The Effectiveness of Think Talk Write Learning Model in Improving Students' Mathematical Communication Skills at MTs Al Jami'yatul Washliyah Tembung

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Abstract

This study aimed to determine whether the mathematical communication skills of students using Think Talk Write model is better than students using conventional learning methods and whether the use of Think Talk Write Learning Model is effective to improve students' mathematical communication skills. The population was students of grade VIII. The sample of the experimental class was class VIII-4 consisting of 35 students and control class was class VIII-5 consisting of 35 students. The type of research used in this study was quasi experiment. The results of the study found in the experimental class after the Think Talk Write model was applied is that the average grade of students increased from 34.14 on pretest to 84.71 on post-test or increased by 50.57. While in the control class, students' mathematical communication skills increased by 44, from 26.71 on pretest to 70.71 on post-test. Based on the results of hypothesis test calculation, it was obtained t_{count} = 5.259. Furthermore, t_{count} results were compared with t_{table} with significant level α = 0.05, then it was obtained t_{table} = 2.052. Thus it can be said $t_{count} > t_{table}$ that is 5.259 > 2.052. Then H_a was accepted with a hypothesis stating that the use of Think Talk Write Model is effective in improving students' mathematical communication skills.

Keywords: Think Talk Write Learning Model; Students' mathematical communication skills.

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1. Introduction

Mathematics as one of basic science, both its applied aspect and its reasoning aspect, has an important role in the mastery of science and technology [1]. Mathematics functions to improve skills in calculating, measuring, deriving, and using the mathematical formulas that are necessary in everyday life. Mathematics also serves to improve skills in communicating ideas through mathematical models that can be sentences and mathematical equations, diagrams, graphics / drawings, or tables. Thus, mathematics in schools needs to function as a vehicle to cultivate intelligence, abilities, skills and to form student personality.

But mathematics is regarded as a difficult lesson by the learner because of the abstract, logical, systematic characteristics of mathematical material, and it is full of confusing symbols and formulas, causing some students to dislike mathematics – because mathematics is full of quantification and poor of communication [2], whereas in the world of education, communication is an important part of mathematics and mathematics education [3].

In curriculum standards, mathematics is a communication tool (mathematics as communication) for students in which they are able to: (1) model the situation either in oral, writing, real, images, graphics, and algebraic strategies; (2) reflect and clarify their own thoughts about mathematical ideas and their relationships; (3) develop understanding with mathematical ideas into rules and definitions; (4) use the ability to read and hear to interpret and evaluate mathematical ideas; (5) discuss mathematical ideas, make conjectures and convincing arguments; (6) appreciate the value, mathematical notation, and its role in developing mathematical ideas [4].

In the process of learning mathematics in schools, it generally tends to be conventional that is teacher-centered learning (the teacher centered aprroach). In a teacher-centered approach, almost all learning activities are fully controlled by the teacher. The entire system is directed to a series of neat events within educational institutions, with no attempt to seek and apply different learning approaches according to the theme and learning difficulty of each individual [5].

From the statement above, it can be concluded that one of the factors that cause student learning outcomes to be less is student's low ability of mathematical communication and that most of students tend to be passive. Mathematical communication skill is a skill that must be possessed by a student in presenting, reading and writing mathematical problems and solutions into pictures, tables and algebraical and able to express a mathematical concept, situation and mathematical solution by using the appropriate language and mathematical symbols. Communication skills can be seen from the ability of students to communicate what is known and asked, modeling, completion strategy and explanation of the completion steps, and the final result of a question or problem.

Then based on these problems, it is a need to apply a model of learning that leads students of MTs Al Jami'yatul Washliyah Tembung to improve their mathematical understanding and communication skills. An activity that is expected to develop students' mathematical understanding and communication skills is to apply the learning strategy of Think Talk Write [6] in which students are given the opportunity to start learning by understanding the problem first, then actively involved in group discussion, and finally write the results (outcomes) gotten by

using their own language [7].

