Mathematical communication ability of 7th grade students viewed from indonesian language ability in experiential learning model

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Abstract

Communication ability need to be improved so that students can solve math problems well. This study aims to determine 1) the completeness of learning mathematics communication 7th grade students with experiential learning models; 2) the influence of Indonesian language ability on mathematical communication ability; 3) mathematical communication ability of students who have very high Indonesian language ability; 4) mathematical communication ability of students who have high Indonesian language ability; 5) mathematical communication ability of students who have medium Indonesian language ability. This study uses a combination method. The population in this study is 7th grade students in one of the junior high schools in the city of Semarang year 2018/2019. Sampling by random sampling technique and subject selection with purposive sampling technique. The results show that (1) mathematical communication ability of 7th grade students with experiential learning models can achieve learning completeness; (2) there is an influence of Indonesian language ability on students' mathematical communication ability in the experiential learning model; (3) students with very high Indonesian language ability have been able to reach all indicators of written communication ability; (4) students with high Indonesian language ability have been able to reach all indicators of written mathematical communication ability even though there are still errors in making conclusions; (5) students with medium Indonesian language ability are only able to master two indicator of written mathematical communication ability.

1. Introduction

Education is very important for the development of a nation and country. Law of The Republic of Indonesia Number 20 of 2003 concerning the National Education System, education is defined as efforts and plans to create a learning atmosphere so students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed in society, the nation and country.

Mathematics is one of the important subjects taught at every level of education, because it provides many benefits and can be applied in various fields of life (Mahendra, 2017). This is in accordance with Government Regulation in Indonesia Number 32 of 2013 concerning National Education Standards which establishes mathematics as a compulsory subject at all levels of education, namely elementary education, secondary education and higher education.

The general purpose of mathematics learning is formulated by National Council of Teachers of Mathematics (NCTM) (2000) namely: 1) problem solving ability, 2) reasoning ability (reasoning), 3) communication ability, 4) ability make a connection (connection), 5) the ability of representation (representation). So, the purpose of learning mathematics is so students learn about the values contained in mathematics, are confident in their mathematical abilities, become problem solvers, can communicate mathematically, and can reason mathematically.

Of the five abilities above, the development of communication ability has a very important role in mathematics learning. Studying communication is

the most important learning in mathematics education (Inprasitha et al., 2012). According to Paridjo (2017), mathematical communication has an important role in mathematics learning, because through mathematical communication students can express, explain, describe, hear students' deep understanding of mathematics. The importance of communication ability is also expressed by Mahmudi (2009) in his research that, the development of communication is one of the goals of mathematics learning and graduate competency standards in the field of mathematics. Through learning mathematics, students are expected to be able to communicate their opinions both with symbols, tables, diagrams, and other media to clarify a situation or problem that exists. While the importance of mathematical communication ability according to Fujiati (2014), is communication ability become important when students hold discussions. Because with discussion, they will practice to explain, describe, listen, state, ask, and work together so that they can understand the mathematical concepts by building their own knowledge with the guidance of the teacher.

Based on some of the opinions above, it is clear that mathematical communication ability are very important for students in Indonesia. This is corroborated by Permata et al. (2015) which states that mathematical communication ability are very important for Indonesian students. But in reality, students' mathematical communication ability in Indonesia are still low. This can be seen from the 2015 Trends in the International Mathematics and Science Study (TIMSS) that Indonesia is in 45th position out of 50 countries with a mathematical score of 397. In addition, based on the results of the 2015 three-year Program for International Student Assessment (PISA) survey, Indonesia ranked 62 out of 70 countries that took part in the survey. Indonesia got a score of 386 in the field of mathematics.

The low mathematical communication ability of students are also indicated by the results of the Qohar study (2010) which states that the mathematical communication ability of junior high school students are still low. Similarly, the results of the study by Prayitno et al. (2013) which states that students' mathematical communication ability in Indonesia are still low. While Shadiq (2007) found the fact that most students who were in several different regions in Indonesia had difficulty changing a question related to everyday life in the form of a mathematical model. This show that the

mathematical communication ability of students in Indonesia are still relatively low.

Many math questions are presented in the form of stories. So that the Indonesian language ability of students also influences the completion of math problems, one of which is reading ability. In accordance with the results of the research of Wijarani (2016), that there is a positive and significant effect of reading comprehension on mathematics learning achievement.

The low mathematical communication ability of students can also be caused by the application of learning models that lack space for students to develop mathematical communication ability. Kolb & David (2008) suggest that the experiential learning model is learning that prioritizes human development and how an individual learns to shape himself. This means that experiential learning emphasizes the experience of students in the learning process to find concepts that are then applied to find solutions of problems. The learning experience can be obtained through discussion activities which are then followed by the disclosure of written ideas in resolving the problems given by the teacher. Furthermore Kolb & David (2008) suggest that the stages of learning in experiential learning consist of 4 stages namely (1) concrete experience (real experience), (2) reflective observation (observation reflection), (3) abstract conceptualization (conceptualization), (4) active experimentation. With these stages of learning, experiential learning can lead students to interact and communicate their ideas from their experiences in the learning process.

