

EFFECTIVENESS OF CONSTRUCTIVISM APPROACH TO INCREASE MATHEMATICAL COMMUNICATION SKILL OF STUDENTS JUNIOR HIGH SCHOOL

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Abstract

The purpose of this study was to analyze and explore the effectiveness of constructivism approaches in improving mathematical communication skills of junior high school students in the city of Paser. The experimental quasi method was used in this study to test the hypothesis of the study. The sample of the study at three junior high schools in Paser City, representing high, medium and low school students.. The instruments used in this study were pre-post test, pre-post questionnaires, and observation. The data were analyzed using independent sample t-tests, paired sample tests, annova tests, and descriptive analysis. The findings of pre-post test and pre-post questionnaire analysis using t-test showed that there were significant differences in group mathematical communication skills using constructivism approach compared to groups using conventional approaches at all achievement levels of high school students (high, simple and low). Based on the observation, it is found that high achievement school students have good mathematical communication skills in mathematical communication, these are identified in many aspects and observation indicators achieved by students during learning.

Keywords: Constructivism Approach; Mathematical Communication Skill

Introduction

In mathematics learning there are some mathematical skills that must be owned by the 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 (KTSP) in 2006 that the mathematical learning taught in schools is intended to enable students 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 (Dediknas, 2006). The mathematical objectives and skills described in the KTSP are in line with the general objectives of mathematical learning as outlined by the National Council of Teacher of Mathematics (NCTM, 2000), namely: (1) learning to communicate, (2) learning to think, 3) developing students' skills to solve mathematical problems, (4) learning to connect ideas, (5) forming 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.

However Trends in International Mathematics and Science Study (TIMSS) in recent years has shown that the achievement of students in mathematics and science has dropped dramatically. In 2011 TIMSS reported that the mastery of Indonesian mathematics and science was ranked 38th with a score of 386 out of 42 countries taking the test (Mullis, Martin, and Foy, 2011). This result dropped in comparison to TIMSS report in 2007, where Indonesia ranked 36th (Gurria, 2013). In other words, the mastery of mathematics in Indonesian students has decreased scores according to the results of the TIMSS survey. In addition, the 2012 Program for International Student Assessment (PISA) report found that Indonesia ranked 64th out of 65 countries participating in mathematical literacy tests with a score of 375, still below the international average of less than the 500 score (Gurría, 2013).

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 the improvement of curriculum targets. In addition, mathematical learning is less concerned with the development of mathematical communication skills, so that the efficiency of these skills is still low. As the

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result of the study conducted by Ahmad Fauzan (2008) shows that the ability to communicate in mathematics is still weak among the students.

The empirical state of the above studies is in line with the findings of earlier studies that researchers have undertaken in June 2017 to grade VII students at one of the national standardized junior high schools in Paser City, which shows that the students have not been able to apply the wide- the kite they have just learned in solving the questions given. Almost all students who participated in the study, did not understand how to solve the problem and put forward 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 students' skills in understanding the problem.

According to Nur Izzati (2012) in his study, low math communication skills among students need to be taken seriously. Because until now learning does not pay attention to the development of this competency. Therefore, we must strive to acquire learning approaches that can provide students with learning experiences, and provide space for students to practice learning to communicate well, and provide space for students to practice communicating well in mathematical subjects. The constructivism approach is an approach that conforms to all of the conditions stated above. Constructivism is a more focused approach to students, who in their learning process explain how knowledge is structured in the minds of students (Hanafiah Nanang and Sucana Suhana, 2009). In the constructivism approach it is found to be the result of the student's own efforts and not only transferred from the teacher to the student. This means that students are no longer sticking to the old teaching and learning concepts, where teachers only deliver or transfer knowledge to students without prior effort from their own students.

However, these studies are more likely to be on the achievement and learning outcomes achieved by the students and no studies on the

mathematical communication skills applied by constructivism approach. In addition, the studies have not been implemented in Paser City.