2. Learning Model Think Talk Write

Learning model is a pattern or conceptual framework that describes the systematic procedures in organizing the learning process so that the expected learning objectives can be achieved. The learning model refers to the approach to be used, including learning objectives, learning stages and classroom management [8].

TTW is a cooperative learning model that is basically a learning strategy through the stages of thinking, talking and writing. This strategy was first introduced by Huinker and Laughlin who stated that "The think-talk-write strategy builds in time for thought and reflection and for the organization of ideas and the testing of these ideas before students are expected to write. The flow of communication progresses from student engaging in thought or reflective dialogue with themselves, to talking and sharing ideas with one another, to writing "[9].

The TTW learning strategy involves 3 important stages that must be developed and done in mathematics learning, which are as follows: 1) Think (Think or Reflective Dialog). Thinking and talking are important steps in bringing the meaning into student's writing [9], 2) Talk (Speaking or Discussing). At the talk stage, learners join in groups to reflect, compose, and express ideas in discussion activities, 3) Write (menulis). Writing can help students make their tacit knowledge and thoughts more explicit so that they can look at, and reflect on, their knowledge and thoughts [10].

The activity of thinking can be seen from the process of reading a mathematical text or containing a mathematical story and then make notes about what have been read. In this stage, students individually think of possible answers (settlement strategies), take note of what they have read, whether it is what they know, or the steps of completion in their own language.

After the "think" stage is accomplished, it is continued with the next stage of "talk" where students are asked to communicate by using words and language they understand. The communicating phase on this strategy allows students to be skilled in speaking. The process of communication is learned by students through their lives as individuals who interact with their social environment [9].

The next phase "write" is to write the results of discussion on the activity sheet provided (LAS). Writing activity means constructing ideas, because after discussing with friends, students then express their ideas through writing. Writing in mathematics helps to realize one of the learning objectives, namely students' understanding about the material being studied [11]. Writing activities will help students make relationships and also allow teacher to see the development of students' concepts. Student writing activities also allows teacher to monitor student mistakes, misconceptions, and conceptions of the same idea. The activities of the students during this stage of writing are (1) writing solutions to a given question or problem including calculation, (2) organizing all the work step by step, either by using diagrams, graphs or tables for easy reading and follow-up, 3) correcting all works so that no work or calculation is missing, (4) believing that his best work is complete, easy to read and assured of its authenticity [11].

3. Method

The research type was quasi experiment. This quasi-experimental study aimed to reveal causal relationships by involving the control group in addition to the experimental group, but the separation of both groups is not by random technique [12].

The population in this research was students of grade VIII at MTs Al Jami'yatul Washliyah Tembung. The sample of research was class VIII-4 consisting of 35 students as experimental class and class VIII-5 consisting of 35 students as control class.

The instrument used in this study was a descriptive test/ essay given before the process of learning activities called the pretest and after the whole teaching and learning process took place called posttest. The test used contained all indicators to determine students' mathematical communication. The test used was in the form of a description of 5 questions, in which the correction of content in this case was first done by experts using the validity and reliability test.

In this study, students' mathematical communication skill was compared by using the learning model of Think Talk Write in the experimental class and using the conventional method in the control class and it was conducted by having the pre-test to find out the students' first mathematical communication skills and posttest to know the students' last mathematical communication skills in each class. And design of the research was *Pretest-Posttest Control Group Design*.

Table 1: Research Design

Class	Pretest	Treatment	Posttest
Experiment	P_1	X_1	T_1
Control	P_2	X_2	T_2

Description: X1 = Treatment given in experimental class (Think Talk Write learning model), X2 = Treatment given in the control class (the conventional learning method), P1 = Initial test (pre test) given in the experimental class, P2 = Initial test (pre test) given in Control class, T1 = Final test (post test) given to the experimental class, T2 = The final test (post test) given in Control class.

