JOURNAL ofMathematics Education
Website: http://usnsj.com/index.php/JME
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EFECTIVITY OF CONTEXTUAL LEARNING TOWARDS MATHEMATICAL COMMUNICATION SKILLS OF THE 7TH GRADE OF SMPN 2 KOLAKA

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ARTICLE INFO

ISSN: 2528-2026
Vol. 2, No. 1, June 2017
URL: http://usnsj.com/index.php/JME/article/view/2.1.1-10

Abstract

This study was a quasi experimental research with the aim to know the effectiveness of contextual learning in kolaka city to the skills of mathematical communication. Population in this research was all student of class VII SMP Negeri 2 Kolaka Academic Year 2015/2016. To avoid a large bias in the determination of research samples, the researchers conducted several stages i.e. firstly to test homogeneity against the groups that had formed in the population. After that, took two classes of control and experiment group. Data collection techniques applied tests and observations. Data analysis techniques used descriptive statistics using data centering and data dissemination, then inferential statistics using Independent t-test. The results of descriptive research indicated that the mathematical communication skills of the students taught by using contextual learning of kolaka city consisting of 24 students showed the average value of 71.18 while students who were taught with conventional learning consisting of 27 students showed the mean value of 60.34. Furthermore, the results of inferential statistical analysis of hypothesis testing by using t-test obtained tcount as much as (2.03658)> ttabel (1.67655), indicating that H0 was rejected and H1 was accepted, meant that there was a significant difference between the mathematical communication skills of the students who are taught with contextual learning of kolaka city and conventional learning on the 7th grade students of SMP Negeri 2 Kolaka. From the result of this research, it can be concluded that the mathematical communication skills of the students who are taught by contextual learning of kolaka city is more effective than mathematical communication skills of the students taught by conventional learning in class VII SMP Negeri 2 Kolaka.

Keywords: *learning effectivity, context of kolaka city, conventional learning, mathematical communication skills*

A. Introduction

Educational problems faced by the Indonesian nation are the low quality of education at every level and educational unit. The UNESCO 2000 Report on Human Development Index (HDI), the composition of the educational achievement rankings, reported that in 1999, Indonesia was ranked 109 out of 174 countries, the following year, this situation worsened to 114 out of 146 countries. The low of HDI shows the low competitiveness of nations in the global arena (Hanafiah and Suhana, 2009: 35).

The low quality and relevance of education is influenced by a number of factors, including the quality of the learning process that has not been able to create a quality learning process, the low learning outcomes of students, especially in high-level capabilities, and educational outcomes are also not supported by the testing system and assessment of institutional and Indenpendent so that the quality of education cannot be monitored objectively and regularly. Students will learn better if the learning environments are created naturally in the sense that students experience what they are learning, rather than knowing what is already being directly transferred by the teacher. Lie (2008: 4) states that teachers need to carry out learning activities based on the following points of thought: (1) knowledge is discovered, formed, and developed by students; (2) students build knowledge actively; (3) teachers need to strive to develop student competence; (4) education is the personal interaction between students and the interaction between teachers and students, to build understanding and knowledge together. It can be actualized in learning, one of them is in learning mathematics.

The purpose of learning mathematics that students expect to have is high level of ability and one of them is the skills of mathematical communication as stated by NCTM (2000) that the skills of mathematical communication is one of the abilities that must be possessed by students in learning mathematics that contains five process standards, including problem solving and evidence, communications, connections, and representations. Therefore, mathematical communication is one of the main objectives of mathematics education and is one of the main parts in mathematical activity. There are several indicators of mathematical communication skills in learning mathematics according to NCTM (1991: 214), namely: (1) skills to express the mathematical ideas orally, by written, and demonstrate it and describe it visually; (2) the skills to understand, interpret, and evaluate mathematical ideas both orally and in other visual forms; (3) the skills to use terms, mathematical notations, and structures to present ideas, describe relationships, and situational models.

The skills of mathematical communication especially in Kolaka district is still low. This is proven by the result of mathematical communication skills test analysis done by Rustam (2014: 96) which concludes that the mathematical communication skills of SATAP 1 Mowewe students was 35,93%, SMPN 1 Kolaka student equal to 53,99%, SMAN 1 Tanggetada equal to 43.81%, while SMPN 1 Tanggetada amounted to 40.06%. The acquisition shows that students' mathematical communication skills was very concerning, this is what makes the researcher interested to do initial observation at SMPN 2 Kolaka by looking at students' learning outcomes to know the skills of mathematical communication. The causes of such low mathematical communication skills was influenced by the learning system used so far, focusing on active teachers and passive students.

