

Secondary School Students' Mathematical Communication Through Think-Talk-Write (Ttw) Learning Model and Interactive Media

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Abstract. Mathematical knowledge plays an important role so students have to master it as early as possible. However, in the reality, students always assume that mathematics is a difficult and tedious lesson. One of students' problems in mastering mathematics is having low mathematical communication. The issue became the background of this research concerning the implementation of Think-Talk-Write (TTW) learning model and interactive media. Therefore, the purposes of this study were to find out whether the TTW learning model improved students' mathematical communication compared with the conventional one and to examine students' responses toward the implementation of TTW in improving students' mathematical communication. The study applied the Quasi Experiment Research by involving the students of grade VII-A as the participants of experimental class and the students of class VII-B as the participants of control class located at SMP Negeri 1 Sukaluyu Cianjur. In the beginning, the pretest was conducted in the experimental and control class. Then, the TTW learning model and interactive media were implemented in the experimental class. Meanwhile the conventional learning model was applied in the control class. At the end, the students of the experimental and control class got post-test. The questionnaire was distributed for the experimental class only. The findings show that the students implementing TTW learning model and interactive media have better mathematical communication compared with the students applying conventional learning model. Moreover, students show positive responses after applying the TTW learning model and interactive media.

1. Introduction

One of the skills students must have in mathematics learning is communicating ideas with symbols, tables, diagrams, or other media to clarify things or problems. Therefore, to achieve the objective of learning mathematics, one of the aspects that students must master is the ability of mathematical communication. Mathematical Communication in mathematics learning activities is needed, because students are required to think then communicate various ideas that can be explained through verbal talks, writings, graphs, maps, or diagrams To all students so that what is being learned is meaningful to him. Baroody said that there are at least two important reasons why communication in mathematical learning needs to be developed [1]. Firstly, mathematics is not just a tool for thinking, tools to find patterns, solve problems or take conclusions, but mathematics is also an invaluable tool to communicate ideas clearly,



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Precise, and concise. Secondly, math learning is a social activity and also a vehicle for interaction between students and students and teachers.

The importance of mathematical communication skills is also expressed by Greenes and Schulman that communication is: (a) The strength of students in formulating mathematical concepts and strategies; (b) As students' success capital toward approach and settlement in mathematical exploration and investigation; and (c) as a container for students to communicate with friends, to obtain information, exchange thoughts and inventions, brainstorm, assess and question ideas to convince others [2].

But it's not easy to design learning so that students are active in communicating. Based on experience in the course of field experience, that students still lack good in communication both oral and written. It can be seen when students are given assignments and they are confused on how to solve them, they choose to wait for answers from their friends instead of trying to work on their own.

The opinion on the importance of communication in mathematics learning is also proposed by the stating that a good school mathematics teaching program should emphasize students to: (a) Organize and associate their mathematical thinking through communication, (b) communicating their mathematical thinking in a coherent (logically arranged) and clear to his friends, teachers, and others [3]. (c) Analyse and assess the mathematical thinking and strategies that others use. (d) Use the language of mathematics to correctly express mathematical ideas. Communication skills program perceived by most course respondents is very important to the acquisition of the necessary communication skills in their academic life [4]. So in the process of learning mathematics is very important for students have the ability in terms of mathematical communication. Where learning communication in mathematics helps the development of interaction and disclosure of ideas in the classroom because students learn in an active atmosphere. In large line It can be concluded that the mathematical communication consists of verbal and written communication [5].

The ability of mathematical communication is an ability that can include and contain various opportunities to communicate in the form of:

- a. reflecting real objects, drawings, and diagrams into mathematical ideas;
- b. Create models of situations or problems using oral, written, concrete, graphing, and algebraic methods;
- c. Declare daily events in the language or mathematical symbols;
- d. Listen, discuss, and write about mathematics;
- e. Read with the understanding of a written mathematical presentation;
- f. Create conjectures, compose arguments, formulate definitions, and generalizations;
- g. Explain and make questions about mathematics that has been studied [6].

In mathematics learning activities are often encountered that when students are given a written assignment, students always try to directly start writing answers. Although that is not something wrong, it will be more meaningful if he or she first performs thinking, reflects and compiles ideas, and tests those ideas before beginning to write them. The thought-talk-write strategy chosen in the study was built by giving students time to do the activity (think, reflect and to organize ideas, and test those ideas before writing them). The first stage of the activity of students learning with a think-talk-write strategy is think, which is the level of thinking where students read the text of questions (if possible start with questions relating to the daily problems of students or Contextual). In this stage students individually think of possible answers (completion strategies), make small notes on the ideas found in the readings, and/or things that are not to be performed according to their own language.

The second stage is the talk (talk or discussion) giving students the opportunity to talk about their investigation in the first stage. At this stage students reflect, organize, and test (negotiation, sharing) ideas in group discussion activities. The progress of students' communication will be seen in the dialogue in discussing either the idea of exchanging ideas with other people or their own reflections that they reveal to others. The third stage is write, the student writes the ideas he acquired from the activities of the first and second phases. This article consists of the foundation of the concept used, the relationship with the previous material, the completion strategy, and the solutions it acquired. Teacher roles and

assignments in an effort to make effective use of the think-talk-write strategy are to propose and provide tasks that enable students to actively engage in thinking, encouraging and listening with Careful ideas submitted by students orally and in writing, consider and give information to what students are unearthed in discussion, as well as monitor, assess, and encourage students to participate actively [7].

