

Identifying of problem solving abilities in Mathematics among Junior High School students

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ABSTRACT

Purpose: This study aims to identify the problem solving abilities possessed by junior high school students. The type of research used is quantitative which uses a research design survey. The sample of this study is 98 students taken based on purposive sampling techniques. This study uses descriptive statistics to analyze the data generated. From the results of the analysis that has been done, it was found that there is a problem solving indicator by students in mathematics which is indicated by the indicators of planning a solution which has a good category of a 56.1% (55 of 98) students, the indicator of problem solving has a good category of a 56.1% (55 out of 98) students, indicators of a problem solving planning had a good category of a 54.1% (53 of 98) students, and an indicator of understanding a problem had a good category of a 60.2% (59 of 98) students.

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1. INTRODUCTION

Education is a complex activity, and many variables that influence it. As a psychological process, education cannot be separated from the learning process, teaching perspective, or those who educate. Especially education for the 21st century in the curriculum of educational institutions is oriented to create productive, innovative, effective, and creative generations through the integration of attitudes, abilities and knowledge with life skills [1-4]. Therefore, educational institutions in the country determine the core and basic competencies as curriculum goals [5, 6]. In addition, educational practitioners such as teachers agree that education aims at educating high-quality students who will be successfully integrated into the education system [7, 8]. Future global competencies of school teachers are expected to include the knowledge base, skills and attitudes they need to effectively carry out their professional duties in school and function profitably in a changing and interdependent society [9, 10]. Therefore, since in college all students are required to cooperate with fellow colleagues. With this the student must have a good attitude in order to work together with his colleagues [11]. Especially in mathematics.

Mathematics is one of the subjects taught from primary, secondary, and higher education [12]. In accordance with the objectives of learning mathematics at the level of primary and secondary education is to prepare students so that in the world of education can always develop logically, rationally, critically, accurately, honestly, efficiently and effectively. So, it is clear that the teacher must be able to create an atmosphere such that students actively ask questions, question, and express ideas. Learning is indeed an active process of students in building their knowledge, not a passive process that only accepts teacher lectures on knowledge [13, 14]. Mathematics lessons are often interpreted as thinking patterns, organizing

patterns, logical evidence, a language that uses terms that are defined carefully, clearly, and accurately represented by symbols and solids. Mathematics is a symbolic language whose practical function is to express quantitative and spatial relationships while the theoretical function is to facilitate thinking [15, 16]. Another factor that supports the success or failure of teaching mathematics is the mastery of mathematics teaching and learning theories as well as facilities that support the learning process. By mastering the theory of teaching and learning students can follow lessons well and can even motivate students to be interested in learning mathematics. Mathematical theory that is controlled by educators will apply to students if they can choose the right teaching and learning strategy, know the educational and teaching goals or approach that is expected and can see whether students already have readiness or learning ability [17-19].

Attitude is something that cannot be underestimated in learning. In the learning process, especially in mathematics, the attitude of the participants is important to note [20-22]. Because, students who have negative attitudes, will be different from students who have positive attitudes [23]. By having a balance between affective and cognitive, it will make students able to find self-concept, creative, and critical. Attitude can be interpreted as giving a reaction in making a view of an object [24-25]. According to [26] that the attitude is part of his personality that has a relationship with the individual. Understanding student attitudes is very important in supporting student achievement, interest and ability towards certain subjects. [27] agreed that the attitudes of high school students can contribute to their academic achievement. It has been observed that many students currently lose interest in science subjects such as mathematics. This is worrying because future generations need good future communities in mathematics [28]. By knowing the readiness of students in learning mathematics, the teaching that will be delivered can be adjusted to the ability of children or students, one of which is problem solving ability.

Problem solving is the process used to solve a problem. Problem solving as a multi-step process with the problem solver must find the relationship between his past experience (schema) and the problem he is now facing and then act to solve it [29, 30]. The importance of learning problem solving in mathematics can be learned in mathematics, in certain cases, it can be transferred and applied in other problem solving situations. Mathematical problem solving can help students improve their analytical power and can help them apply that power to a variety of situations. By teaching problem solving to students, allowing students to be more analytical in making decisions in their lives [31, 32]. In other words, if students are trained to solve problems, the students will be able to make decisions, because students have become skilled about how to gather relevant information, analyze information, and realize how necessary to re-examine the results that have been obtained. Paying attention to what students will get by learning to solve problems, it is only natural that problem solving is a very important, even most important part in learning mathematics. This is because basically one of the goals of learning mathematics for students is that they have the ability or skills in solving mathematical problems or problems, as a means for him to hone careful, logical, critical, analytical, and creative reasoning [33, 34].