Based on the description of the above background, the problem in this study is (1) whether mathematical communication of 7th grade students with experiential learning models can achieve learning completeness?, (2) Are there influences on Indonesian language ability with mathematical communication ability? (3) how are mathematical communication ability of students who have very high Indonesian language ability? , (4) how are the mathematical communication ability of students who have high Indonesian language ability ?, (5) how are the mathematical communication ability of students who have medium Indonesian language ability ?.

In this study, indicators of mathematical communication ability based on NCTM (2000) and Sumarmo (2014) namely (1) the ability to express mathematical ideas in writing using mathematical symbols / notations; (2) the ability to visualize mathematical ideas visually; (3) the

ability to understand and interpret mathematical ideas in writing; (4) the ability to evaluate mathematical ideas in writing.

The hypothesis proposed in this study is that students' mathematical communication ability in the experiential learning model can achieve completeness and there is an influence between Indonesian language ability and students' mathematical communication ability.

2. Methods

The type of research used in this study is a combination research method. While for the research design used in this study is concurrent embedded design (mixture is not balanced). This division is because in this study the quantitative method is the primary method and the qualitative method is a secondary method which has a role to complement and support the discussion of the results of the study. Quantitative research was conducted to examine the completeness of learning mathematical communication ability in the experiential learning model and an influence between Indonesian language ability and students' mathematical communication ability . While qualitative research is conducted to answer or describe how students' mathematical communication ability in the experiential learning model in terms of Indonesian language abilities are seen from national exam scores.

The population in this study were all 7th grade students of Junior High School 19 Semarang in the academic year 2018/2019. The technique used in sampling in this study is random sampling. Random sampling is done by randomly selecting one class from the population without any strata differences between each class. In this study, class 7th E was taken as a research class which was given treatment in the form of learning through experiential learning models. The subject to be chosen is known in advance the characteristics, in this case the researcher conducted classification of national exam scores in Indonesian language subjects from the data that had been obtained. Certain considerations made in this study were to choose two subjects in each category of Indonesian language subjects with very high, high and medium categories.

The independent variable in this study is Indonesian language ability. While the dependent variable in this study is students' mathematical communication ability. Data collection methods used in this study are (1) documentation method used to obtain data relating to research; (2) the method of giving tests is used to obtain data on mathematical communication ability; (3) and the interview method is used to obtain in-depth information about students' mathematical communication ability in terms of Indonesian language abilities based on the tests given.

Quantitative data analysis techniques are used to test the research hypothesis. Quantitative data analysis consists of preliminary data analysis and final data analysis. Analysis of the initial data was carried out in the research class before being subjected to the learning treatment. This is done to find out whether the results of the tests of mathematical communication ability of students in the research class are normally distributed or not. The data for the initial analysis used is the test value of the initial mathematical communication ability, while the data for the final analysis is the value of the final mathematical communication ability test.

3. Results And Discussion

Based on the results of the normality test of the initial research mathematical communication test, it shows that the beginning data is normally distributed. After testing the beginning mathematical communication ability and meeting normal assumptions, the class can be sampled in this study. Likewise with the results of the final mathematical communication ability test, a normality test is carried out to ensure that the research class is normal, before testing the hypotheses that have been prepared. After the normality test was carried out on the final mathematical communication ability test and fulfilled the normal assumptions, the analysis of mathematical communication ability can be continued by testing hypotheses 1 using parametric statistical calculations. Calculation of hypothesis testing is divided into 2, namely the average test and the proportion test. The average test uses a one-party average test (right party). Based on calculations with a significance level of 5% and dk = 32-1 = 31, obtained $t_{tabel} = 1.6955$, and $t_{count} = 3.622$. Therefore, because $t_{count} > t_{tabel}$, then H_0 is rejected. So, it can be concluded that the average test results of students' mathematical communication ability in experiential learning are more than 69.5. While the proportion test uses the proportion test of one party, namely the proportion test of the right party. Based on calculations with a

5% significance level obtained $z_{count} = 2.092$, and $z_{tabel} = 1.645$. Therefore, because $z_{count} > z_{tabel}$, then H_0 is rejected. So, it can be concluded that the proportion of students' mathematical communication ability who take part in learning with the experiential learning model is more than 0.745.

Based on the results of hypothesis 1 testing, it was found that experiential learning was able to improve students' mathematical communication ability. This is in accordance with Kusuma's research (2014) which states that the classmates' mathematical communication ability which after applied experiential learning models can achieve completeness.

Furthermore, to test hypothesis 2, the test of the effect of Indonesian language ability on mathematical communication ability is the regression test. Based on the output of the Model Summary in SPSS 19.0 for windows, the correlation coefficient value between the variables of the Indonesian language ability with the students' mathematical communication ability was 0.641 which showed a strong and positive relationship between the two.

The coefficient of determination of Indonesian language ability on mathematical communication ability is 0.411 (R square) or 41.1%. This means that the contribution of Indonesian language ability to variations in the ups and downs of mathematical communication ability is 41.1% and the remaining 58.9% is caused by other factors. In accordance with the research of Wijarani (2016) which states that, the more highly the ability to read comprehension, the higher the learning achievement of mathematics will be. So that there is a positive and significant influence on the ability of Indonesian language ability on mathematics learning achievement.

