



The Effectiveness of Ethnomathematics-Based Contextual Teaching And Learning (CTL) on The Mathematical Communication Skills Of Elementary School Students

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Submitted: 17-01-2023 / Reviewed: 17-01-2023 / Accepted: 20-01-2023

ABSTRACT

Students do not understand the initial concept of mathematics is a factor of students' mathematical communication ability to be low. The application of ethnomathematics-based contextual teaching and learning (CTL) to obtain better mathematical communication skills. This study aims to see the effectiveness of ethnomathematics-based CTL learning on students' mathematical communication ability. The research method uses quantitative research with a quasi experimental design consisting of 2 classes, namely fifth grade students at SDN 01 Ungaran. The indicator of communication ability becomes a guide in the instrument used in the form of a description test and non-observation test. The results showed that the mathematical communication skills of students who were given ethnomathematics-based CTL learning were higher than students who were given mobile learning-based learning, students' mathematical communication abilities increased after being given ethnomathematics-based CTL learning, in ethnomathematics-based CTL learning on students' mathematical communication skills has a positive influence. So it was concluded that ethnomathematics-based CTL learning is effective when applied to elementary school students and can facilitate students and teachers in the learning process.

Keywords: Contextual Teaching and Learning (CTL), Ethnomathematics, Mathematical Communication Skills

INTRODUCTION

The new civilization from pandemic to endemic has an effect on the process of learning mathematics in schools. During the pandemic, students studied online, which made it more difficult for students to understand early concepts in learning mathematics. The online learning method is by providing material using a platform and it is considered very difficult for students to understand the concept of learning mathematics. Of course this is related to the achievement of student learning outcomes which is the main goal in learning activities at school. Learning when viewed with the current conditions is not as expected. This was marked by a decrease in student achievement, especially in mathematics. The curriculum and learning process are also one of the factors causing problems in mathematics in Indonesia. Pakpahan (2017) stated that the average achievement of Indonesian students can be said to be relatively low compared to the achievements of students in other countries.

The importance of a student's achievement, then in the learning process in schools the teacher has a big responsibility in guiding and evaluating students. The success of the learning process will occur if the teacher has a strategy in managing the class according to the expected goals. Teachers have an obligation to facilitate a variety of learning resources so that students can master the material from several aspects. In addition, another thing that must be considered by the teacher is to pay attention to the abilities possessed by each student. Therefore, teachers must be more innovative in developing learning that is easily understood by students and can develop the abilities possessed by students. The ability that students should have is mathematical communication skills (Ismayanti & Sofyan, 2021). The importance of communication skills makes a component that is needed to improve the abilities possessed by students, because in communication skills students not only master in solving mathematical problems, but students can also convey their ideas orally or in writing. The low ability of students' mathematical communication resulted in an understanding of the initial concept so that students find it difficult to express their ideas or ideas. Some of the impacts if students' mathematical communication skills are low include: (1) students lack confidence to ask questions, (2) students lack confidence in conveying ideas or ideas, (3) students are hesitant in concluding the material that has been studied, and (4) students lack confidence in presenting the results of their work. These students do not have courage, are less able to make conclusions, and are embarrassed when showing the results of their work to others which can result in students having difficulty solving problems because they do not communicate well. So that it can be drawn a common thread if students have good mathematical communication skills, students will know better how to solve math problems. Vice versa if the communication skills possessed by students are low, then students will experience difficulties in solving mathematical problems. Another factor that causes low students' mathematical communication skills according to Hartinah et al., 2019 is because the teacher's way of delivering mathematics lessons never changes and does not combine with other things related to culture so that students feel lazy in thinking about math problems.

Based on the description above, the teacher must have a new strategy to develop students' mathematical communication skills and improve the learning process so that it is even better. The use of models, methods and approaches that have been applied by many



teachers in class is not necessarily optimal when applied in other classes. The strategy used by the teacher must emphasize more interaction in the classroom, because without interaction there will be no exchange of ideas. One strategy that is able to facilitate students in understanding mathematical problems and can improve students' mathematical communication skills is contextual teaching and learning (CTL) which is integrated with ethnomathematics. CTL learning had previously been implemented by teachers at school. However, in this study, ethnomathematics-based CTL learning makes learning meaningful because it is contextual and the application of mathematics is related to culture. Kistian (2018) said that by learning CTL students will acquire knowledge and skills gradually from the self-construction process which is used as a provision to solve problems in their lives. Meanwhile, the mix between culture and mathematics is called ethnomathematics (Febriyanti et al., 2018). This culture grows and develops from time to time and its existence is recognized and owned by the local community. A teacher must try to connect mathematics subject matter with the culture that surrounds students. Gull & Shehzad (2015) stated that when the teacher combines cultural values in learning mathematics, students will know that mathematics can be learned within the existing culture. This makes students easily understand math material and can feel mathematics in real life. The next generation of the nation must be able to preserve the culture they have because if they can't preserve it, it can become extinct.

