European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available on-line at: www.oapub.org/edu

doi: 10.5281/zenodo.1489188 Volume 5 | Issue 6 | 2018

EFFECT OF STUDENT WORKSHEETS BASED ON PROJECTS THAT INTEGRATE INFORMATION TECHNOLOGY ON PROBLEM-SOLVING ACHIEVEMENT IN GEOMETRY SPACE SUBJECT

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Abstract:
The research objective is to describe the use of student worksheets based on projects that integrate information technology to assess students' mathematical problem-solving abilities. This type of research is descriptive research and the research subjects were students of the 2015 class of STKIP PGRI Sumatera Barat Mathematics Education program. The instruments used were essay test questions, which consisted of pre-test and post-test questions. Data analysis techniques with descriptive analysis indicators of mathematical problem-solving abilities in this study are (1) Identifying known elements, which are asked and the adequacy of the elements needed; (2) Formulating mathematical problems; (3) Explain the results of the problem using mathematics. The results of the study state that in the pre-test answers students can answer using the step method by identifying the known elements, but have not been able to formulate mathematical problems and explain the results of problems using mathematics. While the results of student answers at the time of the post-test are better, where students are able to meet the three indicators of problem-solving expected.

Keywords: student worksheets, project-based learning, geometry space subject

1. Introduction

One of the problems faced in the world of our education is the problem of the learning process. In the learning process, students are not encouraged to develop intellectual abilities that involve the ability to think systematically, reasoning, creative and critical. This ability greatly determines the level of success of absorbing, understanding, using,

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analyzing, synthesizing, evaluating concepts from a science and solving various problems. The learning process is no longer just knowledge to students but is a process of acquiring concepts that involve them actively and directly in solving problems. To solve the problem, students must examine what information can be used and be able to find out what information is needed.

Problem-solving skills are very important for everyone. Not only because most human lives will be faced with problems that need to be resolved, but problem-solving can also improve analytical power and can help to solve problems in various other situations. Besides that, without activities or efforts to develop the potential abilities of students, problem-solving skills will not develop properly. One effort that can be done to develop the potential of these abilities is through an educational program. One educational program that can solve various mathematical problems (Muir and Beswick, 2004). Problem-solving ability can improve student learning achievement in the learning process (Arthur, 2015). Problem-solving ability is an ability that must be possessed by students, even the ability to solve mathematical problems as the heart in learning mathematics (Sumarmo, 1994). The ability to solve problems becomes a determinant for a student in improving his performance in solving various problems (Muir et al., 2018).

The observation results show that students have difficulty in learning and digging information in the learning process because the learning process is dominated by lecturers. Students only accept what is delivered by the lecturer, they are only required to be able to solve the questions correctly and get satisfactory grades. As a result, the material explained by the lecturer is not understood by students, the concepts taught are not understood and there are errors in solving problems in the practice questions given by the lecturer. Lecturers place students more as objects and not as students. When solving math problems students find it difficult to understand the meaning of the problem and do not understand how to solve the questions given, namely the questions related to students' mathematical problem-solving abilities. They cannot mention and apply the concept correctly and precisely. Most students tend to memorize the problem-solving path. If the form of the question is slightly replaced with the question same, then they have difficulty answering it.

To overcome the problems that occur, the solution that is expected to develop the ability of student problem solving is to use student worksheets based on a project that integrates information technology. Student worksheets based on a project that integrates information technology is a systematic teaching method that involves students in learning knowledge and skills through a structured process, real and thorough experience designed to produce products (Park et al., 2015). Project-based learning is connecting students' experiences with life to foster critical thinking when students gain new knowledge (Efektatia, 2014). The use of student worksheets based on a project that integrates information technology encourages the creation of independent, interactive, inspirational, challenging, and motivating learning in the learning process and will make learning more effective and efficient (Ergül and Kargın, 2014). Student worksheets based on a project that integrates information technology can

make students discover their own concepts in accordance with the knowledge and skills they have (Sumarni et al., 2016). Student worksheets based on a project that integrates information technology helps students to add information about concepts learned through learning activities systematically and can improve students' creativity and critical thinking (Anazifa and Djukri, 2017). The existence of project-based learning can improve cognitive abilities and skills of students in the learning process (Mukama, 2010). Teaching students to solve problems will enable these students to become more analytical in their decisions in life. In this case, researchers try to see the effectiveness of using student worksheets based on a project that integrates information technology to problem-solving skills in Space Geometry subject.