The procedure conducted in this research consisted of several stages: 1) Preparation stage: In this stage, the determination of population and sample and preparation of creating RPP, teaching materials, and research instruments were done, 2) Pretest stage: In this stage, the initial test was done to determine the initial grade of students in the experimental class and control class before being treated, 3) Stage of learning implementation: In this stage, learning activities were done, where the experimental group used Think Talk Write model while the control class group used conventional methods, 4) Posttest stage: The final test was done to find out the final grade of the students in the experimental class and control class after being treated, 5) Stage of data analysis: In

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this stage, data analysis was conducted by using statistical method that compared the pretest and posttest result in the experimental class and control class after the treatment 6) Stage of hypothesis testing: In this stage, conclusion was made to reject or accept the results of hypotheses based on the results of data processing, 7) Stage of making conclusions: In this stage, the researchers made conclusion based on the results of hypothesis testing. Data analysis technique is a way to process the data so that the information from the research conducted can be presented. After the data had been obtained statistically, the data were analyzed by the following steps: (1) Calculating Mean (average grade of each variable), (2) Normality Test, (3) Homogeneous Test (4) t-test (Hypothesis), (5) Gain Test.

4. Research Results

1. Data Description

After the research had been carried out by providing test in the form of essay to students of grade VIII at MTs Al Jami'yatul Washliyah Tembung with 70 students as sample, 35 students of experimental class and 35 students of control class, all the results of tests that had been completed were collected to be analyzed.

a. Descriptive Analysis of the Initial Test Scores (Pretest)

In the fist stage of the study, pretest was given on each class. From the data obtained, the pretest grades of the experimental and control classes were as follows:

Table 2: Pretest Grade of Experimental Class and Control Class

Class	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
Experiment	35	20	60	1195	34.14	10.536	111.008
Control	35	10	55	935	26.71	13.770	189.622

From the table above, it was known that the pretest grade of the experimental class was 34.14 and the standard deviation was 10,536, while the pretest grade of the control class was 26.71 and the standard deviation was 13,770. This shows that the pretest grade of the experimental class is greater than the control class, so it can be seen that the students' mathematical communication skills in the experimental class is better than the control class.

b. Descriptive Analysis of Post-Test Grades

After the treatment of Think Talk Write model in experimental class and conventional learning method in the control class, the final test (post-test) was given to see the improvement of mathematical communication skills

achieved by each student in the experimental class and control class. From the data obtained, the post-test grade of the experimental class and control class were as follows:

Table 3: Post-Test Grade of Experiment Class and Control Class

Class	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
Experiment	35	60	100	2965	84.71	10.142	102.857
Control	35	50	95	2475	70.71	9.788	95.798

From the table above, it was known that the post test grade of the experimental class resulted in the mean of 84.71 and the standard deviation of 10.142 while the post-test grade in the control class resulted in the mean of 70.71 and standard deviation of 9.788. It means that the post-test grade of the experimental class is greater than the control class. Based on the data above, it can be seen that the average learning achievement of students of the experimental class increased from 34.14 to 84.71 after being taught by applying Think Talk Write model— the increasing was 50.57. For the average learning achievement of control group that used the conventional learning method increased from 26.71 to 70.71 or by 44. Based on the difference in the average increase of the mathematical communication skills, it can be concluded that the learning model of Think Talk Write is effective in improving students' mathematical communication skills of grade VIII at MTs Al Jami'yatul Washliyah Tembung on mathematics with circle as topic.

2. Data Analysis.

a. Data Normality Test

Normality test was intended to determine whether the results obtained distributed normally or not.

Table 4: Normality Test of Experiment Class and Control Class

	Kolmogorov-Smirnov[a]		
	Statistic	**Df**	**Sig.**
Pre etest Experiment	.167	35	
Post-test Experiment	.130	35	.139
Pretest Control	.145	35	.061
Post-test Control	.142	35	.071

Based on the results of the normality test calculation in the experimental and control class, it can be seen that sig. > 0.05 on pretest experimental class that is 0.014> 0.05, on post-test experimental class 0.139> 0.05, on pretest control class 0.061> 0.05, on post-test control class 0.071> 0.05. It shows that the significant grade of all data on mathematical communication skills> 0.05 so that it can be conclude that both classes studied distributed normally.

b. Data Homogeneity Test

After it had been known that pretest and post-test data normally distributed, the next step was to test homogeneity to find out the similarity of variance between post-test score.

