

# The Effect Of CTL Approach With Talking-Chips Setting On Mathematical Communication Of Junior High School's Students

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**Abstract**— The purpose of this study was to describe the effect of contextual teaching and learning (CTL) approach with talking chips type cooperative setting on junior high school student's mathematical communication. This study was a quasi-experimental research whose population was all the 8<sup>th</sup> graders in SMP Negeri 3 Sleman that consisted of six classes. From the six classes, class VIII A and VIII B were randomly selected as the sample. Class VIII A as the experiment group dealt with CTL approach in talking chips type cooperative setting, while class VIII B as the control group dealt with conventional learning approach. The instrument used to collect the data was mathematical communication test. The results of the study using Independent Sample T-test in 5% significant level, showed that the CTL approach in cooperative setting of talking chips type has an effect on student's mathematical communication in SMP Negeri 3 Sleman. For further, it can be concluded that the CTL approach with talking chips type cooperative setting is better than the conventional learning approach in terms of developing student's mathematical communication in SMP Negeri 3 Sleman.

**Keywords:** contextual teaching and learning, mathematical communication, talking chips

## I. Introduction

Mathematics is a part of the science aspects which its application widely used in various fields. In the appendix explanation of National Education Minister Regulation Number 22 in 2006 mentioned that the rapid development in the field of information and communication technology today is based on the mathematical development in the field of number theory, algebra, analysis, probability theory, and mathematical discrete. In the appendix was also mentioned that in addition to a focus on mathematics learning achievement, one of the goals of mathematics learning is that students have the ability to communicate ideas with symbols, tables, diagrams, or other media to clarify the situation or problem. This is referred as mathematical communication.

Based on Depdiknas (2003, p. 12) mathematical communication is a students' skill to express and interpret mathematical ideas orally, in writing or demonstrating what is in mathematical problem. On other hand, Principles and Standards for School Mathematics (NCTM, 2000) stated that "if the students have good mathematical communication skills, the students' mathematical ideas can be reflected, improved, discussed and developed. The communication process also helps the students to build understanding and belief of an idea" (p. 60). Based on the explanation above it can be seen that the mathematical communication is one of the important aspects that need to be developed in mathematics learning.

However, it is unfortunate that the process of mathematics teaching and learning in Indonesia still mostly oriented towards the mastery of basic skills, there is little emphasis on the application of mathematics in the context of daily life, communicating mathematically, and mathematical reasoning (Sadiq, 2007, p. 2). Based on information from the BERMUTU's program (Better Education through Reformed Management and Universal Teacher Upgrading) that issued by the Ministry of National Education also mentioned that Indonesia's ranking in the Trends in International Mathematics and Science Study (TIMSS) and the Programme for Internationale Student Assessment (PISA) is still far from the expectations. Indonesia's performance on the TIMSS 2007 was ranked 36<sup>th</sup> out of 49 countries, while

based on the results of PISA in 2009, Indonesia was ranked only 61<sup>th</sup> out of 65 participants (Kemdiknas, 2011, p. 1).

The result of TIMSS and PISA that are lower is certainly due to many factors. One contributing factor as listed in the BERMUTU's program (Kemdiknas, 2011, p. 1-2), among others, is due to Indonesian students in general are less trained in solving problems with the characteristics of such matters in the TIMSS and PISA. This thing at least can be seen from the examples of learning outcomes assessment instruments designed by mathematics teachers of secondary school in Indonesia in the Development Model of Syllabus issued by BSNP in 2007. The syllabus commonly presents the learning outcomes assessment instrument which is substantially less associated with the context of the students' real life and less to facilitate students in revealing the process of thinking and arguing. Whereas the characteristics of matter TIMSS focuses on three domains, namely knowledge, application and reasoning, while focusing on PISA is literacy, that emphasize on skills and students' competencies who obtained from the school and can be used in various situations of daily life.