Initial observations that researchers did in class VII SMPN 2 Kolaka obtained that students' mathematical communication skills were low and needed to be improved. The result of observation and interview with mother Fauziah (teacher of mathematics) at SMPN 2 Kolaka showed that generally, the students' mathematical communication skills was still low. This can be seen from the results of students' learning that can be seen in Figure 1 below:

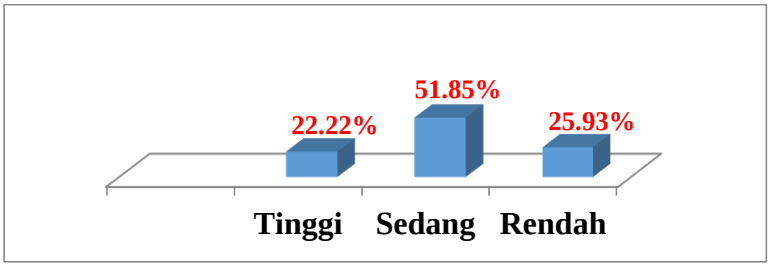

Figure 1. Diagram of Percentage of Daily Test Results of Class VII SMPN 2 Kolaka

Figure 1 shows that student learning outcomes are categorized as high as 22.22%, moderate category is 51.85%, and low category is 25.93%. Various factors that occur in schools, especially in junior high schools cause many problems that result in the difficulty of students in developing their thinking skills. One of the thinking skills that must be developed is the skills of mathematical communication. Therefore, researchers want to propose a learning approach that is Contextual Learning Kolaka City (PKKK). This learning alternative will be tested at SMPN 2 Kolaka. This is due to various considerations that SMPN 2 Kolaka is one of the schools domiciled in the city of Kolaka and most students come from the city of kolaka. Therefore, contextual learning of Kolaka City is considered appropriate in teaching mathematics. With this learning approach students are expected to be fast, active, responsive, and creative in solving math problems with the context of the kolaka city surrounding.

The learning approach with contextual Kolaka City is very suitable with the condition of the students environment so that the students get the opportunity to read the problems that occur around them, so that students will be accustomed to communicate mathematically, in utilizing the potentials in Kolaka well and effectively and be ble to show the best creations based on mathematical analysis.

B. Literature Review

Contextual

Nurhadi (in Kurniasih & Sani, 2015: 140) stated that contextual teaching and learning (CTL) is a learning concept that encourages teachers to connect between the taught material and the real world situation of the students. In addition, CTL also encourages students to make connections between the knowledge it possesses and its application in their lives. Johnson (Greater and Suryani, 2012: 75) states that CTL is an educational process that helps learners see in the academic material they learn by connecting academic subjects to the personal, social, and cultural life context.Johnson (Agung & Suryani, 2012: 76), stated that there are three pillars in the CTL system as follows:

a. CTL reflects the principle of interdependence. Interdependence manifests itself, for example when students join to solve problems and when teachers meet with peers.
b. CTL reflects the principle of differentiation. Differentiation becomes evident when CTL challenges students to respect each other's unique, respectful differences, to be creative, to work together, to generate new ideas and different outcomes, and to realize that diversity is a sign of consolidation and strength.
c. CTL reflects the principle of self-organization. Organizing is seen as students look for and discover their own distinct abilities and interests, get from the feedback provided by authentic judgment, review their efforts in clear goals and high standards, and participate in student activities that make the heart they are happy.

City of Kolaka

In a geographical sense, the city is a place where the population is tight, the houses are in groups, and the livelihoods of the inhabitants are not agricultural. Meanwhile, according to Bintarto (1987), the city in geographical review is a cultural landscape created by natural and non-natural elements with substantial population concentration features, with a heterogeneous and materialistic life style compared to the area behind it. The city in a physical or morphological review emphasizes the forms of physical appearance of the urban environment. Smailes (in Yunus: 1994) introduces three morphological elements of the city that are land use, road patterns, and the type or characteristics of buildings. Meanwhile, Conzen (in Yunus: 1994) also suggests elements similar to the proposed by Smailes, namely plan, architectural style, and land use.