One of the studies that applies ethnomathematics in learning mathematics is research from Anggraini & Pujiastuti (2020) which shows that there is an element of mathematics in traditional hopscotch games. The material given in this study is flat geometry. This material will be given in the form of contextual images obtained from the culture around students. Therefore, the purpose of this study is to explore and attempt to contribute to ethnomathematics-based CTL learning to students' mathematical communication abilities.

RESEARCH METHOD

The type of research carried out is quantitative research with a quasi experimental research design. The population of this study was taken from fourth grade students at SDN 01 Ungaran. The subjects used for research were 30 students as an experimental class who were

given ethnomathematics-based CTL learning and 30 students as a control class who were given mobile learning based learning. Data collection techniques in this study through tests and non-tests. The test technique is carried out by testing mathematical communication skills. While non-test techniques with observation and interviews. This technique aims to determine the effectiveness of ethnomathematics-based CTL learning on students' mathematical communication skills.

This research is said to be successful if based on indicators consisting of the presence of quantitative data with normal and homogeneous data results, there is a difference in the average of the experimental class and the control class, there is an effect of ethnomathematics-based CTL learning on mathematical communication skills, and ethnomathematics-based CTL learning is effective for improving mathematical communication skills.

RESULTS & DISCUSSION

Quantitative research is an alternative used to analyze the effectiveness of ethnomathematics-based CTL learning. The test of mathematical communication ability (TKKM) for grade IV students was carried out before the pretest and after the research with the posttest. The results of the data collection were then analyzed with several hypothesis tests using SPSS version 26. From the pretest and posttest TKKM data collection, then a normality test was carried out first to determine whether the data that had been obtained was normally distributed or not.

Based on the results of the pretest and posttest TKKM data normality analysis with SPSS version 26 using the Test of Normality test on the Kolmogorof-Smirnov section with a significant level of 5%. TKKM significant values obtained pretest and posttest of $0,200 > 0,05$, then H_0 is accepted. This shows that TKKM data is normally distributed which is obtained from the experimental class and the control class. After it was stated that the pretest and posttest data were normally distributed, then an analysis of the homogeneity test of the posttest TKKM data was carried out to find out whether the data had a homogeneous variant or not. The results of the homogeneity test with SPSS version 26 using the Test of Homogeneity of Variance test with a significant level of 5% obtained that the sig. value

= 0,571 > 0,05, then H_0 is accepted. It means that the posttest TKKM analysis in the experimental class and the control class has no difference or has a homogeneous variance. So it was found that the results of pretest and posttest TKKM data collection were normally and homogeneously distributed.

Once it is known that the TKKM pretest and posttest are normally distributed and homogeneous, then it is carried out with a hypothesis test to find out the difference in the average TKKM results in the experimental class and the control class.

Table 1. Group Statistics

	Kelas	N	Mean	Std. Deviation	Std. Error Mean
TKKM	Post-Test Eks (CTL Berbasis Etnomatematika)	30	72.43	8.320	1.519
	Posttest Kontrol (Mobile Learning)	30	64.63	7.907	1.444

From the results of Group Statistics output, it was found that the TKKM posttest mean of the experimental class was 72,43 and that of the control class was 64,63. Thus there is an average difference between the posttest TKKM results of the experimental class and the control class. Meanwhile, to prove the difference is significant, look at the Independent Samples Test output.

Table 2. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
TKKM	Equal variances assumed	.325	.571	3.722	58	.000	7.800	2.096	3.605	11.995
	Equal variances not assumed			3.722	57.850	.000	7.800	2.096	3.605	11.995

Known from table 2 in the sig value section. (2-tailed) is $0,000 < 0,05$ and it is obtained that H_0 is rejected. So it was concluded that there was a significant difference between the posttest TKKM average of the experimental class students and the control class students.

After that, it was carried out by testing the next hypothesis, namely the paired sample test which was used to find out the difference in the average results of the TKKM pretest and posttest in the experimental class. The following output results from the data obtained can be seen in the table 3.

Table 3. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Posttest	-9.400	3.103	.566	-10.559	-8.241	-16.593	29	.000

From the results of the ethnomathematics-based CTL learning hypothesis test it can be seen that it is effective, are marked by the difference in the average pretest and posttest TKKM results of the experimental class. From the table above, it is obtained from the pretest and posttest TKKM results data for the experimental class with SPSS version 26 using the Paired Sample Test with a significant level of 5%, it is obtained that the sig. (2 tailed) = is $0,000 < 0,05$, which means H_0 is rejected. So it was concluded that there is an average difference between the results of the pretest and posttest, which means there is an effect of using ethnomathematics-based CTL learning on students' mathematical communication abilities. TKKM results of students after being given ethnomathematics-based CTL learning have increased. Students' communication skills can be increased in a way, students first understand the concept of material with strategies in the form of contextual problems. So that teachers are required to master the strategies contained in CTL so that students understand concepts in learning mathematics (Yudha et al., 2019). Contextual problems can be accepted by students anywhere.

