Effectiveness of Constructivism Approach to Increase Mathematical Communication Skill of Students Junior High School

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Abstract

The purpose of this study is to analyze and explore the effectiveness of constructivism approach in improving the mathematical communication skills of junior high school (SMP) in Paser city, Indonesia. Type of research used in this study are mix method (quantitative and qualitative) in form of pre test, post test, questionnaire and observation. The research method used in this research is quasi experimental method. In this study, the population is all high school students in Paser City and the sample study was VII class students at three junior high schools in Paser City, Furthermore from each of the schools selected 1 class as the treatment group and 1 class as the control group, so the total is 6 classes. In this research there are two types of data that are quantitative data and qualitative data. For quantitative data analysis and data processing using Statistical Package for Social Science (SPSS) Version 21.0. using the Levene Test is used to see the uniformity of treatment groups and control groups. Then Qualitative data is obtained from the observation process. For observations in descriptive analysis to support quantitative data completeness

Keywords: Constructivism, Approach, Mathematical, Communication, Skill

1. Introduction

In mathematics learning there are some mathematical skills that must be owned by students. One such mathematical skill is communication skills. The importance of communication skills in mathematics can be seen from the objectives of the curriculum in Indonesia namely the Education Unit Level Curriculum or Kurikulum Tingkat Satuan Pendidikan (KTSP) in 2006 that the mathematical learning taught in schools is intended to enable pupils to communicate ideas with symbols, schedules, charts or other media to clarify the situation or problem . Next is the expected skills in mathematical learning ie the concept understanding, the logical element, the problem solving and the importance of mathematics (Depdiknas, 2006). The mathematical objectives and skills described in the KTSP are in line with the general objectives of mathematical learning as summarized by the National Council of Teacher of Mathematics (NCTM) (2000), namely: (1) learning to communicate, (2) learning to think, 3) developing pupil skills to solve mathematical problems, (4) learning to connect ideas, and (5) developing positive attitudes towards mathematics. From the objectives of KTSP and NCTM shows that mathematical communication is one of the key skills that must be developed in every mathematical topic. Therefore, mathematical learning at school should pay attention to the development of this skill.

In the study of Lim and Chew (2007) states that there are two reasons for communication to be one of the focus of mathematics learning. First, because mathematics is not just a tool that helps pupils find patterns, solve problems and draw conclusions, but also tools to convey students' thoughts on various ideas in a clear, correct and concise manner. In addition, mathematics is considered a universal language with unique symbols and structures. The reason is that mathematical communication is an important skill that must be developed for the achievement of student mathematics (Nur Izzati, 2012).

Teacher is one of the factors that can influence pupils in the context of teaching and learning (Mohd Uzi, Noor Shah, and Mohd Faizal, 2014). Therefore, to improve the quality of education, good collaboration between teacher and pupil is needed, besides teachers play an important role in guiding and helping their students achieve the desired skills and improving the quality of teaching. Therefore, efforts to develop systematic communication skills and mathematical learning processes in the classroom are important. The constructivism approach is built to assist pupils in enhancing mathematical communication skills to cultivate courage, motivate students to express their thoughts to friends, teachers and others, either verbally or in writing.

2. Problem Statement.

According to TIMSS and PISA surveys, the achievement of Indonesian mathematics students is still below the average score. According to a study conducted by Nur Izzati (2012) stating that the decline in the learning process at various levels of the school, especially in Indonesia, is due to the overloading of curriculum so learning is focused only on improving the curriculum's target. In addition, mathematical learning is less concerned with the development of mathematical communication skills, so that this efficiency of pupil is still low.

The empirical state of the above studies is in line with the findings of Noor Hikmah's (2014) study on grade VII students at one of the junior high schools in Paser City, which shows that students have not been able to apply the concepts of mathematical learning they have just learned in completing questions given. Almost all students participating in the study did not understand how to solve the problem and to make the solution using the right mathematical language. The questions being tested for the students are very simple contextual problems, but contain a lot of information. It aims to see the students' skills in understanding the questions. Furthermore, according to Marpaung (2011) stressed that based on his observations of teaching and learning of school mathematics in the regions of Indonesia is still conventional.

In this study, researchers pay attention to three levels of school, namely high school, middle and low degree. The school level is a school grouped by the department of education in accordance with the national examination results, percentage of school's approval and performance, in this study a school follows the decision of the Paser urban education office in 2018. Researchers pay attention to three levels of school tailored to ensure all Paser city schools can be represented by three levels of school (high, medium, and low), up to the more represented as each school level has different abilities (Nur Izzati, 2012).

3. The Aim of Research

This study is aimed to analyze and explore the effectiveness of constructivism approach in improving mathematical communication skill in junior high school (SMP) in Paser city. Therefore, the objectives of this study are as follows:
1. Identify the effects of constructivism approaches in improving the mathematical communication skills of junior high school students (SMP) in Paser city.
2. Identify students' mathematical communication skills during the learning process in both groups (control and treatment) and all levels of the school (high, medium, low).