Based on the various morphological elements of the city mentioned above, it is seen that in general the morphological elements of the city ranges between the characteristics of the building, the pattern of roads and land use. These elements are most often used to recognize an area morphologically city or not. The city of kolaka is a very unique and interesting area. In the environmental field, the city of Kolaka has received several awards, namely the recipient of the award from the Minister of the Environment namely the Best Effort Adipura Certificate category 2005/2006, the fifth recipient of Adipura Small Town category in 2006, and 2007 was ranked as the first. In addition, the first winner of the Nature Conservation Biodiversity Category that

concerned with the forestry of Southeast Sulawesi Province, and to host the celebration of the 52nd halo sultra in 2016.

Kolaka city geomorphologically has a sea area, a hill, a mountain of agricultural land, plantations, farms, and forests. The great potential is a good capital in an effort to develop the Kolaka City as a base area on agribusiness activities in a broad sense. In addition, the potential can be developed into rectangular related learning that can provide high economic value to the community such as the construction of a culinary center gate, the construction of a seaside hospital, the construction of a square-shaped park in the middle of the city, the construction of curbs on the sidewalk, As well as the construction of a rectangular beachside tour. These potentials are linked to the contextual learning of Kolaka city, by giving contextual urban issues of kolaka.

Mathemtical Communication Skills

Communication is an essential part of mathematics and the educational mathematics (Turmudi, 2008: 58). Communication is a way of sharing ideas and classifying understandings. Through communication, ideas become objects of reflection, refinement, discussion, and revolution (Wahyudin, 2008: 203). The process of communication also helps to build meaning and estrangement for ideas as well as make them public.

Mathematical communication reflects mathematical understanding and is part of mathematical power. Students study math as if they are talking and writing about what they are doing. They are actively involved in math, when they are asked to think about their ideas, or talk and math, when they are asked to think of their ideas, or talk and listen to other students, in sharing ideas, strategies and solutions. Writing about mathematics encourages students to reflect on their work and clarify ideas for themselves.

The indicators of mathematical communication by NCTM (1989) can be seen from: (1) skills to express mathematical ideas through oral, written, and demonstrate and visualize it; (2) the skills to understand, interpret, and evaluate mathematical ideas either orally, in writing, or in other visual forms; (3) the skills to use terms, mathematical notations and structures to align ideas, illustrates the relationship of relationships with situational models.

With regard to the skills of mathematical communication, Sumarmo (2002) details these abilities into activities: 1) connecting real objects, images, and diagrams into mathematical ideas; 2) explaining ideas, situations and mathematical relationships, orally and in writing with real objects, drawings, graphs and algebra; 3) declare everyday events in language or mathematical symbols; 4) listening, discussing, and writing about mathematics; 5) reading with the understanding of a written mathematical presentation; 6) create conjunctures, construct arguments, formulate definitions and generalizations; 7) explain and make questions about mathematics learned.

Communication skills are needed in math learning. (Hariwijaya, 2009: 16) states the skills of communication is needed to trace and describe the construction of solution results of analysis or logical translation of mathematical problems that arise. While in NCTM (1991: 96) also said that communication is a vehicle between teachers and students to respect each other when the process of problem solving and reasoning occur.

C. Methodology

Research design

This research is a type of Quasi Experimental Design. This study used two different learning models: Kolaka City Contextual Learning (PKKK) given to experimental class and Conventional Learning (PKV) students given to control class students.

Setting

This research was conducted at SMPN 2 Kolaka in class VII of even semester of academic year 2015/2016 on 20 May - 20 June.

Population and Sample

The population in this research was all students of class VII of SMP Negeri 2 Kolaka in second semester of academic year 2015/2016 consisting of 9 classes that is class VII-1, up to VII-9 with number of 237 students. To avoid a large bias in the determination of research samples, the researchers conducted several stages, namely first to test homogeneity against groups that have

been formed in the population by using data of the daily results of odd semester. After that, take two classes of control classes and experiment class. Here is shown the process of determining the sample research.

Normality Test

Analisis ini dilakukan untuk melihat data yang diperoleh apakah berasal dari populasi yang Normally distributed. After analyzing using Kolmogorov Smirnov Test statistic through SPSS assistance, it was found that of all 9 groups of data used normally distributed.