Problem Solving is a process cycle that consists of four stages, namely a plan, do, check and action [35]. Plan is the process of defining and defining and identifying potential solutions to problems. Problem solving is the process of teaching and learning in the form of eliminating differences or differences that occur between the results obtained with the desired [35]. As stated by [36], that Problem Solving is a method of teaching by confronting students with problems that must be solved by students themselves by directing all the abilities that exist in these students. Factors that are capable of influencing ability in problem solving are situational and personal [37]. Situational factors occur, for example in stimuli that cause problems, in the nature of the problem, difficult - easy, new - old, important - less important, involving several or many other problems [38-41]. Therefore, researchers have the aim to identify students' problem solving abilities in mathematics?

2. RESEARCH METHOD

This type of research is quantitative research using survey research designs. Survey research is a study that manages surveys for a sample or the entire population that is used to get according to the objectives of the study [42, 43]. The purpose of this study was to determine the problem solving ability of junior high school students towards learning mathematics, that means in accordance with the design used.

The study was conducted at the State Junior High School in Jambi City with the number of samples in this study totaling 98 students, which were obtained based on purposive sampling techniques, namely the selection of samples based on specified criteria [44]. Therefore, researchers determine the criteria in this study, the criteria are students with high ranks of 3 people and 3 people ranked low from each class.

Test and interview are the instrument used in study. The test of problem solving has 20 valid statements and using structured interviews aimed at strengthening quantitative data. The data is used by the

SPSS program to look for descriptive. Descriptive statistics are presented in a summary frequency, for example, Median, Minimum, Maximum, Mean, Mode [45].

The categories of problem solving questions include, very good, good, not good, and very not good, like Table 1 in below:

Table 1. Categories of problem solving

Category	Interval			
	Understand the Problem	Planning for Completion	Resolve Problems As Planned	Reviewing the Settlement
Very Not Good	5.0 – 6.2	5.0 – 6.2	5.0 – 6.2	5.0 – 6.2
Not Good	6.3 – 7.5	6.3 – 7.5	6.3 – 7.5	6.3 – 7.5
Good	7.6 – 8.7	7.6 – 8.7	7.6 – 8.7	7.6 – 8.7
Very Good	8.8 – 10.0	8.8 – 10.0	8.8 – 10.0	8.8 – 10.0

All data were obtained from problem solving questionnaires collected and calculated and assisted with the SPSS 21 application. In this study, quantitative data were analyzed using Mean, Median, Min, Max, and Percentage. Descriptive statistics are given to calculate the frequency, percentage, mean, median, min, and max of sample [43]. And interviews were analyzed using miles & Huberman, which is reducing data, presenting data, and concluding.

3. RESULTS AND ANALYSIS

Students can be seen from the characteristics they have, in solving problems when they study. Where in this study what will be seen is the ability of students to solve problems in mathematics lessons as seen from indicators of understanding problems in mathematics, plan solutions in mathematics, solve problems according to plans in mathematics, and review solutions in mathematics.

3.1. Understand the problem

The results of the test questions that have been obtained and processed using the SPSS 21 application that we can see in the Table 2 below:

Table 2. The results of the indicators understand the problem in problem solving

Range	Classification		Mean	Min	Max	%
	Responses	Total				
5.0 – 6.2	Not very good	0				0.0
6.3 – 7.5	Not good	15	8.1	6.5	8.0	15.3
7.6 – 8.7	Good	59				60.2
8.8 – 10.0	Very good	24				24.5
TOTAL		98				100

From Table 2, which came from 98 respondents from high school students in the good category, it was found to understand problems in problem solving having a good category of 60.2% for 59 students from 98 total students, not good at 15.3% for a total of 15 students from 98 total students, and very good 24.5% for 24 students out of 98 total students. Of the 98 students, the mean value was 8.1, the maximum score was 8, and the minimum score was 6.5.

The results of the analysis of essay questions in table 2, the indicators of understanding the problem have a good ability of 60.2% (59 of 98) students in mathematics. This ability is shown by being able to understand the questions asked, and being able to prove the answers he wrote because he has the ability to understand good problems.

In the step of understanding the problem, students can determine the information needed from the problem so that students are able to understand concepts to plan problem solving. This study is in line with [46] which states that the problem solving method can improve understanding of concepts that have been learned in various real situations and increase the ability of analysis of a situation. This research is reinforced by [47] that students who have the ability to understand problems can solve problems well. By using problem solving strategies, it has a positive effect on students' mathematical problem solving abilities, especially on aspects of understanding problems and planning problems [48].

3.2. Planning for completion

The results of the essay questions that have been obtained and have been obtained and processed using the SPSS 21 application that we can see in the Table 3 below:

Table 3. The results of the indicators planning for solving problem solving

Range	Classification		Mean	Min	Max	%
	Responses	Total				
5.0 – 6.2	Not very good	10	8.2	5.1	9.0	10.2
6.3 – 7.5	Not good	13				13.3
7.6 – 8.7	Good	53				54.1
8.8 – 10.0	Very good	22				22.4
TOTAL		98				100

From Table 3, which came from 98 respondents from high school students in the good category, it was found to plan solutions in problem solving having a good category of 54.1% for 53 students from 98 total students, not good at 13.3% for a total of 13 students out of 98 total students, very good 22.4% for 22 students out of 98 total students, and very poor 10.2% for 10 out of 98 students. Of the 98 students, the mean value was 8.2, the maximum score was 9, and the minimum score was 5.1.