Objectives of the Study

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. Identifying the way students learn are assessed from: (1) the learning process; (2) completion of mathematical communication questions, both groups (control and treatment) and all levels of school (high, medium, low).

Research Questions

Based on the objectives of the study, the research questions to be investigated in this study are divided into two according to the objective of the study:

This question is used for the first objective:

1. Is there a significant difference in mean score for achievement of mathematical communication skills in the treatment group and control group assessed from high achievement schools?
2. Is there a significant difference in mean score for the achievement of mathematical communication skills in the treatment group and the control group evaluated from the medium achievement school?
3. Is there a significant mean difference score for the achievement of mathematical communication skills in the treatment group and the control group evaluated from the low achievement school?

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4. Is there a significant difference in mean score for achievement of mathematical communication skills assessed from high achievement, medium, and low schools?
5. Is there a significant increase in mean score on student responses to constructivism approaches in improving mathematical communication skills in treatment groups assessed from high achievement schools?
6. Is there a significant increase in mean score on student responses to constructivism approaches in improving mathematical communication skills in treatment groups assessed from middle-achieving schools?
7. Is there a significant increase in mean score on student responses to constructivism approaches in improving mathematical communication skills in treatment groups assessed from low achievement schools?

This question is used for the second objective:

8. What is the level of mathematical communication skills of students during the learning process in both groups (control and treatment) and in high achievement, medium, low schools?

Hypothesis of the Study

The hypothesis of this study is hypothesis testing for the effectiveness of constructivism approach in improving mathematical communication skills.

H₀₁: There is no significant difference in mean score for achievement of mathematical communication skills in the treatment group and control group assessed from high achievement school.

H₀₂: There is no significant mean difference in the achievement of mathematical communication skills in the treatment group and the control group is assessed from the medium achievement school.

- H₀₃: There is no significant mean difference in the achievement of mathematical communication skills in the treatment group and the control group assessed from the low achievement school.
- H₀₄: There is no significant difference in mean score for achievement of mathematical communication skill assessed from high achievement, medium, and low schools.
- H₀₅: There is no significant increase in mean score on student responses to constructivism approaches in improving mathematical communication skills in treatment groups assessed from high achievement schools.
- H₀₆: There is no significant increase in mean score on student responses to constructivism approaches in improving mathematical communication skills in treatment groups assessed from middle-achieving schools.
- H₀₇: There is no significant increase in mean score on student responses to constructivism approaches in improving mathematical communication skills in treatment groups assessed from low achievement schools.

Conceptual Framework

Based on Figure 1.1, the diagram explains the conceptual framework of the study where the constructivism approach is a variable that affects students' mathematical communication skills in mathematics learning, as well as evaluations of student learning processes. While the communication skills of students in mathematics learning are dependent variables that are affected by the constructivism approach.