Homogeneity Test

Homogeneity test is done to know the existing groups, whether significantly the same variance or not. With the help of SPSS, the result of Leven statistic test obtained by value of Pvalue (sig) = 0,829, because Pvalue (sig) = 0,829> α = 0,05 then H0 was accepted, so it was concluded that population data of class VII was homogenous. After the stage was completed, the researcher took the sample of two groups as the research sample. Thus, the researcher chosen classe VII-6 and VII-7 which were determined that class VII-6 as the experimental class and class VII7 as the control class.

1. Variables

The variables in this experimental research are the students' mathematical communication skills being taught, contextual learning of Kolaka City, and conventional learning.

2. Design

The design used in this study was Quasi Experimental Design with Posttest-Only Design with Nonequivalent Comparison Groups as follows:

$$\begin{array}{ll} X & O_1 \\ \hline & O_2 \end{array}$$

McGuigan (1960: 271)

3. Technique of Data Collection

Data collection techniques used in this study was tests and observations. The test technique was used to collect data related to students' mathematical communication skills. Observations were used for teacher and student in which statements were in accordance with the contextual learning procedure aming to measure the extent to which the learning is done. The student's observation sheet is filled by the teacher, while the teacher's observation sheet is filled by one of the teachers observing the learning process.

4. Instrument

This study used a test instrument to collect data. A description of the Instrument tests for the skills of mathematical communication.

a. Test of Mathematical Communiction

This test of mathematical communication skills is a test description given at posstest. Posstests are given to the experimental class and control classes at the end of the research activity. The result of this posstest was used to see the students' mathematical communication skills both in experiment and control class. To obtain a test score for students' mathematical communication skills, a Maryland Math Communication Rubric scheme was modified and issued by Maryland State Department of Education in the form of a holistic scale for grade 7 of mathematics students (CORD, 1999). Before the test is used, firstly tested the validity and reliability, as follows:

Validity Test

The validity of each item, the scores on the test items were correlated with the total score. Calculation of item validity was done by using product moment correlation formula from Karl Pearson, which was as follows:

$$r_{xy} = \frac{N\sum_{i=1}^{n} XY - \left(\sum_{i=1}^{n} X\right)\left(\sum_{i=1}^{n} Y\right)}{\sqrt{\left\{N\sum_{i=1}^{n} X^2 - \left(\sum_{i=1}^{n} X\right)^2\right\}\left\{N\sum_{i=1}^{n} Y^2 - \left(\sum_{i=1}^{n} Y\right)^2\right\}}}$$ (Djaali and Muljono, 2008:53)

Reliability Test

Reliability of the item applied the Cronbach Alpha formula as follows:

$$r_{11} = \left(\frac{n}{n-1}\right)\left(1 - \frac{\sum_{i=1}^{n} S_i^2}{S_t^2}\right)$$ (Sundayana, 2014: 69)

The observation sheet was prepared based on the implementation of the PKKK. Teacher observation sheets were used to record the quality of the teacher learning process and the responses that arise from students relating to the problem situations that teachers were given when learning with the PKKK. While student observation sheets were used for student activities during the learning process took place.

5. Technique of Data Analysis

The data analyzed in this research was the data of the students' mathematical communication skills test.

a. Descriptive analysis

Descriptive analysis is used to describe research data. Data analysis using descriptive statistics grouped into three parts of frequency distribution, data concentration, and data dissemination (Rustam, 2016: 27).

b. Inferential analysis

Inferential statistics were used to test the hypothesis, for this purpose a statistical test of two different mean free samples was performed using the t-test, in which the population variance was homogeneous and normally distributed.,

$$t_{hitung} = \frac{\overline{X}_1 - \overline{X}_2}{s_{gab}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \qquad \text{with: } s_{gab} = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$ (Dowdy, et al., 2004: 192)

D. Finding and Discussion

1. Findings

This research was an experimental research conducted at SMPN 2 Kolaka. The lessons applied to the experimental class (VII.6) used the contextual approach of kolaka city, whereas the learning applied to the control class (VII.7) used conventional learning. The results of the analysis in this study are presented based on the results of descriptive analysis and inferential analysis results.

a. Descriptive Analysis Result

The data of descriptive analysis result of posttest of mathematical communication skills in experiment class and control class can be seen in table 5 below:

Table 5. Descriptive Analysis Results

Data Description	Experiment Group	Control Group
Total Score	1708,33	1629,17
Total Data	24	27
Mean	71,18	60,34
Maximum	100	85,42
Minimum	22,92	25
Standard of Deviation	20,0078	18,01
Variance	400,312	324,35

The description shows that after being given two treatments using the learning model in both classes, it is found that on average the grade given treatment looks better than the control class.

b. Results of Inferential Analysis

Inferential analysis is used to find out whether the hypothesis proposed in this study is accepted or rejected, in the inferential analysis there are several stages of analysis which is a prerequisite to perform hypothesis testing analysis. The inferential analysis phase in this study is described as follows:

Normality test
Test the normality of data in this study using Kolmogorov-Smirnov test statistic with the help of SPSS 17.0 for windows application that can be seen in table 6 below:

Table 6. Result of Data Normality

Group	Asymp. Sig. (2-tailed)	State
Experiment	0,285> 0,05	Normal
Control	0,820> 0,05	Normal

Homogeneity Test
The homogeneity test of variance is used to find out whether are not for the two groups of mathematical data of communication skills. Using the help of SPSS 17.0 forwindows application applying the Levene's Test which is presented in table 7 below:

Table 7. Results of Data Homogeneity Analysis

Levene Statistic	Sig.	State
0,004	0,947	Homogenous

Hypothesis Test
Hypothesis testing in this study using Independent t-test i.e. t_{count} (2.03658) > t_{table} (1.67655) which can be seen in appendix 13, while using SPSS.17.0 application the results can be seen in table 8 below:

Table 8. Results of Data Hypothesis Analysis

Assumption Variance Homogenety	t	df	Sig. (2-tailed)	State
Equal variances assumed	2.063	49	.044	H_0 rejected

Based on the analysis results obtained value Pvalue (Sig.2-tailed) = 0.044. Because Pvalue (Sig.2-tailed) = 0.044 < α = 0.05 then H_0 is rejected, which means that students 'mathematical communication skills taught using the contextual approach of kolaka city are significantly more effective than the students' mathematical communication skills taught using Conventional learning.

2. Discussion

In this study, both the experimental and control classes discuss the same learning material that identifies the properties of the rectangle and calculates the circumference and extent. The learning for the experimental class using LKS (Students' Work Sheets) that is designed by the reserachers themselves, while in the control class using the LKS that had been already provided by school class teachers.

Each learning process, students are faced with problems in everyday life related to rectangular material, then to know the solution of the problem given, students are given activity sheets and then students are divided into six groups, students work on LKS with friends of his group. Each group then presents the results of the group discussion, then the others corrects the answers from the group that are presentations and together concludes their results. After the students conclude, students are given a quiz in the form of a problem that can be solved using the material they have just learned. Observing on experimental and contro class, the learning process has been implemented with planning. When viewed from the average percentage of learning activities on learning with contextual approaches kolaka city amounted to 82.14%, while the conventional learning is 83.33%. In addition, based on students' observation sheets in the experimental class were more active than the students in the control class.

Contextual Learning of Kolaka City (PKKK)

The learning process that has been done by the researcher, there are several different student activities, based on the teacher's explanation on the previous learning rarely found the students who are enthusiastic in completing the tasks given, because at the time of conventional learning process the activity is very limited, the students even saturated with various mathematical symbol Which is less contextual, consequently the attention of students is not the focus of the lesson even they feel bored, because of the lack of variety and its relation to life. The lessons given are associated with contexts of the kolaka city context, from some of the problems given that students are expected to understand them before joining the group. After understanding it, they joined their respective groups, during the discussion process all the students were actively involved, and helped each other in relation to their daily experience in the area of kolaka city. After the time comes, each group presents the results of the work to the questions contained in the LKS, designed by researchers to guide them in discovering the material concept, which allows each member of the group to play an active role in the discussion.

Contextual Learning of Kolaka City fosters students' positive spirit in active learning. In accordance with Berns and Erickson's statement (2001: 2), CTL is a conception of teaching and learning that helps teachers relate subject matter content to real world situations; and that the contextual learning is a teaching and learning concept that helps teachers in relating the subject matter with the real world, And motivating students to make connections between knowledge and application in their lives as family members, citizens, and hard work is needed in learning. In addition, it is also supported by the statement of Blanchard (in Trianto, 2009: 105) that contextual learning is a learning that occurs in close relationship with the real experience. Thus the students feel interested and challenged to solve the problems that exist around him.