Seeing these problems, we need a method of learning that allows students to be active, more freely to express their opinions, help each other, and cooperate with peers in solving problems to acquire the new knowledge. This is consistent with the statement of NCTM (2000, p. 61) that "to support classroom discourse effectively, teachers must build a community in which students will feel free to express their ideas." The conditions that favorable for the emergence of such matters is learning in a small-groups which called cooperative learning and make mathematics closer to students' daily life. One of the learning methods in accordance with those characteristics are contextual teaching and learning in cooperative setting. One of the advantages of cooperative learning are students can deepen their understanding as they discuss and exchange ideas with team members. Johnson (2011) revealed that "the cooperation can eliminate mental barriers due to limited experience and the narrow perspective. By working together to achieve a common goal, the students can also develop their mathematical communication skills because the students are required to explain their ideas, either orally or writing" (p. 164-165).

Furthermore, as it has been known that cooperative learning has many types. One type of structured cooperative learning model that supposedly can provide opportunities for students to develop mathematical communication skills is talking chips model. Lie (2008, p. 63) explains that talking chips model can be applied to all subjects included mathematics. In talking chips activities, each member of the group gets a chance to contribute and listen to other group member views and ideas.

According to (Kagan and Kagan, 2009, p. 6:11) "talking chips was developed to solve the problem of one or two students dominating a team discussion." Thus, the advantage of this technique is to overcome barriers of equal opportunities to contribute to the discussions that often happen in a group discussion. The learning activities like these can certainly have a positive impact not only on student learning outcomes but also open up opportunities for students to develop mathematical communication skills. Therefore, the researcher had collaborated the contextual learning method with talking chips type cooperative setting. This is accordance with the National Education Minister Regulation Number 22 (2006) which states that at every opportunity, the mathematics learning should begin with contextual problem. By filing a contextual problem, the learners gradually guided to master mathematical concepts." This is known as Contextual Teaching and Learning (CTL).

Berns and Erickson (2001, p. 2) define Contextual Teaching and Learning (CTL) as a learning process that aims to help students to understand the subject matter by linking the principal subject matter to its application in real-world situations and motivate students to connect knowledge with its application in their lives as family members, citizens, and workers, as well as engage in the hard work that requires learning. Then, for a deeper understanding of the concept of contextual learning, Center for Occupational Research and Development (CORD, 2012) describes CTL into five basic concepts of learning abbreviated REACT, namely: (1) Relating, forms of learning in the context of life or a real experience; (2) experiencing, learning in the context of exploration, discovery and invention; (3) applying, learn to apply the learning outcomes in a variety of real-life situations; (4) cooperating, learning by sharing information and experiences, and also communicate with other students; and (5) transferring, learning activities in the form of utilizing the knowledge and experience on new situations and contexts to gain knowledge and new learning experiences.

With the concept of CTL as described above, learning outcomes become more meaningful for students. The learning process takes place naturally in the form of students' activities work and experiences, not a transfer of knowledge from teacher to student. Contextual learning is a teaching that was developed with the aim of learning to walk more productive and meaningful. Furthermore, the observation and preliminary observation that researcher did in SMP Negeri 3 Sleman indicate that there

were problems of mathematical communication skills at grade eighth students. The students mathematical communication problems demonstrated by the inability of students when asked to reveal the reasons in answering questions from the teacher. Additionally, when there was a problem that presented in a story form, the students got difficulties to create a mathematical model of the problems and also what they had written less structured. Furthermore, based on the observation obtained the information that the study of mathematics in grade eight of SMP Negeri 3 Sleman has not indicated the implementation of CTL approach in talking chips cooperative setting. The learning method that teachers did in teaching directly and question-and-answer method that both dominated by the teacher's role in presenting the material as well as the discussion of a practical exercise. It was less give opportunity for the students especially to develop their mathematical communication skills. Therefore, the researcher conducted this research on the effect of CTL approach with talking chips cooperative setting on mathematical communication skills of students in SMP Negeri 3 Sleman.