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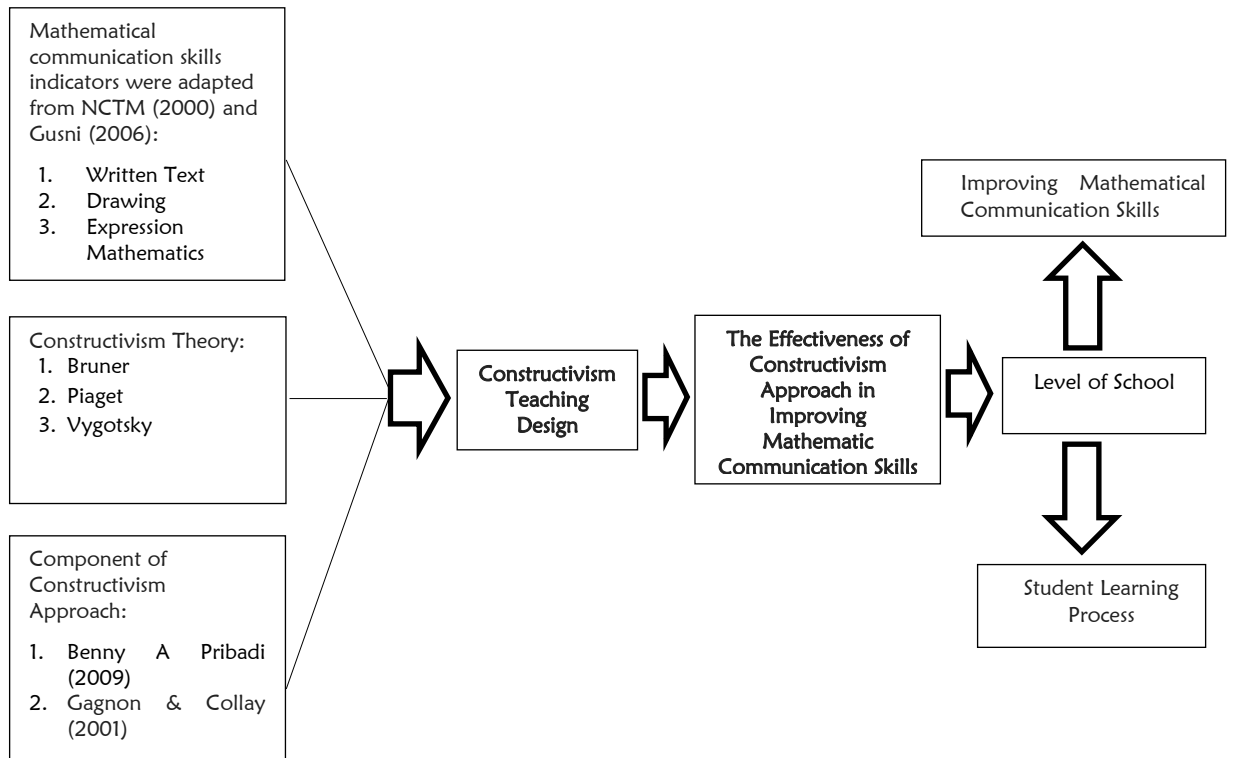


Figure 1.1. Conceptual Framework

Research Method

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

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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 (2008) 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. Therefore, the reason for the selection of junior high school students as a population is to be grounded in a preliminary review that the reviewer

conducted in June 2017 that the mathematical communication skills of junior high school students in Bandar Paser are still low.

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

Instruments are used to collect data according to the purpose of the study. In this study, the researcher used several research instruments including mathematical communication achievement test (pre test and post test), questionnaire, and observation.

5. Data Analysis Technique

In this research there are two types of data that are quantitative data and qualitative data. Quantitative data is derived from pre-test, post-test, questionnaires based on goal-based and hypothesis studies. Qualitative data is obtained from the observation process. For observation in descriptive analysis to support the completeness of quantitative data. Data analysis and processing using Statistical Packages for Social Science (SPSS) Version 21.0.

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Results and Discussion

Objective 1:

Effectiveness of constructivism approaches to improving mathematical communication skills

The effectiveness of learning by using constructivism approach is identified through comparison with conventional learning. Four research questions have been raised for this purpose.

Comparison of post-test in treatment and control groups at high achievement schools was carried out to answer the first questionnaire which is that there is a significant mean difference score for the achievement of mathematical communication skills in treatment groups and control groups assessed from high achievement schools.

The effectiveness of constructivism approaches to enhancing mathematical communication skills is identified through student reactions. Three study questions have been submitted for this purpose. In high achievement schools, the results of the t-test showed that there was a significant increase in student response to the constructivism approach in improving mathematical communication skills. In simple achievement schools, the results of t-test analysis showed that there was a significant increase in student response to the constructivism approach in improving mathematical communication skills. At low achievement schools, the results of t-test analysis showed that there was a significant increase in student response to constructivism approach in improving mathematical communication skills.

