cannot invert the text into mathematical symbols.
3. Students lack interest in solving mathematical problems due to the length and complexity of the problems, which is demotivating.
4. Teachers do not present daily life matters as problems very often.
5. Teachers are likely to make students memorize "keywords" in the problems to use in formula.
6. Teachers focus on following examples given in textbooks rather than teaching the principles behind each problem.
7. Teachers teach without concern with thinking process orders.

Lack of many mathematics skills caused difficulties in solving problem. Garderen [16] Stated deficiency in visual spatial skill might cause difficulty in differentiating, relating and organizing information meaningfully. There are five types of math skills:

i. number fact skill (proficiency of number facts, tables and mathematics principal);
ii. arithmetic skill (accuracy and logarithm in computational and mathematical working procedure);
iii. information skill (expertise to connect information to a concept, operational, and experience as well the

expertise to transfer information and transform problems into mathematical sentence);

iv. language skill (proficiency of terms and relevance of mathematical information)

v. visual spatial skill (skill to visualize mathematical concepts, manipulate geometrical shape and space meaningfully).

Theoretically, lacked in mathematics skills that could caused difficulties in mathematics especially in problem solving might be due to interference in cognitive abilities [17,18].

4. Research Methods

This research is a qualitative descriptive. Reference [19] Said that a qualitative descriptive research is the basic types of research that major purpose is description of the state of affairs as it exists at present. The type of this research is qualitative descriptive to see the description student difficulties in problem solving ability of student math. Subjects in the study of students of class VIII MTs SWASTA IRA Medan amounted to 39 students. Technique of collecting data is written test and interview. Problem solving ability tests in the form consisted one problem cube with four questions. The scoring techniques used in this study using the following guidelines:

Table 2: Grid of problem solving

Indicators of Mathematic Problem Solving Ability	**Indicators of Cube**	**Number of Test**
Understanding problem	Resolving problems related to calculate the area of the cube	1a
Planning	Resolving problems related to calculate the area of the cube	1b
Performing the plan	Resolving problems related to calculate the area of the cube	1c
Confirmation the answer	Resolving problems related to calculate the area of the cube	1d

To calculate the percentage ot the total score for each indicator of problem solving ability (P_k) used :

$$P_k = \frac{Aqcuisition\ score\ \ on\ indicator\ to-k}{Total\ score\ on\ indicator\ to-k} \times 100\% \quad (1)$$

$k = 1, 2, 3, 4$

Table 3: Test scoring guidelines mathematical problem solving

Rated Aspect	Reaction To The Problem	Score
Understanding problem	The completion is based on a wrong process or argument, or no response at all	0
	Completion is not resolved in its entirety but there is the correct argument	1
	Completion of the problem completely and correctly	2
Planning	There is no completion strategy plan	0
	The planned strategy is not quite right	1
	The strategy used is correct and leads to the right answer	2
Performing the plan	There is no completion	0
	There is completion but the plan is not clear	1
	Make a completion using a specific plan and leads to the right answer	2
	Perform a completion using a specific plan that is correct but incorrect in calculating	3
	Perform a completion using a specific plan that is true and the results are correct	4
Confirmation the answer	No checking of answer	0
	Inaccurate examination only on the process	1
	An examination of the process and the answer to the truth	2

With the qualification such as table 4 below:

Table 4: The qualification of total score percentage

Percentage	Qualification
$85 \leq P_k \leq 100$	Very Good
$70 \leq P_k \leq 84{,}99$	Good
$55 \leq P_k \leq 69{,}99$	Good Enough
$40 \leq P_k \leq 54{,}99$	Not Enough
$0 \leq P_k \leq 39{,}99$	Very Less

Arikunto [20]

5. Result and Discussions

5.1 Result

From the research data showed the test results of mathematical problem solving ability of students are presented in table 5 as follows:

Table 5: Students' score of indicators of problem solving ability

Code of Student	Score of Indicators			
	Understanding Problems	Planning	Performing the plan	Confirmation the answer
S1	2	1	2	1
S2	2	1	2	0
S3	2	2	4	2
S4	1	2	1	1
S5	2	1	3	0
S6	1	1	2	1
S7	1	1	3	1
S8	2	2	1	0
S9	1	1	1	1
S10	1	2	2	0
S11	2	1	2	1
S12	2	2	4	2
S13	2	1	2	0
S14	1	1	2	1
S15	2	1	2	0
S16	2	1	2	0
S17	2	1	0	0
S18	2	1	2	1
S19	2	2	2	0
S20	2	1	0	0
S21	1	1	2	1
S22	1	1	0	0
S23	1	2	2	1
S24	2	1	0	0
S25	2	1	0	0
S26	2	0	0	1
S27	2	1	2	1
S28	2	1	2	0
S29	1	2	0	1
S30	2	1	2	1
S31	1	2	2	1
S32	2	1	1	0
S33	2	2	4	2
S34	2	1	2	1
S35	1	1	2	1
S36	2	1	0	0
S37	2	1	1	0
S38	2	1	1	1
S39	2	1	0	1

Here is examples of students' answers on problem solving abilities test:

Problem:

Anggi makes a cube shaped cake with a rib length of 20 cm. Anggi will put the cake into cardboard. Anggi will make his own cardboard using cardboard. What to do Anggi?

a. What data is obtained from the problem?
b. How Anggi puts the cake into the box?
c. Calculate the surface area of the cube shaped cake that will be inserted into the box?
d. Check back the results of the question c! Is the surface area of the cake 2.400 cm^2? What to do Anggi? Explain!