As for knowing the influence of ethnomathematics-based CTL learning, namely through the results of the regression test taken from observational data that has been carried out by researchers on research subjects. The data was taken through student observation

sheets and compiled based on the implementation of learning in the ethnomathematics-based CTL learning syntax and obtained in the table 4.

Tabel 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.896 ^a	.802	.795	3.768

a. Predictors: (Constant), Pembelajaran CTL Berbasis Etnomatematika

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1609.833	1	1609.833	113.387	.000 ^b
	Residual	397.534	28	14.198		
	Total	2007.367	29			

a. Dependent Variable: Kemampuan Komunikasi Matematis

b. Predictors: (Constant), Pembelajaran CTL Berbasis Etnomatematika

The results of the regression test from testing the hypothesis on the Anova output with a sig value of $0,000 < 0,05$, then H_0 is rejected. It is known that the influence of ethnomathematics-based CTL learning (X) on mathematical communication skills (Y) is obtained with a value of $R_square = 0,802 = 80,2\%$. In conclusion, there is a ethnomathematics-based CTL learning has a positive effect on mathematical communication skills by 80,2%, and it is possible that 19,8% have other variables that affect mathematical communication abilities. Ningsih et al., (2021) also believes that in ethnomathematics-based learning students' attitudes towards learning provide a good attitude with a positive influence so that the expected learning process is achieved.

Students who are given the ethnomathematics-based CTL learning treatment tend to be more active in learning, because students find it easier to understand geometric material. This can be seen from each indicator of mathematical communication skills contained in the completion of questions that have been worked on by students. Students in learning mathematics through culture are one of the strategies for students to understand more in geometry lessons. Mathematics can be found in various cultures around students. In ethnomathematics studies such as the shape of the roof of the Joglo house, students can immediately find out that the roof of the house resembles a geometric shape, namely a trapezoid. So this has a positive impact on students to dare to express their ideas which results in increased mathematical communication skills possessed by students. In line with

Fauzi et al., (2022) in the Sasak community settlement is one of the cultures in which there are ethnomathematics elements. The traditional form of housing for the Sasak people has a geometry section that can be found in learning mathematics. The settlement of the Sasak people are known to have pyramid-like roofs, while the front and rear roofs are trapezoidal in shape, the side roofs are isosceles triangles and the stairs leading to the hall are in the form of a truncated pyramid.

The mathematical communication skills of students who were given ethnomathematics-based contextual mathematics learning treatment experienced a significant increase compared to students who were given conventional learning treatment (Heryan, 2018). The results of students' mathematical communication skills using ethnomathematics-based CTL learning proved to be effective when used in learning mathematics. Likewise the explanation from Mei & Tupen (2021) by applying mathematics learning that is contextual and ethnomathematics based is effective when used in learning geometry. So that teachers as educators must also be innovative in designing mathematics learning by linking a culture that is adapted to the student's environment. This will become a self-interest for students in learning mathematics and culture. Given the importance of mathematics, ethnomathematics-based CTL learning will make students have a good sensory on objects related to mathematics in data structure material.

CONCLUSION

From the description of the results and discussion it is obtained that : (1) the results of the pretest and posttest of students in the experimental class and control class were normally distributed (2) TKKM posttest results of students there is an average difference, where students who provided ethnomathematics-based CTL learning of 72,43 which was greater from the average results of TKKM posttest students who are given mobile learning-based learning of 64,63 (3) ethnomathematics-based CTL learning has a good influence on students' mathematical communication abilities, namely 80,2% (4) there is an average difference between pretest results with TKKM posttest students, then ethnomathematics-based CTL learning has proven to be effective when applied to elementary students in learning mathematics. Therefore, learning mathematics using ethnomathematics-based CTL learning will make students have better mathematical communication skills and students will be more



enthusiastic in the learning process. It is recommended that there be follow-up research related to this article in order to develop and improve students' mathematical communication abilities.

ACKNOWLEDGMENT

This research can be completed with the involvement of several parties. The researcher would like to thank the parties involved, among others : (1) The Chancellor of Ngudi Waluyo University who has provided guidance in writing this research and article; (2) Research and community service institute at Ngudi Waluyo University which provides guidance and funding in research; (3) The head of the Ngudi Waluyo University study program who provides support and enthusiasm; (4) Lecturers who provide support and advice; (5) The extended family of SDN 01 Ungaran who grants permission to carry out research . The author hopes that the results of this research can be useful and contribute especially to the science of education.

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