This finding shows that learning using constructivism approaches can improve students' mathematical communication skills compared with conventional learning.

Objective 2:**The Effectiveness of Constructivism Approach to Improving Students' Mathematical Communication Skills during the Learning Process**

The effectiveness of constructivism approaches to the improvement of student's mathematical communication skills during the learning process. A study question has been submitted for this purpose. From the results of the observers, it is found that the students' mathematical communication skills in the treatment group are usually better and more mathematical communication skills indicators are compared to the control classes that do not use the constructivism approach. This means that learning by using constructivism approach affects the improvement of student's mathematical communication skills.

Conclusion

In conclusion, the constructivism approach is an appropriate method of being used as an alternative to conventional teaching in pedagogical and broad-spectrum teaching to improve mathematical communication skills. Collaboration between school administration systems, changes in teacher teaching practices and students' readiness to accept student-centered teaching methods will maximize the effectiveness of learning constructivism approaches for the future of students and the success of the country's education system.

References

- Ahmad Fauzan. (2008). *Problematika Pembelajaran Matematika dan Alternatif Penyelesaiannya*. (Publish). Thesis Master. Padang: Padang University.
- Chua, Y.P. (2006). *Research Method*. (Second Edition). Kuala Lumpur: McGraw Hill.
- Creswell, J.W. (2008). *Educational Research. Planning, Conducting, and Evaluating Qualitative & Quantitative Approaches*. London: Sage Publications.

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- Creswell, J.W. (2012). *Research Design Qualitative Research, Quantitative, and Mixed*. Edisi ke-2. NJ: Pearson Education, Inc.
- Depdiknas. (2006). *Kurikulum Tingkat Satuan Pendidikan*. Jakarta: Depdiknas.
- Fraser, B.J. & Walberg, H.J. (1995) *Improving Science Education*. Chicago : The National Society for The Study of Education.
- Gagnon, G.W. & Collay, M. (2001). *Designing for Learning: Six Elements in Constructivist Classroom*. California: Corwin Press Inc.
- Gurria, A. (2013). *PISA 2012 Results in Focus*. Download by: <http://www.oecd.org/pisa/keyfindings/pisa-2012-results-overview.pdf>.
- Hanafiah Nanang & Cucu Suhana. (2009). *Konsep Strategi Pembelajaran*. Bandung: PT Refika Aditama.
- Lim, C.S. & Chew, C.M. (2007). *Mathematical Communication in Malaysian Bilingual Classrooms*. (Unpublished) Conference at Sultan Idris Education University. Tanjung Malim, Perak.
- Marpaung. (2011). *Inovasi Pembelajaran Matematika Berbasis Teknologi Untuk Mempersiapkan Siswa Menjadi Generasi Kompetitif/Comparatif*. Seminar at Wijaya Kusuma University, Surabaya 18 July 2011.
- Mohd. Uzi Dollah., Noor Shah Saad., Nizam Lee., (2014). *Nilai-Nilai Dalam Pendidikan Matematik di Sekolah Menengah*. (Unpublished). Perak: Sultan Idris Education University.
- Mullis, I. P. S., Martin, M.O., & Foy, P. (2011). *Results in Mathematics*. Chestnut Hill, MA, USA: TIMSS & PIRLS International Study Center. Download by Http://timssandprils.bc.edu.tims2011.downloads/T11_IR_Mathematics_FullBook.pdf.
- National Council of Teachers of Mathematics (NCTM). (2000). *Principles and Standards for Scholl Mathematics*. Reston:NCTM,Inc.
- Nur Izzati,. (2012). *Peningkatan Komunikasi Matematis dan Kemandirian Belajar Siswa pada Sekolah Menengah menggunakan Pendekatan Matematika Realistik*. (Publish) Thesis Master). Bandung: Education University Indonesia.

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Smith, R.S. (2008). *The role of auxin transport in plant patterning mechanisms*. PLoS Biology 6,e323

Sugiyono. (2013). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabet

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