Table 5: Data of the Test Result on Homogeneity

		Levene Statistic	df1	df2	Sig.
Pos	**Based on Mean**	.142	1	68	.708
	Based on Median	.227	1	68	.635
	Based on Median and with adjusted df	.227	1	67.767	.635
	Based on trimmed mean	.141	1	68	.709

Based on the homogeneity test calculation on the experimental class and the control class, it was obtained sig. 0.218. By comparing the grade of $\alpha = 0.05$ where sig. > 0.05 ie 0.708> 0.05, it can be concluded that the data on the experimental class and control class came from a population with the same or homogeneous variance.

c. The T-test (Hypothesis)

After the data normality test and homogeneity test from the post-test results had been done,it was known that the distribution of post-test scores on the experimental and control classes normally distributed so that to test the difference of two post-test data, T-test statistical test was used with the help of SPSS 16.0 program with 5% significant level.

Hypothesis Statistics:

$$H_o : \mu_1 = \mu_2$$

$$H_a : \mu_1 > \mu_2$$

The formulation of hypotheses tested:

1) H_0 = Effectiveness of the application of learning model Think Talk Write equals to the use of conventional

learning methods on students' mathematical communication skills of grade VIII at MTs Al Jami'yatul Washliyah Tembung on Mathematics with the subject of the circle, 2) H_a = The effectiveness of the application of Think Talk Write learning model is higher than the use of conventional learning method on the mathematical communication skills of eighth graders at MTs Al Jami'yatul Washliyah Tembung on the mathematics lesson with the subject of the circle.

Hypothesis Test Criteria:

If $t_{count} > t_{table}$, then H_0 is rejected and H_a is accepted

If $t_{count} < t_{table}$, then H_0 is accepted and H_a is rejected

Based on Signification

If $P > \alpha$ (0.05), then H_0 is accepted and H_a is rejected

If $P < \alpha$ (0.05), then H_0 is rejected and H_a is accepted

The following is post-test difference test of two classes with the help of SPSS 16.0

Table 6: T-Test Results

Upper		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Pos	**Equal variances assumed**	.057	.813	5.259	27	.000	17.476	3.323	10.658	24.295
	Equal variances not assumed			5.268	26.988	.000	17.476	3.317	10.670	24.283

Based on the table above from the calculation of the analysis, the significance of 0.813> 0.05 could be seen so that it could be concluded that all samples had the same variance or variance homogeneity requirement was

fulfilled. Moreover, it is shown in table that t_{count} = 5.259 dan t_{table} = 2.052, differences of mean = 17.476, the lowest mathematical communication skill differences = 10.658 and the highest = 24.295. Decision making can be seen from t_{count} (5.259) > t_{table} (2.052) that means H_0 was rejected and H_a was accepted.

So based on the results of statistical calculations and testing criteria, H_0 was rejected while H_a was accepted and it means that the mathematical communication skills of students who were taught with Think Talk Write learning model were higher than the ones with the conventional learning method.

d. Test Gain

To see the effectiveness of using Think Talk Write learning model on mathematical communication skill in experimental class, gain test was done.

