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The Effect Of Using Geometer's Sketchpad Software Towards Students' Mathematical Communication Skills

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Abstract.

Students' mathematical communication skills in Indonesia are still under expectation. The purpose of this study is to know the effect of using Geometer's Sketchpad Software to students' mathematical communication skill. Collecting data was done using developed mathematical communication instrument. Moreover, 63 students were participated in this study. The proposed hypothesis in this study is there is an effect in using Geometer's Sketchpad Software to the students' mathematical communication skills. The independent variable in this research was Software Geometer's Sketchpad, while the dependent variable was mathematical communication ability. The results shows that there is an effect of using Geometer's Sketchpad Software to the students' mathematical communication skill.

Keywords: mathematical communication skill, mathematical software, geometer's Sketchpad.

1. INTRODUCTION

The fundamental mathematical concepts emphasize the skills to think logically, analytically, systematically, critically, and creatively, as well as the skill to work together [1]. This leads to mathematics as a difficult subject. Abdurrahman said that many people view mathematics as the most difficult field of study [2]. Nevertheless, everyone should learn it because this subject makes people easier daily life problems. Therefore, mathematics is very important to help solve everyday problems.

There are several important mathematical skill that should be improved by students. One of them is mathematical communication skills. Students' mathematical communication skills in Indonesia are still not satisfactory. The evidence coming from the study of the Program For International Student Assessment (PISA) in 2009 shows that Indonesia was ranked 63rd out of 65 countries. In fact, PISA measurement indicators show that almost 90% of Indonesian students are below level 3 [3]. Meanwhile, communication skills are in the indicator level 3 to level 6. It is clear that Indonesian students' mathematical communication skills are still in unsatisfactory

level. Therefore, students' mathematical communication skills need to be developed again. This agrees with the objectives of learning mathematics which makes students easier to have the ability to communicate ideas with symbols of tables, diagrams, or other media to clarify situations or problems [1]. From these facts, mathematics communication skills should be developed by mathematics teachers. One of them is by using media that will help students understand the material.

One of the media that can be done to improve students' mathematical communication skills is by utilizing technology. National Council of Teachers of Mathematics (NCTM) states that technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning [4]. The use of technology such as ICT-based learning media is very important because it makes teachers possible to improve mathematics learning outcomes and increase student knowledge. However, many mathematics teachers prefer teaching without using ICT on the grounds that it is easier and more practical. Even though this will make students saturated with mathematics subjects. If ICT is well utilized in mathematics learning, it will help students communicate mathematical ideas, ideas or symbols so that they are easy to understand. In addition, mathematics learning becomes more varied.

The scope of ICT-based learning media is quite broad, including in the form of software (software). Many software can be used in math subjects. One of them is Geometer's Sketchpad (GSP) which can explore everything about two-dimensional shapes. GSP is a mathematics learning software that can construct and manipulate various shapes of flat shapes, so that it can stimulate students to be able to manipulate concepts and be able to know the real form of these mathematical concepts. The process of learning mathematics can be carried out by the teacher by utilizing a computer and GSP which is projected with an LCD (Liquid Crystal Display). This software is expected to improve students' mathematical communication skills and make it easier for teachers to explain the material.

GSP is interactive software, so students can use it themselves to understand subject matter. GSP can improve mathematical connection and communication skills, critical thinking skills, and mathematics learning outcomes. This has been proven in research conducted by Nuriadin [5], Syamsuduha [6], and Setiyono [7]. Based on the research conducted, there is a possibility that the use of GSP might influence mathematical communication skills.

II. METHODS

Research methodology was done through Quasi Experiment design method. The data sources in this study were students of class VII-C as a class taught with Geometer's Sketchpad and class VII-B as a class taught without using GSP at SMP Islam Al-Azhar 12 Rawamangun Jakarta. The experimental class consists of 32 students and the control class consisted of 31 students. Data collection was done using

developed mathematical communication skill after passing validation and reliability test. In addition, this instrument involved mathematical topic on the rectangular shape material.

To analyze the data obtained in the study, a statistical test was used using the t-test, but previously the normality and homogeneity tests were carried out as a requirement for data analysis tests. Firstly, the normality test is used to measure whether the sample used is normally distributed or not, so that it can determine the type of statistics to be used for further analysis. Secondly, homogeneity test was done to know that the variance of the samples used is not significantly different. Finally, t-test is performed to test hypothesis .

III. RESULT AND DISCUSSION

Validation of the instrument records that there are 9 out of that of 12 mathematical communication skills questions are valid. Moreover, reliability test results shows $r_{count} = 0,5506$ more than $r_{table} = 0,3202$ which indicates the reliability of students' mathematical communication instrument.

Normality test was done through lilliefors test which shows $L_{count} = 0,1379 < 0,1566 = L_{table}$ for experiment class while $L_{count} = 0,0835 < 0,1591 = L_{table}$ for control class. Therefore, both classes have normally distributed data. Homogeneity test reports that $F_{count} = 1,2011$, $F_{0,95(31,30)} = 0,5587$, and $F_{0,05(31,30)} = 1,7900$. Since, $F_{0,95(31,30)} = 0,5587 < F_{hitung} = 1,2011 < F_{0,05(31,30)} = 1,7900$ then both experiment and control classes have the same variance. Furthermore, the results of the t-test shows that the results of the calculation of the mean of the experimental class and the control class are obtained $t_{count} = 3,0130$, while $t_{table} = t_{0,95(61)} = 1,6702$. It can clearly be seen that $t_{count} = 3,0130 > 1,6702 = t_{0,95(61)}$ which indicates learning using GSP affects students' mathematical communication skills because the mathematical communication skills of students who teach using GSP are better than the mathematical communication skills of students who do not use GSP.

The results of hypothesis testing also prove that there are differences in mathematical communication abilities not a coincidence, but because of differences in the treatment given to the experimental class and the control class. So, it can be concluded that the use of learning using GSP affects students' mathematical communication skills. As for the achievement of mathematical communication skills in this study, there are two lessons that are applied, the first class uses GSP learning and the second class does not use GSP learning. The effect of using GSP can be seen in the table 1.

Table 1. Mastery Level of Students' Mathematical Communication skill

Mathematical Communication Indicators	Tingkat penguasaan	
	experiment	control
1. Stating a situation into a mathematical model	77%	50%
2. Explaining mathematical situation in writing	58%	42%
3. Reading with the understanding of a written mathematical representation	68%	54%
4. Revealing a mathematical description in its own language	65%	46%

IV. CONCLUSION

In conclusion, the results of the research that have been conducted show that the use of GSP has an influence on students' mathematical communication skills, including students who can be motivated to learn mathematics because of the unusual way of displaying teaching materials using GSP. Therefore, ICT-based learning media must continue to be developed to be applied in learning in schools. Thus, learning mathematics is not only limited to numbers and formulas. Because with ICT-based learning media it is possible for good mathematical communication to students.

Mathematics is one of the subjects that must be included in the primary and secondary education curriculum. Mathematics can be interpreted as a language to be continuously improved, especially in mathematical communication skills. Therefore, efforts to improve students' mathematical communication skills continue to be made. The results of this study can be used as a basis for further research on the use of GSP in mathematics teaching, so that the assumption of mathematics as something that is only related to formulas, symbols and scary can turn into something interesting and fun.

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