The results of the analysis of essay questions in table 3, the indicators of planning for completion have a good ability of 54.1% (53 of 98) students in mathematics. This ability is shown by being able to find the previous problem, pay attention to what was asked, get the results then used in this problem.

In planning a solution, students already have a way that can be used to solve problems. With problem solving methods change conventional learning where the teacher is dominant in learning and students only practice to be students who create problems and problem solving strategies by themselves [49]. By applying the problem solving method, student learning outcomes have increased, where students are guided to solve mathematical problems with the steps of solving that have been designed. [50] explained that in the step of planning a solution, students need to identify the operations involved to solve the given problem.

3.3. Resolve problems as planned

The results of the essay questions that have been obtained and have been obtained and processed using the SPSS 21 application that we can see in the Table 4 below:

Table 4. The results of the indicators resolve the problem according to plan in problem solving

Range	Classification		Mean	Min	Max	%
	Responses	Total				
5.0 – 6.2	Not very good	3	8.3	5.7	9.2	3.1
6.3 – 7.5	Not good	15				15.3
7.6 – 8.7	Good	55				56.1
8.8 – 10.0	Very good	25				25.5
TOTAL		98				100

From Table 4, which came from 98 respondents from high school students in the good category, it was found to solve the problem according to plan in problem solving having a good category of 56.1% for 55 students from 98 total students, not good at 15.3% for a total of 15 students out of 98 total students, very good 25.5% for 25 students out of 98 total students, and very poor 3.1% for 3 out of 98 students. Of the 98 students, the mean value was 8.3, the maximum score was 9.2, and the minimum value was 5.7.

The results of the analysis of essay questions in table 4, the indicators of solving problems according to plan have a good ability of 56.1% (55 of 98) students in mathematics. This ability is demonstrated by using the correct strategy to get solutions to problems.

In the implementation of planning to solve problems, some students are able to operate the method and perform calculations optimally. This study was strengthened by [51] who concluded that at the stage of solving problems according to plan, good problem solvers are able to implement their plans and demonstrate cognitive abilities during the implementation of the plan. Problem solving methods help students to actively solve mathematical problems, so students better understand and master the subject matter. Because there will be an increase in the ability to solve mathematical problems after applying the problem solving method in learning mathematics [52, 53].

3.4. Reviewing the settlement

The results of the essay questions that have been obtained and have been obtained and processed using the SPSS 21 application that we can see in the Table 5 below:

Table 5. The results of the indicators reviewing solutions to problem solving

Range	Classification		Mean	Min	Max	%
	Responses	Total				
5.0 – 6.2	Not very good	7				7.1
6.3 – 7.5	Not good	14	8.3	5.5	9.3	14.3
7.6 – 8.7	Good	55				56.1
8.8 – 10.0	Very good	22				22.5
TOTAL		98				100

From Table 5, which came from 98 respondents from junior high school students in the good category, it was found to review solutions to problem solving having a good category of 56.1% for 55 students from 98 total students, not good at 14.3% for a total of 14 students out of 98 total students, very good at 22.5% for 22 students out of 98 total students, and very poor at 7.1% for 7 out of 98 students. Of the 98 students having a Mean value of 8.3, a Maximum Value of 9.3, and a Minimum Value of 5.5.

The results of the analysis of essays in Table 5 show that the indicators of planning for completion have a good ability of 56.1% (55 of 98) students in mathematics. This ability is demonstrated by being able to check the truth of an answer, can the answer be used for other problems.

In the step reviewing the solution, most students review the results of solving the problem. Activities that can be carried out in reviewing the settlement are to analyze and evaluate whether the procedures applied and the results obtained are correct, or whether the procedures can be generalized [54]. In addition, students are encouraged to think of other ways to solve problems. In the stage of reviewing completion, students look back at the solutions obtained to evaluate the concepts they use, ensure that the plan they take is correct and to minimize the possibility of failure in solving problems [55, 56]. Research results from [57] namely problem solving methods can improve student learning outcomes in fraction material as evidenced by the increasing percentage of learning outcomes in each cycle. The ability to solve students' mathematical problems is also important to develop. The importance of problem solving is stated [58] he argues that problem solving ability is the heart of mathematics. In this study, students' mathematical problem solving abilities have been viewed from the indicator benchmarks which means that the problem solving method can improve students' problem solving abilities.

4. CONCLUSION

From the results of the analysis that has been done, it was found that there is a problem solving ability of students in mathematics which is indicated by the indicators of planning a solution which has a good category of 56.1% (55 of 98) students, the indicator of problem solving has a good category of 56.1% (55 of 188) students, indicators of problem solving planning have a good category of 54.1% (53 of 98) students, and indicators of understanding a problem have a good category of 60.2% (59 of 98) students. For this reason, it is recommended that students be given the opportunity to develop direct experiences and thoughts in learning activities.

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