2. Methods

This type of research is a quantitative descriptive research because in this study describes the conditions that occur at present in a systematic and factual manner with the aim of describing and resolving the problems studied. Descriptive Research is research intended to investigate circumstances, conditions or other things mentioned, the results of which are presented in the form of research reports. Researchers do not change, add to, or manipulate objects or areas of research. The researcher only photographed what happened to the object or region studied, then explained what happened in the form of a straightforward research report, as it is (Arikunto, 2010).

Descriptive method is a problem-solving procedure that is investigated by describing/describing the condition/subject/object of research (someone, institution, society, and others) at the moment based on facts that appear as they are (Nawawi, 1991). The quantitative descriptive method in research this is the method used in completing a scientific study with the aim to solve the problem being studied, namely the ability to solve student problems in the Geometry Space lecture at STKIP PGRI Sumatera Barat.

3. Results and Discussion

Mathematical problem-solving ability is an ability in which students try to find a way out that is done in achieving goals, also requires readiness, creativity, knowledge and abilities and applications in everyday life. Mathematical problem-solving ability is one of the abilities that must be possessed by students because problem-solving provides great benefits to students in seeing the relevance between mathematics and other subjects, and in real life. Students are said to be able to solve mathematical problems if they can understand, choose the right strategy, then apply it to problem-solving. Good mathematical problem-solving ability also influences the learning outcomes of mathematics to be better and is also a general goal of teaching mathematics, because the ability to solve mathematical problems can help in solving problems both in other lessons and in everyday life. The lack of mathematical problem-solving abilities of

students also causes the mathematics teaching and learning process does not achieve the expected learning outcomes.

The same study was expressed by the National Council of Supervisors of Mathematics (1977) in their position papers on basic skills. Similar statements describe mathematics as basically a problem-solving effort (Wirtz 1975) and as a vehicle for producing and training problem-solving abilities (Braunfeld 1975). Problem solving is an effort made to solve the problems found. Polya says problem-solving is one aspect of high-level thinking. So that Polya (Hartono, 2014) presents two kinds of mathematical problems, namely: (1) Problems to find (problem to find) where we try to construct all types of objects or information that can be used to solve the problem, and (2) Problems to prove where we will show one of the truths of the statement, ie the statement is true or false.

This type of problem prioritizes hypotheses or conclusions from a theorem whose truth must be proven. Problem-solving is a part of a very important mathematics curriculum. This is because students will gain experience in using the knowledge and skills they have to solve non-routine questions. Agree with the statement, Lencher (Hartono, 2014) defines problem-solving in mathematics as a process of applying mathematical knowledge that has been previously obtained into a new situation that is not yet known. There are several benefits that will be obtained by students through problem-solving, namely: 1.) Students will learn that there are many ways to solve a problem (divergent thinking) and there are more than one possible solution of a problem. 2.) Students are trained to explore, think comprehensively, and reason logically. 3. Develop communication skills, and shape social values through group work. Problem-solving for an individual requires the arrangement of processes below to support a situation faced by individuals (LeBlanc, 1977).

According to Polya (Fauzan, 2011) in problem-solving there are four steps that must be taken, namely: (1) understanding the problem; (2) planning solutions; (3) solve the problem according to the plan of the second step; (4) re-examine the results obtained. One of the best ways to learn problem-solving is done, namely by thinking or reviewing the steps taken in solving the problem. According to Sumarno (Fauzan, 2011) Indicators for solving mathematical problems are as follows: (a) identifying known elements, which are asked and the adequacy of the elements needed; (b) formulating mathematical problems or compiling mathematical models; (c) implement strategies to solve various problems inside or outside mathematics; (d) explain or interpret the results of the problem using meaningful mathematics.

From some of the descriptions above, the indicators of mathematical problem-solving abilities in this study are (1) Identifying the known elements, which are asked and the adequacy of the elements needed; (2) Formulating mathematical problems; (3) Explain the results of the problem using mathematics. These three indicators can measure students' mathematical problem-solving abilities well. In solving mathematical problem-solving questions with these three indicators, students have directly trained the right way of thinking. This can represent all problem solving indicators.