4. Method of Research

1. Types of Research and Research Approach

This research type is field research (Field Research), that is research done by direct to field for studying the effectiveness of constructivism approaches in improving the mathematical communication skills of high school students in Paser City.

While the approach used in this research is Mix-method approach. The mix method approach is the approach method of combining qualitative and quantitative approaches in the methodology (as in the data collection phase), and the mixed model study incorporates two approaches in all stages of the research process (Sugiyono, 2013). Meanwhile, according to Creswell (2012) mix- methods is a research approach that combines or associates qualitative and quantitative forms.

2. Research Design

In this study, the quasi-experimental design was used to test the hypothesis of the study. Experimental quasi designs are usually used to replace actual experiment studies when samples can not be randomly distributed (Chua, 2006). In this study, researchers were unable to make random distributions due to constraints to timetables and the use of existing classes set by school administrators. Random distribution will cause problems of timetable and class changes that involve many students and teachers and can disrupt the process of teaching and learning in schools. In addition, students are also comfortable with the existence of their respective classes since the beginning of the

year. Sudden class changes will pose a threat to internal validity as students are forced to adapt to the environment and new friends.

This study uses pre-test and non-equivalent control group design. According to Sugiyono (2013) Non-equivalent Control Group Design is roughly the same as pretest-posttest control group design, only in this design the treatment group and control group are not randomly selected. In this design, whether treatment groups or control groups are given the same treatment, even if the group is selected and placed without going through random. Two groups were given pre-test, then given treatment, and last post-test. The disadvantage of this design is to have more threats to internal validity than actual experiments because random selection is not run (Creswell, 2008). To see more in depth the effectiveness of the constructivism learning approach in improving mathematical communication skills, this study examines the factors of the school level (high, medium, low). As for this study, a school level will be placed in accordance with the decision of the Head of Paser City Education Office.

According to Creswell (2012) a quasi-experimental study was used when researchers wanted to see the relationship between cause and effect between variables. In this study, there are three variables, ie dependent variables, independent variables, and control variables. The dependent variables in this study are the students' mathematical communication skills, the independent variables are learning with constructivism and conventional approaches, and control variables at the school level.

3. Population and Sample

Population is a generalization area consisting of: objects / subjects that have certain characteristics and characteristics established by the investigator to be studied and then make a conclusion (Sugiyono, 2013). In this study population is all high school students (junior high school) in Bandar Paser class VII. The population should be carefully determined and studied so that the review decisions may give appropriate impact to the results of the study.

The sample of the study was the seventh grade students in three junior high schools in Paser City, representing high, medium and low schools respectively, according to the decision of the head of Paser's education department. Thereafter from each of the schools selected 1 class as the treatment group and 1 class as the control group, so the total is 6 classes.

4. Research Instruments

In this study, the researcher used achievement test, questionnaire, and observation.

## 5. Data Analysis Technique

In this study there are two types of data that are quantitative data and qualitative data. Quantitative data is derived from achievement test, questionnaires, then data analysis and processing using Statistical Packages for Social Science (SPSS) Version 21.0.Qualitative used descriptive analysis.

5. Discussion

1. Mathematical Communication Skills

Gusni (2013) mathematical communication indicators from NCTM into three categories: writing text, drawing, and mathematical expressions. (1) Writing texts, giving answers using their own language, containing a model of the situation or problem using mathematical models in oral, written, concrete, graphic and algebraic form, explain and make questions about mathematics learned, heard, discussed and written about math, guessing, formulating arguments and generalizations. (2) Drawing, reflecting real objects / objects, images, and diagrams into mathematical ideas, and vice versa. (3) The mathematical expression, which states the mathematical concept by declaring daily events in mathematical language or symbols.

2. Teaching Design Constructivism Approach
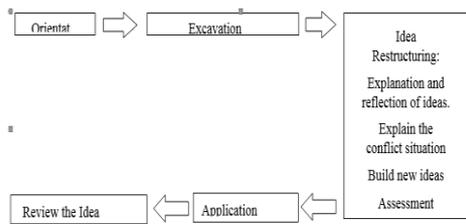
Figure 1. Constructivism Teaching Design

In this study, the researcher developed a modified teaching design from Gagnon and Collay (2001), supported by the constructivism theory of Piaget, Bruner, and Vygotsky.

The steps of the study are as follows:

i) Orientation.

The researcher prepares students to study by conveying: (1) a short description of the material to be taught; (2) showing relevance to real life; (3) submit the goals to be achieved; and (4) show the necessary prerequisites for learning the concepts to be learned.

ii) Excavation Ideas.

At this stage, researchers present problematic events, models, or simulations, which are relevant to the concepts to be learned.

iii) Restructuring Ideas

There are four steps taken at this stage: Explanation and reflection of ideas, Explain to conflict situations, Build new ideas, Evaluations,

iv) Aplication Ideas

Then researchers give students the opportunity to apply new ideas to solve problems.

6. Conclusion

This study is based on previous studies which illustrate the weakness of student communication skills, but from some previous studies the skills of mathematical communication are important to improve student achievement. so researcher built a constructivist teaching design based on Piaget, Bruner, and Vygotsky theories in improving student communication skills.

Acknowledgements

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