
THE EFFECTIVENESS OF MATHEMATICS TEACHING MATERIALS ON PROBLEM-SOLVING ABILITY IN JUNIOR HIGH SCHOOL STUDENTS

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ABSTRACT

Mathematics learning aims to develop all student's mathematical abilities in obtaining good mathematics learning outcomes maximum. The important target in achieving these learning outcomes is by maximizing learning on problem-solving ability. Accordingly, the purposes of this research were to know how the implementation of mathematics teaching materials on problem-solving ability and to know the categories of the effectiveness of mathematics teaching materials on problem-solving ability. The research method used in this research is descriptive which was obtained from observation, questionnaires, and tests. The participants of this study were students of the seventh grade of Junior High School which consists of two classes. The results informed that there were three kinds of effectiveness, that is interaction effectiveness which showed 55% less effective category, effectiveness of understanding which showed 61.8 % quite effective category, the effectiveness of teaching materials on problem-solving abilities which showed 52.78 % less effective category. Furthermore, appropriate learning materials and the creativity of the teacher in delivering learning materials are considered to be implemented in the mathematic learning process.

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INTRODUCTION

Mathematics is basic knowledge and one of the branches of science that is very influential for the development of technology and the world of education. Meanwhile, the general purpose of learning mathematics is to educate and increase students' knowledge and hone students' abilities in solving mathematical problems. These abilities need to be formed from students themselves accompanied by a mathematics learning process that cultivates students in critical thinking. As

Khoirunnisa et al. (2021) reported that students' skills in critical thinking can trigger students to solve, analyze, and identify problems.

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have power religious spirituality, self-control, personality, intelligence, morals noble character, as well as the skills needed by himself, society, and the state (UU No. 20 of 2003). Education will make people develop their potential so that they can face any changes that occur due to advances in science and technology. Therefore, educational problems need more attention and handling both concerning various issues related to quantity, quality, and relevance. Mathematics is one of the subjects that play a very important role in education. Prado (2020) States that mathematics learning not only to develops logical, rational, and critical reasoning but also provides skills to students to be able to use mathematics and reasoning in solving various problems in everyday life as well as in studying other sciences. Because of the importance of the learning process mathematics, educators are expected to be able to adjust, choose, and integrate appropriate learning models in every mathematics lesson. Educational problems researched by Hidayat (2018) explain that the student's ability in problem-solving must be possessed to be able to solve problems related to school materials. Therefore, there is a need for improvements in learning mathematics, such as the learning model used, approaches in the implementation of learning, and learning resources to attract students' interest in learning mathematics.

According to Chairil (2016) problem solving is a process that is spread out in a process to find a solution to a problem. This is also explained by Bambang (2012) which states that problem-solving is a part of intellectual skill or skill which is assessed as an important and significant learning outcome in the educational process. Significance Problem-solving skills can be seen both from the attention of various schools of psychology to this intellectual skill, the high ranking of that skill in various taxonomies of results learning, as well as from the position of these skills in the learning design taxonomy. Problem-solving activities in mathematics include a simple method used based on standard books, non-routine problems, and the use of mathematics in real life. The use of varied learning models and teaching materials in learning mathematics are expected to make students interested in the mathematic subject. Otherwise, there are still many teaching materials, learning models, and learning approaches that apply teacher-centered in the learning process, while students only come, sit, listen, take notes, and memorize the materials. Furthermore, students only master the materials given without knowing the advantages and how to apply the knowledge in daily life. This is in line with the statement submitted by Suryani (2012) which explains several shortcomings in teacher-centered learning, including teachers control of students' knowledge which will have an impact on the lack of learning independence in students, learning communication that only runs in one direction has an impact on the lack of students' mathematical communication skills, not conducive for critical thinking, encourage passive learning. If a learning system like this still happens often, some bad impacts will probably occur, such as students becoming less interested in the lesson, the emergence of boredom, being passive towards the lessons, even the loss of student interest in mathematics. This is one of the reasons the achievement of students' mathematics learning outcomes is still relatively low.

According to Yeni (2014) stated that mathematics learning at this time emphasizes the importance of students' creativity and communication skills when implementing mathematics learning. It is also stated in the Minister of Education and Culture (2013) which explains that several competencies that must be possessed by students are the ability to solve problems, communicate skills, think clearly and critically, and have intelligence that is by the interests and talents of students. As Nissa (2015) argued that problem-solving is a creative skill that must be possessed by students. Therefore, problem-solving will determine the strategies students used to solve problems related to mathematics. One of the ways to improve students' skills in solving mathematical problems is to interpret students' abilities using teaching materials.