## II. METHODOLOGY OF THE RESEARCH

### A. Type and Design of Research

This study was a quasi-experimental research. It was used pretest-posttest with nonequivalent groups design. The researcher used two groups of participants, namely the experimental group and control group. The experimental group was given treatment in the form of CTL approach with talking chips cooperative setting and in control group used conventional approach. Furthermore, both groups were given tests of mathematical communication skills.

### B. Time and Place of Research

The research conducted at SMP Negeri 3 Sleman located at Magelang street Km. 10, Ngancar, Tridadi, Sleman, Yogyakarta. The data was conducted in March-May, 2013.

### C. Population and Sample of Research

The population in this research was all the students of grade eight at SMP Negeri 3 Sleman. The grade eight students consisted of six classes, they were class VIII A to VIII F which totaled 192 students. The sample in this research was determined by using cluster random sampling because the researcher could not directly select a random sample of individuals. In this research the class VIII A randomly chosen as the experimental group, whereas class VIII B as the control group.

### D. Variable of Research

The variables in this research included independent variable in the form of learning approach with two levels that used CTL approach with talking chips cooperative setting and conventional learning approaches, as well as the dependent variable was the mathematical communication skills.

### E. Techniques and Instrument of Data Collection

The data in this research gained directly by the researcher by providing treatment in the experimental group. The data collected by the test to measure the ability of mathematical communication. Meanwhile, the instrument used in this research was mathematical communication test in form of essay.

### F. Validity and Reliability of Instruments

The proof of the validity of the instrument in this research using content validity that gained from the experts. And for estimating the reliability of the instruments used alternate-forms methods or equivalent methods because the instrument in this research consisted of two parallel types of tests (similar but not identical) namely pretest and posttest. The results of the instrument reliability coefficient was 0,58.

### G. Data Analysis Technique

To determine whether there is any effect of CTL approach with talking chips cooperative setting compared and conventional approaches to mathematical communication skills used Independent Sample T-test. The hypothesis tested was:

$H_0 : \mu_1 \leq \mu_2$  (CTL approach with talking chips setting was not better than conventional approach in terms of mathematical communication skills)

$H_1 : \mu_1 > \mu_2$  (CTL approach with talking chips setting was better than conventional approach in terms of mathematical communication skills)

To perform a statistical test with independent sample T-test can be performed using the SPSS program. Criteria for the decision is to reject  $H_0$  if the sig value  $<\alpha = 0,05$ . But before doing t test, the assumption of normality and homogeneity must be fulfilled. Normality test was done by Kolmogorov-Smirnov test while the homogeneity test can be seen from Lavene's test. Both were performed using the SPSS program. Particularly, if the assumption can not be fulfilled then the data can be analyzed using non-parametric method. Non parametric method will be used when the data has an unknown distribution, is non-normal, or has a so small sample size that the central limit theorem can not be applied to assume the distribution. Hence, this method is sometimes referred to as distribution-free method. U Mann-Whitney test is a kind of non-parametric test that can be used to see if there is difference between two groups. Thus, U Mann-Whitney test will be used by researcher when the assumption of parametric test can not be fulfilled.

### III. RESULTS AND DESCRIPTION OF RESEARCH

#### A. Result of Research

Based on the research conducted, the data obtained were presented in Table 1.

Table 1. Mathematical Communication Test Result

Description	Experiment group		Control group	
	Pre-test	Post-test	Pre-test	Post-test
Mean	49,33	72,63	48,13	55,04
Varians	12,85	15,81	10,24	14,89
The highest score	68,75	96,88	73,44	79,69
The lowest score	18,75	35,94	34,38	17,19
Ideal maximum score	100	100	100	100
Ideal minimum score	0	0	0	0

Based on Table 1, it appears that the final condition after treatment, there was an increasing score of mathematical communication skills both in the experimental group and the control group with a range of different upgrade. In the experimental group the average score increased in 23,3 point from the initial score of 49,33 into 72,63. While the control group improved score was 6,91 that occurred from baseline 48,13 into 55,04. Furthermore the result of data analysis was presented as follow.