The instrument used was an instrument in the form of a mathematical problem-solving ability test sheet. Instrument test sheet mathematical problem solving ability is used to determine the mathematical problem-solving abilities of students in solving the problem of space geometrics based on indicators of mathematical problem-solving. The problem of mathematical problem-solving skills consists of four essay questions and is given to experimental class students. The following results of student answer analysis in question number 1 during the pre-test on the building material can be seen in Figure 1.

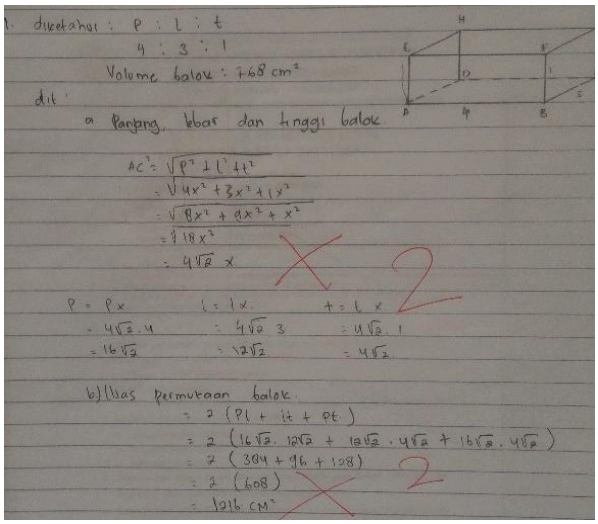

Figure 1: Student pretest answers

In the number 1 pre-test questions, students can answer using pattern steps by identifying known elements but has not been able to formulate mathematical problems and explain the results of problems using mathematics. This means indicators of problem-solving that are expected to have not been achieved. Furthermore, the student learning outcomes at the time of the post-test can be seen in Figure 2.

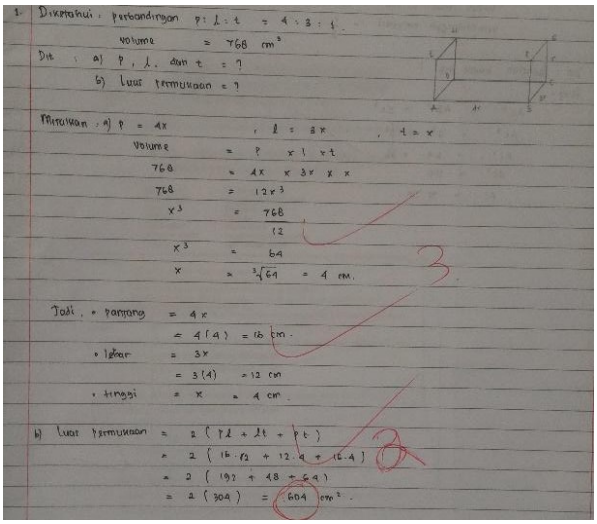

Figure 2: Student post-test answers

In number 1 post-test questions, students can answer by identifying the known elements, formulating mathematical problems and explaining the results of the problem using mathematics. However, it is still a little wrong in writing the final results. This means that the three expected problem-solving indicators have been reached.

4. Conclusion

Based on the results of research on the analysis of mathematical problem-solving abilities it can be concluded that the subject has the ability to solve problem question after using student worksheets based on a projectthat integrates information technology. The initial step of the subject in solving the problem is by understanding the problems presented by the next question, students write down what is known, ask what data they lack and to solve the problem. Indicators identify the elements that are known, asked and the adequacy of the elements needed is still many students who are not precise and systematic. However, the subject has used the ability to think quickly, clearly and precisely the calculation in solving the problem has been good. All indicators of student problem solving ability at the time of the post-test have been achieved. The indicators assessed are; (1) identify the elements that are known, which are asked and the adequacy of the elements needed; (2) formulating mathematical problems, and: (3) explain the results of the problem-using mathematics.

Acknowledgments
Researchers would like to thank all those who have helped conduct the research. Especially to the DIKTI DRPM who have funded this research with the contract number: 3/ E/KPT/2018 January 16, 2018.

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