Table 6: Problem solving ability percentage based indicators of problem solving

Indicators of Problem Solving	Score of Students	Total Score	Percentage	Category
Understanding problem	66	78	84.62%	Good
Planning	48	78	61.54%	Good Enough
Performing the plan	62	156	39.74%	Very Less
Confirmation the answer	25	78	32.05%	Very Less

Student's answer sheets:

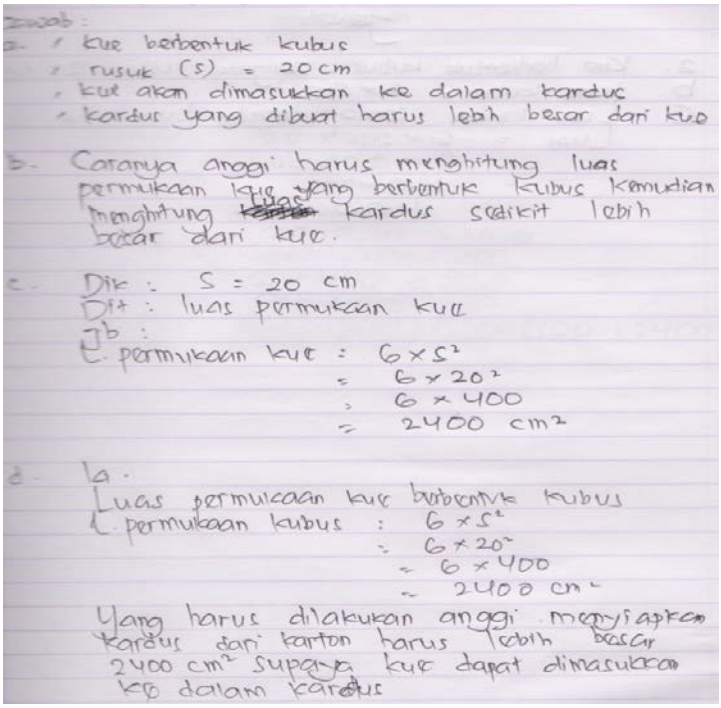

Figure 1: Student 's answer sheet

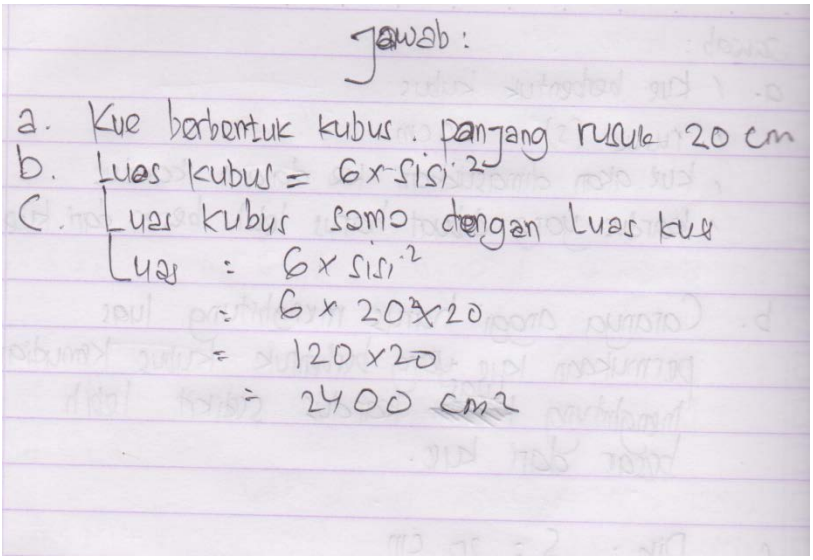

Figure 2: Student 's answer sheet

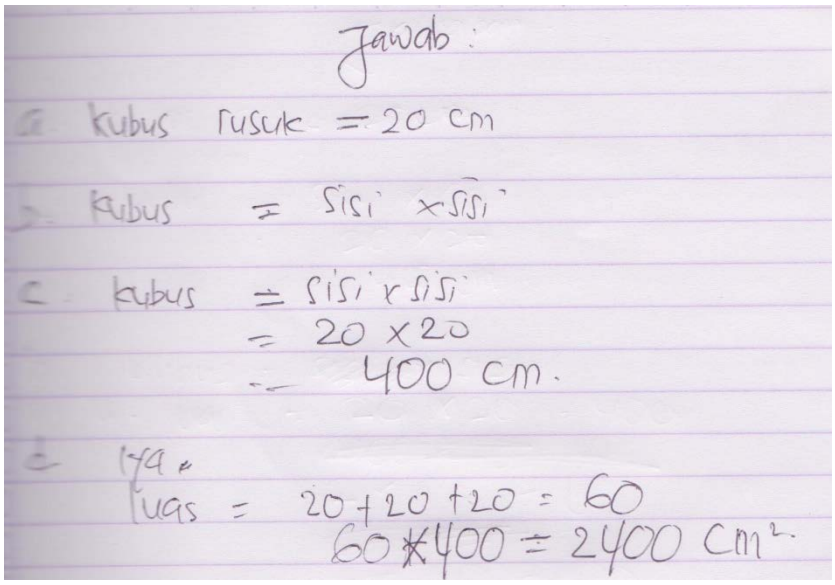

Figure 3: Student 's answer sheet

From the picture above can be obtained as:

- Student on Figure 1 can answer the questions well. He can understand the problem and can make a planning too, then he can solve the problem well. Only 3 of 39 students can solve the problem well, they are S3, S12 and S33.
- Student on Figure 2 can't understand the problem well. She also can't make a planning, the she can performing the plan well.

- Student on Figure 3 are not able to plan and solve the problems at the same time in checking result from the answer, students just multiply the number contained in the problem.

The result of mathematics difficulty analysis of the students in solving the problem is obtained based on the result of the interview on the mathematics teacher that is 1) the students have difficulty solving mathematical problems in reading the text or questions, 2) the students always misinterpreted the problem, 3) If the students don't understand the problem then they will guessed the answer from the problem, 4) the students don't want to find out the solution of the problem given, 5) the students have difficulties in understanding the problem so can't interpreted it into a symbol form.

Teacher A: "Not all students can read and understand the problem well so don't know the intent and purpose of the problem can't even write it into a symbolic form. And also there are some students who don't know where to start in solving math problems because they only know the formula but don't know to use the formula ".

Teacher B: "Students find it difficult to understand math problems so they can't solve the problem. And sometimes students don't have the will to try to understand the purpose of the problem because they assume that the math problem is very difficult. Students also can 't interpreted the problem so that its use into symbolic form is wrong.

5.2 Discussions

Based on the results of the research shows that most students MTs SWASTA IRA Medan class VIII are not able to solve the problems that well provided with meet the level of indicators of problem solving ability. Percentage of students' ability to understanding problem reached 84.62% and classified in the category good, the percentage of problem solving ability of students to planning 61.54% and classified in the category good enough, the percentage of problem solving ability of students to performing the plan 39.74% and classified into categories very less, the percentage of the student's ability to confirmation the answer the results obtained 32.05% and classified in the category very less, while the average percentage reached 54.48% and classified not enough category. This indicates that the class was not finished in solving problems. Reference [11] Stated that problem solving is a process starting from the minute students is faced with the problem until the end when the problem is solved with four indicators of problem solving: understanding problem, planning, performing the plan, and confirmation the answer.

This research is relevant to research conducted by Phonapichat and his colleagues [15] States that students have difficulty in understanding the mathematical problems that affect the problem solving process. Student difficulties in problem solving namely 1) Students have difficulties in understanding the keywords appearing in problems, thus can't interpret them in mathematical sentences. 2) Students are unable to figure out what to assume and what information from the problem is necessary to solving it, 3) Whenever students don't understand the problem, they tend to guess the answer without any thinking process, 4) Students are impatient and don't like to read mathematical problems, and 5) Students don't like to read long problems. Likewise with research (Lubis and his colleagues [21]) Said that the average percentage reached 50% and classified in the not good category. It shows class in solving problems unresolved.

Based on the above explanation, the researcher analyzed the students' difficulties in problem solving ability and

obtained the result of the research based on the indicator that the students of MTs SWASTA IRA Medan class VIII can't solve the problem given with the problem solving indicator.

6. Limitations

This research is a qualitative descriptive research to know how to describe students' difficulties in math problem solving ability class VIII MTs SWASTA IRA Medan in cube material. The mathematic problem solving is analyzed by it's four indicator. The indicators are understanding problem, planning, performing the plan, and confirmation the answer.

7. Conclusions and Recommendations

7.1 Conclusions

Based on the analysis and discussion of the results of research conducted can be concluded that percentage of students' ability to understanding problem reached 84.62% and classified in the category good, the percentage of problem solving ability of students to planning 61.54% and classified in the category good enough, the percentage of problem solving ability of students to performing the plan 39.74% and classified into categories very less, the percentage of the student's ability to confirmation the answer the results obtained 32.05% and classified in the category very less, while the average percentage reached 54.48% and classified in the not enough category. This indicates that students have difficulty in solving problems obtained based on interviews with teachers in the field of mathematics studies such as 1) students have difficulty solving mathematical problems in reading text or questions, 2) students always misinterpret the problem, 3) If students don't understand the problem then They will guess the answer from the problem, 4) the students don't want to find out the solution of the problem given, 5) the students have difficulty in understanding the problem so can't interpret it into symbol form.

7.2 Recommendations

Based on these results, the recommendations can be submitted by researcher are:

- For teacher, it's better to give more practicess to solve non routine problem to increase student's ability to solved student's math problems.
- For students, must to practice more and study math to have a good result and not having any difficulty in doing test that has to do with math solving problem
- For researcher, can use this as reference to do some research to know more about student's difficulty in math problem solving.

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