#### 1. Normality Test

The results of normality test with Kolmogorov-Smirnov test using SPSS program on pretest data for the experimental and control groups respectively obtained sig value 0,147 and 0,001. Because  $0,147 > 0,05$ , while  $0,001 < 0,05$ , it can be concluded that the experimental group of normality assumption fulfilled while in the control group unfulfilled. Besides, normality test results to the posttest data obtained sig value for the experimental and control groups respectively 0,2 and 0,082. Thus, the assumptions of normality were fulfilled for both groups.

#### 2. Homogeneity Test

Based on the results of Levene's test with SPSS program for data pretest obtained sig value of 0,2. Because  $0,2 > 0,05$ , it can be concluded that both are homogeneous group. Furthermore, to the posttest data obtained sig value of Levene's test  $0,777 > 0,05$  so the assumption of homogeneity are also met.

#### 3. U Mann-Whitney Test (non-parametric method)

Because the pretest data normality assumption was unfulfilled then non-parametric method was used to analyze the pretest data. U Mann-Whitney test was used to see if there were any differences in mathematical communication pre-ability between the two groups. The test result used SPSS program obtained sig value  $0,259 > 0,05$ . Thus, it can be concluded that there were no differences in pre-ability mathematical communication between the two groups.

#### 4. Independent Sample T-test

The results of independent sample t-test on the posttest data obtained sig value 0,000 where  $0,000 < 0,05$ . This result was significance. Furthermore, the average mathematical communication test value of the experimental group that was 72,63 more than the control group 55,04. Thus, it can be concluded that the CTL approach with talking chips cooperative setting was better than the conventional approach in terms of students' mathematical communication skills.

### B. Description

Based on the hypothesis test was known that students who received mathematics learning using CTL approach with talking chips setting had an average of mathematical communication ability more than students who received conventional learning approach. While it can be said that the CTL approach with talking chips setting had effect towards the junior high schools students' mathematical communication. This result is most likely due to the learning steps were carried out, especially at the talking chips part that strongly support students to develop their mathematical communication skills. It is accordance with (de Walle, 2008, p. 4-5) that discussion between students will be able to explore mathematical ideas from different view point, so that students can add their mathematics understanding. By working together to achieve a common goal, the students can develop mathematical communication skills because they are required to explain their ideas, either orally or writing. Talking chips technique that used in the discussion also makes students more responsible in group, because for each member of the group is required to have the same capacity to participate in the discussion. In accordance with Kagan (2009) the talking chips model have a function as a regulator of the communication and fluency builders because each student is responsible for participating. This is also supported by the CTL approach which has the principle of making the material closer to the students' daily life. This principle can make meaningfulness learning experience for students so they can easily understand the material content.

From the description above, the theories that have been studied by researcher was suitable with the result of research. The CTL approach with talking chips cooperative setting is better than the conventional approach in terms of students' mathematical communication skills, especially in grade eight students of SMP Negeri 3 Sleman.

## IV. CONCLUSION AND SUGGESTION

### A. Conclusion

Based on the results of data analysis and description, it can be concluded that there was an effect of CTL approach with talking chips cooperative setting on mathematical communication skills of grade eight students of SMP Negeri 3 Sleman. CTL approach with talking chips cooperative setting is better than conventional learning approaches in terms of students' mathematical communication skills.

### B. Suggestion

In accordance with the finding and discussion, there are some suggestions that can be conveyed as follows.

1. The CTL approach with talking chips cooperative setting is proven in theory and supported by empirical research data can be selected as an alternative learning model to support students' mathematical communication skills.
2. For similar research, it can be suggested to make three groups design of research consisting of CTL with talking chips setting group, CTL only group and control group in order to know clearly what is more influence on students' mathematical communication skills.
3. For further research it can be suggested for using CTL approach that varied with the other type of cooperative learning model so the discussion groups can be more interesting and not boring. Last but not least, the mathematical communication skills have to be more emphasis on students' ability to create a mathematical model.

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