Kurniawati (2021) explained that teaching materials are a source of implementing learning activities that can be used by teachers to students. With the teaching materials, the learning process of students and teachers will be more communicative. In addition, students will find in solving problems based on learning materials and the material being studied. Moreover, teachers will be more creative in developing teaching materials so that the learning process will be more aligned between learning materials and the times.

To improve and develop problem-solving in mathematics learning, an effort is needed to be made by mathematics studies teachers, namely by improving the quality of learning materials and improving the learning process. on the applicable curriculum, targets, and problem-solving in learning (Kharisma & Asman, 2018). The educators have an important influence on the mathematics teaching materials used. For this reason, teaching materials are made and used to adapt to the characteristics of students. To develop learning activities, teaching materials are needed that make students not dependent on teachers and can learn independently in the learning process (Yolanda & Wahyuni, 2020). Based on the results of researchers' observations during the implementation of the PPL (Field Experience Program) at Tri Sukses Junior High School, several basic problems were obtained during the implementation of learning. Students only focused on the first 15 minutes when the learning activity took place. So when students were asked about the material that had been studied, most students felt confused about the material being taught. Because the observing process carried out by students did not go well, this had an impact on students' mathematical problem-solving abilities. If students could not observe the learning material well, the students would also feel confused when students tried to complete the exercises given by the teacher.

The ability of students to solve mathematical problems was still considered very lacking because most students only memorized the formulas given by the teacher. So, when students forgot the formula, students could not solve the questions given by the teacher. Furthermore, students were very rigid when they tried to communicate some of the materials that had been studied. After further review, it turned out that students felt bored with the learning process that took place monotonously and the teaching materials used did not involve students in learning, so the learning process only took place in one direction.

In learning mathematics, each student has a level different problem-solving ability. Teacher delivery method in a mathematics lesson, if it is not right, can also result in reduced problem-solving abilities by students. Teachers are expected to optimize students mastering the concept and solve problems with the habit of critical, logical, systematic thinking and structured.

Besides, the indicators of problem-solving abilities are important points that must be developed during the learning process as for some expert opinions regarding indicators of problem-solving abilities. As Miftah (2016) mentioned in her book that problem-solving indicators, namely understanding the problem, making plans, implementing plans, and re-checking answers.

The causes of the declining level of student problem-solving in learning, namely the role of the teacher who has not been maximized in conveying material and classroom mastery for the learning. Before the learning takes place, when the teacher can deliver the material with the right strategy and some instruments to support the learning process, the abilities for each student's problem-solving will increase. The root cause of the low problem-solving ability varies in classroom learning that the teacher uses conventional methods in learning activities. Teachers are more active in mastering students. Also, some students can follow well, meanwhile, some students who do not dare to ask questions or express their opinions, only actively write down what is written by the teacher on the blackboard without comprehension. At the of the teacher give assignments, passive students just wait for answers from students. The passive student increasingly feels confused and has difficulty in solving problems when the teacher gives slightly more difficult questions from the previous.

The related previous study was conducted by Syahlan Syahlan (2016) who implemented Jigsaw cooperative-based teaching materials to improve the problem-solving ability. The instruments used consisted of student activity observation sheets, teacher ability observation sheets, student response questionnaires, and problem-solving ability tests. Based on the data obtained, it was known that the use of jigsaw cooperative-based teaching materials had been able to meet the effectiveness of the learning process, where: (1) the level of student activity had met the ideal time tolerance limit, (2) the teacher's ability score in the trial of 3.20, including the category of good enough. (3) student responses to teaching materials and the learning process had been positive, (4) the percentage of mastery learning at the time of posttest had reached the minimum mastery limit, namely 77.5% of students scored more than 2.66 (B-). Consequently, mathematic teaching materials have a good effect on problem-solving students' abilities.

Analysis of teaching materials is a study carried out to examine in detail the elements or structure of the subject matter as a basis for discussion or interpretation. The study contains descriptions, descriptions, reviews, explanations, careful examination of the subject matter studied. The above definition means that analysis is systematic and thorough research or research. In this study, the object or subject under study is described into its components which are then compiled, researched, and given an assessment. In the process, the attachment of each element and its integration should not be ignored. Briefly from the above understanding, analysis can be interpreted as a systematic process in describing an object or research subject which is then compiled and given an assessment.

The utilization of teaching materials in the learning process has an important role. For a clearer understanding, each role will be explained as follows: for teachers, as Prastowo (2015) mentioned that teaching materials for teachers have a role, namely: with teaching materials, students can be assigned the topic first or the material to be studied, so the teacher does not need to explain The existence of teaching materials in learning activities, the teacher is more With teaching materials, the learning process will be more effective in solving students'

mathematic problems. Then, this study discusses The Effectiveness of Mathematics Teaching Materials on Problem-Solving Ability in Junior High School Students.