Table 7: Gain Test Results on TTW Learning Model

	Pre-Test	Post-test	Maximum score	Post – Pre	Maxscore – Pre score	<g>	Description
Experiment	34.14	84.71	100	50.57	65.86	0.77	High

Based on pretest and post-test scores in the experimental class, normalized gain of 0, 77 were gotten. That number was interpreted into the criteria of the grade of <g>, then the effectiveness of Think Talk Write learning model in the experiment was classified high. From the two pretest and post-test results, it can be concluded that the use of Think Talk Write model is effective on students' mathematical communication skill. It was seen from the percentage of the effectiveness on students' mathematical communication skills that can be said in the high category. Based on the category of quality, Think Talk Write learning model is effective to students' mathematical communication skills. Based on the calculation of analysis and hypothesis testing, it shows that the test results in the experimental class is higher than the test results in the control class. The average score of students' mathematical communication skills in the experimental class was 84.71 and the standard deviation was 10.142 whereas the average score of students' mathematical communication skills in the control class was 70.71 and the standard deviation was 9.788. Based on the calculation done by applied t-test, t_{count} = 5.259 and t_{table} = 2.052 for the real level α = 0.05. It shows that t_{count} > t_{table} or 5.259 > 2.052 then H_0 was rejected and H_a was accepted. Then by using the gain test, it shows that the percentage of the effectiveness of Think Talk Write learning model use was 77%.

5. Discussion

One of studies related to the use of Think Talk Write model was done by Lusia Ari Sumirat. The results showed that the implementation of cooperative learning strategy which is TTW type is more effective in improving students' mathematical communication and disposition skills rather than conventional learning which is expository type. This is supported by the result of post-test on students' mathematical communication skills that

showed the level of effectiveness ES = 1, 031 which means that the effectiveness of TTW strategy in improving students' mathematical communication ability is high [13]. Another study done by Sari Rahma Chandra, Ahmad Fauzan, dan Helma showed the results that mathematical communication skill of the students taught using TTW model was significantly higher than those taught using conventional model. This conclusion was also valid for male and female student [14]. The Think-Talk-Write (TTW) introduced by Huinker & Laughlin, is basically built by thinking by using reading material (listening, critiques, and alternative solutions), the results of the reading are communicated by presentations, discussions, and then making presentation reports, discussions; In short, Think Talk Write includes these activities: getting information, group work (reading-note-tagging), presentations, discussions, and reporting [15]. Think-Talk-Write (TTW) learning model is basically using cooperative learning strategies that is why in its implementation, this model divides students into small groups heterogeneously in order to make the learning atmosphere more effective [16]. In the implementation of learning by group, TTW also refers to cooperative learning that can construct students' mastery of concepts.

6. Conclusion

The mean of students' communication skills using the Think Talk Write model was 4.71 and the standard deviation was 10.142 whereas the mean of students' mathematical communication skills using conventional method was 70.71 and standard deviation was 9.788. By using the Liliefors test, it was found that both samples normally distributed with the $L_{count} > L_{table}$. Based on calculations done by using t-test, $t_{count} = 5.259$ while $t_{table} = 2.052$ with the real level $\alpha = 0.05$ then the grade of $t_{count} > t_{table}$ that was 5.259 > 2.052, in this case, H_0 was rejected and H_a was accepted. Thus it was concluded that the use of Think Talk Write learning model is effective to improve students' mathematical communication skills of grade VIII at MTs Al Jami'yatul Washliyah Tembung. And also, it was strengthened by using gain test—the use of Think Talk Write model was effective on students 'mathematical communication skills, it can be seen from the percentage of the effectiveness of mathematic learning achievement on students of experiment class which is larger than the percentage of students' learning achievement in the control class. Finally, Think Talk Write Model is effective for students' mathematical communication skills of grade VIII at MTs Al Jami'yatul Washliyah Tembung.

7. Suggestions

Based on the conclusions and research results, the writer put forward the following suggestions:

1.   For The School

Learning to use a model Think Talk Write expected to be used as an alternative learning school mathematics, because this learning has been shown to improve the communication skills of mathematics students more both in the learning activities.

2.   For The Math Teacher

Teachers should know and learn about correct and effective various models of learning in improving students math communication skills. Therefore, teacher must be more creative and active to follow various activities

(workshop) about learning model that one of them is Think Talk Write.

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