The selection of research subjects for Indonesian language abilities in the very high, high and medium categories was interpreted with the following criteria (Arikunto, 2013).

Table 1. Category of Indonesian Language Ability

Interval (x)	Criteria
$x > \bar{x} + SD$	Very High
$\bar{x} - SD \leq x \leq \bar{x} + SD$	High
$x < \bar{x} - SD$	Medium

From the calculations according to the table above, the results of the national exam scores analysis in Indonesian were obtained from 32 students of class 7th E. There were 4 students with very high Indonesian language ability, 25 students with high Indonesian language ability, and 3 students with medium Indonesian language ability. After that, two research subjects were selected from each level of Indonesian language ability such as the following.

Table 2. Subject of Research

Number	Name	Code	Category
1	Khaisa Claresta Sahda E.	P-18	Very High
2	Yumna Nabila Putri	P-32	Very High
3	Naila Zahra Hafidzah	P-26	High
4	Selfi Fatikasari	P-28	High
5	Bulan Naila Shabrina	P-12	Medium
6	Faris Hanafi	P-15	Medium

3.1. Mathematical Communication Ability of Students with Very High Indonesian Ability.

Based on the results of tests of students' mathematical communication ability can be analyzed that mathematical communication ability in groups with very high Indonesian language abilities including very good. This can be seen from the ability of students to solve problems can meet all indicators of written mathematical communication ability.

The findings in this study describe that students with very high Indonesian language ability have the written mathematical communication ability as follows: students are able to write known and asked information correctly and completely using symbols / notations as they are known in the problem, drawing a model according to the problem completely and correct use of information and signs, write down the steps in a coherent and structured solution and can determine the right formula in solving problems in the problem, and can write conclusions from the results of solving problems that the subject has done correctly and completely using their own language.

These findings are appropriate with the research conducted by Mutmainah (2016) which states that students with high linguistic intelligence which in this study is a very high category have a tendency to mathematical communication in solving mathematical problems well. Students can fulfill aspects of using and expressing mathematical sentences, describing problem

situations visually, interpreting mathematical ideas, using comprehensive representations to express mathematical concepts and solutions, stating resolution strategies, and presenting results and explaining conclusions that are obtained well.

3.2. Mathematical Communication Ability of Students with High Indonesian Language Ability

In students who are in the group with high Indonesian language ability, when the results of the tests of mathematical communication ability are analyzed show that students with high Indonesian language ability are included in the good category and meet all indicators of written mathematical communication ability even though they are still less careful in evaluating mathematical ideas.

The findings in this study describe that students with high Indonesian language ability are having written mathematical communication ability as follows: students are able to write information that is known and asked correctly and completely using symbols / notations in accordance with what is known in the problem, drawing a model according to the problem completely and correctly use information and signs, write steps in a coherent and structured solution and can determine the right formula in solving problems in the problem but still not thorough in evaluating mathematical ideas.

These findings are appropriate with the research conducted by Mutmainah (2016) which states that students with medium linguistic intelligence which in this study is a high category are able to fulfill the aspects of using a comprehensive representation to express mathematical concepts and solutions, stating the resolution strategies quite well and aspects of using and expressing mathematical sentences, describing problem situations visually well.

3.3. Mathematical Communication Ability of Students with Medium Indonesian Language Ability

In students who belong to the group with medium Indonesian language ability, when the results of the tests of mathematical communication ability are analyzed, it shows that students with medium Indonesian language ability are able to meet several indicators of written mathematical communication ability.

The findings in this study describe that students with medium Indonesian language ability have written mathematical communication ability as follows: students have not been able to write known and asked information correctly using symbols / notations in accordance with what is known in the problem and have not been able to write steps coherent and structured and have not been able to determine the right formula in solving problems in the problem. But they can drawing a model according to the question completely and correctly using information and signs, and can write conclusions in accordance with the results of solving problems that the subject has done.

These findings are appropriate with the research conducted by Mutmainah (2016) which states that students with low linguistic intelligence which in this study is a medium category can visualize problem situations visually. However, the aspect of using comprehensive representation is to express the mathematical concept and its solution and state the resolution strategy is not good.

4. Conclusion

Based on the results of research and discussion, conclusions obtained (1) mathematical communication ability of 7th grade students with experiential learning models can achieve completeness. (2) there is an influence of Indonesian language ability on students' mathematical communication ability in the experiential learning model. (3) students with very high Indonesian language ability have been able to reach all indicators of mathematical communication ability very well. Students are able to make the steps of completion by coherence and conclude with their own language. (4) students with high Indonesian language ability have been able to reach all indicators of written mathematical communication ability even though there are still errors in making conclusions. (5) students with medium Indonesian language ability are only able to meet two indicators of written mathematical communication ability. Students still have difficulty expressing problems in mathematical symbols. In addition, students also still have difficulty in solving problems using coherent steps and the right formula.

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