METHOD

This research was conducted at Tri Sukses Junior High School, Bogor City. With a population of 39 students of 2 classes and 2 mathematic teachers. While for this research technique used experimental research and descriptive analysis. A problem statement relating to the question of the existence of independent variables, either only on one or more variables (a stand-alone variable). So in this study, the researcher did not make comparisons of that variable to other samples and look for the relationship of that variable with other variables. This kind of research is hereinafter referred to as descriptive research (Sugiyono, 2018).

This experiment was divided into 2 classes, with the first-class 7A using teaching materials based on a book which is the mathematic book of curriculum 2013 new revise, and the second class 7B using teaching materials developed by the teacher.

The variable is the object of research, or what is the point of concern in a study. So the research variable is an attribute or nature or value of people, objects, or activities that have certain variations determined by the researchers to study and then draw conclusions. The variable studied in this study was the effectiveness of teaching materials on students' problem-solving abilities.

Mulyasa (2014) says that the categories of student learning outcomes (cognitive and psychomotor domains) are as follows in Table 1:

Table 1. Categories of students learning outcomes

Score	Categories
80% - 100%	Very Effective
56% - 65%	Quite Effective
40% - 55%	Less Effective
30% - 39%	Fail

Mustafidah (2021) says that the Interpretation Criteria Score of teaching material is listed in Table 2.

Table 2. Criteria Score of teaching materials

Score	Description
80% - 100%	Very valid (The product can be used immediately without repair)
60% - 80%	Valid (Product can be used with a little improvement)
40% - 60%	Sufficiently Valid (The product can be used with many improvements)
20% - 40%	Less Valid (It is recommended not to use because it needs improvement)
20%	Invalid, or should not be used

From the two expert opinions below, I chose the opinion conveyed by Mulyasa, because this research does not only analyze the teaching materials but also analyzes the teaching materials and problem-solving abilities of junior high school students.

To gain the data of this research, the researcher used three kinds of instruments. In this study, the writer used observation, questionnaires, and tests to collect the data. In collecting the data, there were several steps in the data collection. To describe the situation of the learning process, the researcher conducted into three steps which consisted of :

The first section of data collection was observation. The teacher introduced 2 classes which consisted of 30 students to the two kinds of mathematic learning materials; the mathematic book of curriculum 2013 new revise, and the teaching materials developed by the teacher. During the learning process, the teacher observed the situation of the class and students' responses and checklist the responses based on the observation sheet.

The second section of data collection was questionnaires. The teachers were given the questionnaire sheet after they had finished conducting the learning process. It was a link to a google form that measure how far they make the mathematic learning materials based on the learning media, such as syllabus, lesson plans, sources, and the learning model they apply.

The third section of data collection was tested. Before having the test, the researcher prepared the questions based on the materials that had been discussed in the learning process. Then, the teacher asked the students to answer the questions of the test. It was used to know the effectiveness of the mathematic learning materials through the problem-solving ability of the students. Lastly, the researcher interpreted the students' responses.

RESULTS AND DISCUSSION

Results

Based on the results of research conducted at Tri Sukses Junior High School which is located at Jalan Haji Miing, Kampung Warung Jengkol Kavling Muara Barokah No. 01 Rt 04 Rw 04 Karihkil Village (113.79 km) Ciseeng, West Java 16330 data obtained from the total score of students based on the results of the preliminary study as follows:

Table 3. The total score of the research

No	Name	A score of Interaction Effectiveness	The score of Effectiveness Understanding	Score of the effectiveness teaching materials
1	S1	15	10	5
2	S2	30	30	20
3	S3	10	15	20
4	S4	10	20	30
5	S5	15	10	15
6	S6	25	25	10
7	S7	20	10	15
8	S8	5	5	15

9	S9	10	10	5
10	S10	0	20	20
11	S11	10	10	10
12	S12	10	10	15
13	S13	5	5	15
14	S14	25	25	20
15	S15	10	20	15
16	S16	10	30	20
17	S17	10	10	25
18	S18	30	25	20
19	S19	10	10	15
20	S20	5	25	20
21	S21	25	10	15
22	S22	5	5	5
23	S23	10	10	25
24	S24	20	15	15
25	S25	25	30	20
26	S26	15	10	15
27	S27	5	10	5
28	S28	20	15	25
29	S29	5	5	5
30	S30	5	10	15
Total score		400	445	475

Data analysis, intended to know the effectiveness of teaching materials with using test and practice methods at Tri Sukses Junior High School, as follows in table 4.