The results of interviews with teachers show that he is very grateful for the presence of researchers. Throughout his observations, this learning after polishing with the contextual city of kolaka is more effective than general CTL learning, even firmly implies the LKS proposed by researchers in the lesson we rarely do let alone provide a construction in the LKS. Based on the narrative of several parties, showed that this learning is quite effective. This is an input for future teachers to be more active in designing contextual learning around students.

Skills of Mathematical Communication

The skills of mathematical communication is the skills that can help the students to communicate a problem and sharpen the thinking of the students in looking at various interrelationship of mathematics material, which is based on the effectiveness, accuracy, and accuracy of students in using the mathematical language. Based on the results of the study described in table 9 below:

Table 9. Data Description of Students' Mathematical communication skills

Indicators of Mathematical Communication Skills	Average of the Students' Mathematical Communication Skills	
	Experiment Group	Control Group
The skills to draw, includes stating situations or mathematical ideas in the form of drawings, diagrams, or graphs.	68,75	62,82877
Skills to create mathematical expressions, including the skills to express situations, images, diagrams or real objects into language, symbols, ideas or mathematical models.	77,52083	74,53704
Skills to explain ideas, situations, and mathematical relationships in writing and reveals a description or a mathematical paragraph in their own language.	67,82	60,92593

The average score of mathematical communication skills 1 for the students in the experimental class is higher than the control class, because in the experimental class the students are learning which is designed by Kontontacttivism which is then associated with the Kolaka City context, so that they are accustomed to communicate the problem. In addition, the students in the experimental class are familiar with the problems that involve the indicators of

drawing abilities contained in the LKS that the researchers provide in it contained various quadrangle problems in the city kolaka, so the skills to describe the problem in the experiment class is higher although the difference is not so big.

For the second communication indicator in the experimental class and control class, based on the table, the second indicator of communication skills is quite successful because it has the highest average score, it indicates that the students are more likely in the skills to create mathematical expressions, and the score is flat. The indicator of communication skills 2 on students taught by contextual approach of kolaka city is bigger than the average score of students taught by conventional learning, it is because in the experiment class there are aspects of modeling, and in the learning process students are accustomed to get the problem or material which requires students to analyze the picture again they are very excited because the image given is a picture that they often encounter in everyday life that exist in the city of kolaka. Then, on the third indicator of the skills to explain the idea in the experimental class and control class, based on the table, that the average score of communication skills 3 on the students taught by the contextual approach of kolaka city is greater than the average score of students taught by the learning Conventional. It is these 3 communication capabilities that produce the smallest average score among the three indicators of mathematical communication skills. This is because most students are less able or unaccustomed to revealing a description in their own language. Because, during this on the learning process students are not familiarized with the matter or any matter related to the indicators explain the idea or non-routine questions. Based on the description of the posttest data, the learning done in the experimental class is by using the contextual approach of kolaka city capable of bringing more effective changes to the students' mathematical communication skills compared to the learning done by the teacher in the class.

Statistically, the result of hypothesis testing by using Independent-sample T-test obtained result = t_{count} = 2,036 > t_{table} =1.67655 with df = 49 at the significant level of α= 0.05 then the results of hypothesis testing with t test can be concluded that the mathematical communication skills of students who were taught by using the contextual approach of kolaka city greater than students taught using conventional learning. This research is in line with Rustam (2014: 100) research that by applying contextual learning the students' communication skills is better than learning which is not related to the students' real life. As the statement of Keneth (in Rusman, 2011) that:

"*Contextual teaching is teaching that enables learning in wich student emplay their academic understanding and abilities in a variety of in-and out of school context to solve simulated or real world problems, both alone and with others."*

That CTL is a learning that allows the learning process where students use their understanding and academic ability in various contexts within and outside the school to solve simulative or real problems, either individually or jointly.

E. Conclusion

Based on the results of the analysis and discussion in this study, it can be concluded that Kolaka City Contextual Learning (PKKK) is more effective than conventional learning in improving students' mathematical communication skills at SMPN 2 Kolaka class VII.

Acknowledgement

Many thanks are presented to my sponsorship, Indonesia Endowment Fund for Education/LPDP and the BUDI-DN KEMRISTEKDIKTI which funds my study for my Doctoral program.

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