Table 4. The categories of effectiveness result

Effectiveness of Teaching Materials	Results	Categories
Interaction Effectiveness	55 %	Less Effective
Effectiveness of Understanding	61.8 %	Quite Effective
The effectiveness of teaching materials on problem-solving abilities	52.78 %	Less Effective

Based on table 4, it can be seen that the effectiveness of the interaction in Tri Sukses Junior High School is showing the less effective category with the results obtained 55%, quite effective category on the effectiveness of understanding with 61,8%, and less effective category on the effectiveness of teaching materials on problem solving abilities with 52,78%.

Discussion

The research was conducted according to the research procedure. The number of meetings in this study was adjusted to the number of teacher meetings during class teaching based on the density of the material that had been discussed. Learning is done using a problem-solving approach with more emphasis on the ability to solve a problem that has been given by the teacher. Before conducting this research, the researcher first conducted a literature study for the effectiveness of the teaching materials used by the teacher on the ability to understand mathematical problems of students in junior high school.

After carrying out the literature study, the researcher continued to examine the effectiveness of teaching materials using a problem-solving approach to determine students' mathematical problem-solving abilities. This is done by observing the way the teacher carries out the learning process in the classroom using different teaching materials. This research on teaching materials was carried out after observing the effectiveness of these teaching materials on students' mathematical understanding abilities, then testing the effectiveness of student interactions during the learning process using a problem-solving approach to the teaching materials used, after that testing the effectiveness of teaching materials on students' problem-solving abilities.

The conclusion based on the research carried out is that the effectiveness of teaching materials on interaction skills is still considered less effective, and the effectiveness of teaching materials on students' mathematical understanding abilities is considered quite effective and the effectiveness of teaching materials on problem-solving abilities is considered less effective. This shows that there are still many shortcomings in the design of learning devices that must be improved, especially in teaching materials to hone the mathematical problem-solving skills of junior high school students, especially in the interaction aspect in the implementation of mathematics learning. In addition, teaching materials also have an impact on students' mathematical understanding abilities and the spirit of independent learning in students. And one way that can be done to improve this is with the development of teaching materials that are tailored to the needs of students during the implementation of learning.

Related to the previous studies, this is in accordance with the results of Syahlan (2016) which the use of jigsaw cooperative-based teaching materials had been able to meet the effectiveness of the learning process, where: (1) the level of student activity had met the ideal time tolerance limit, (2) the teacher's ability score in the trial of 3.20, including the category of good enough. (3) student responses to teaching materials and the learning process had been positive, (4) the percentage of mastery learning at the time of posttest had reached the minimum mastery limit, namely 77.5% of students scored more than 2.66.

In addition, based on the results of research conducted by Miftah (2016) the main cause of the decrease in the level of students' problem-solving abilities is the lack of the role of the teacher or the role of the teacher in delivering the material and mastering the class during the learning process has not been maximized. In addition, the strategies used when the learning process used by the teacher is not so steady or is still changing so that this has an impact on the way students respond to the teacher when they do not understand the learning material.

While based on research conducted by Wahyuni (2021) is explained that design, defining, develop and disseminating are important elements that will determine student interest in teaching materials used by teachers in the implementation of learning. In addition, research on students' mathematical problem-solving abilities related to teaching materials has also been studied by Maulana which explains that there are significant differences between different teaching materials when used by teachers in the same eye with the same approach.

This is in line with the results of research that has been carried out by researchers which can be concluded that the processing of mathematics teaching materials in the learning process greatly determines the effectiveness of student interaction during the implementation of learning and affects the effectiveness of students' mathematical understanding. This also has an impact on students' mathematical problem-solving abilities. It could be seen that the mathematic learning materials used by teachers determined the problem-solving ability of students in the learning process.

CONCLUSION

From the results of the data analysis formulated above, it can be seen that the effectiveness of absorption in Tri Sukses Junior High School is showing the less effective category. This shows that several students got easily bored and become lazy in carrying out learning, especially in mathematics subjects.

Based on the analysis, data processing, and discussion, the results of this study can be concluded that learning by using practical methods at Tri Sukses Junior High School, includes three stages, namely:

1. Interaction Effectiveness at Tri Sukses Junior High School shows results that are categorized as **Less Effective**.
2. Effectiveness of Understanding at Tri Sukses Junior High School shows results that are categorized as **Quite Effective**.
3. The effectiveness of teaching materials on problem-solving abilities at Tri Sukses Junior High School shows results that are categorized as **Less Effective**.

Suggestions provided based on the result of this study are the learning materials are considered to be appropriate when it is implemented and the creativity of the teacher in delivering learning materials is considered to be communicative to make a good impact on students' mathematical communication skills in solving mathematical problems given by the teacher based on the material that has been studied in the teaching materials.

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