2. Research Method

This research was performed in Sekolah SMP 1 Sukaluyu. The method used in this study was the Quasi experiment, with the design used in this research that is Nonequivalent group Pretest-posttest design. The population of this study is all students of Class VII SMP Negeri 1 Sukaluyu, and the samples taken are class VII A as experimental classes and VII B as Junior Secondary control class 1 Sukaluyu Cianjur with consideration of communication skills that will be in, according to one teacher of mathematics in the school, students are still lacking in communicating to mathematics and more fundamental considerations in the selection of this population. The selected sample uses the Purposive Sampling technique.

3. Result and Discussion

Mathematical communication skills of students using TTW learning models and who use regular learning models. Conducted analysis of this achievement using percentage analysis of the test, that is to see the results of the percentage of postes students and compared to the value of the school KKM. Based on data analysis the results of the Postes were obtained as table 1.

Table 1. Analysis results of mathematical communication ability of students

Class	N	KKM	KKM (%)	Presentase	Kategori
Experiments	37	76	15	40,54%	low
Control	36	76	5	13,88%	Very low

Based on table 1, the results of the mathematical communication capabilities using the interactive media-assisted TTW learning model in the experimental class shows that only 40.55% reached the value of the KKM from 37 students so it belongs to the low category. While the achievement of mathematical communication skills of students using the normal learning model in the control class showed that only 13.88% reached the value of the KKM from 36 students so that belongs to the category is very low. It can be concluded that the access to the mathematical communication skills of students using the interactive media-assisted TTW learning model is low and the achievement of mathematical communication skills of students who use the normal learning model is very low. This is because learning using TTW's interactive media-assisted learning model encourages students to play an active role in classroom learning. The teacher's role only helps students discover facts, concepts/principles of both themselves and their peers, rather than giving talks or controlling all activities in the classroom. And students do not receive passive information, but the students actively participate in the learning process and to construct the meaning of information that exists around it. Therefore, the achievement of the mathematical communication skills of students using the TTW learning model with an interactive media aid is higher than the mathematical communication skills of students using regular learning models.

Based on research that has been done, obtained the data of Students ' mathematical communication skills. Data obtained is pretes and postes data. The first step is to analyse the initial skills of mathematical communication of students from both classes. And obtained statistical test results that the initial ability of student mathematical communication is the same.

Next to see the mathematical communication skills of students seen from the Posttest score. Berdasarkan Table 2 determined that the average Posttest experiment group score was higher than the average postes control group.

Table 2. Results of a descriptive analysis of mathematical communication

Class	N	Mean	Std. Deviation	Minimum	Maximum
Experiments	37	62.78	0,151	31	92
Control	36	41.79	0,173	10	71

The mathematical communication skills of students using the interactive media-assisted TTW learning model are better than the mathematical communication skills of students using regular learning models using the Mann-Whitney test. Before conducting the Mann-Whitney test, first test normality data of the second class was used by Shapiro-Wilk because the samples were less than 5. Postes test result of mathematical communication ability of the experimental class students derived from the normal distribution population with a significance value of 0.387, while the control class derived from the population that is not normal distribution with the value Significance 0.004.

The significance of the difference the average of the two data classes used non parametric statistical tests, for data pairs that are not normally used the Mann-Whitney Test is presented in Table 3. and acquired Asymp. Sig. (2-tailed) = 0.001. The value of ASYMP. Sig. (1-tailed) = 1/2 Asymp. Sig. (2-tailed) so that the value of ASYMP. Sig. (1-tailed) = 1/2 (0.001) = (0.0005) (Widiarso, 2011). Thus acquired the value of ASYMP. Sig. (1-tailed) < 0.05 means H_0 is rejected. Then it can be concluded that the mathematical communication skills of experimental class students are better than the mathematical communication skills of control class students.

Treatment with interactive media-assisted TTW learning model to students in the experimental class can help students understand learning materials and able to develop students' mathematical communication skills. One that affects this is with the provision of the LKS in accordance with the steps of learning with the direction of the teacher guided so that the students are more focused on the material being studied, and the challenges In the learning process so as to produce students to be able to raise their opinions and active in discussions and questions in learning so that students can solve the problems that are given more easily. It is also demonstrated by the average results of the Posttest experimental class is 0.6278 which means students' mathematical communication skills in high interpretation.

3.1. Student attitudes towards interactive Media-assisted TTW Learning

To learn about students' attitudes toward mathematics learning by using the interactive media-assisted TTW learning model is carried out data processing obtained from the results of the students' attitudes and responses given to the experiment group. From the results of the analysis of the student attitudes based on the indicators that are divided into three aspects, namely to the learning of TTW Interactive media, to the ability of students' mathematical communication, and to the learning Math.

Table 3. Percentage all of student Attitudes

Aspect of the description	Mean (%)		Keterangan
	Positive	Negative	
On the interactive media-assisted TTW learning ode	72%	28%	mostly positive
On the ability of mathematical communication of students	68%	32%	mostly positive
On mathematics learning	69%	31%	mostly positive
Mean	70%	30%	mostly positive

Average percentage of students' positive attitudes is 70%, indicating that most students' attitudes are positive towards learning using the TTW learning model for interactive media. This is because students know that the things that are learned in mathematics are beneficial and because of the steps of completion in each given issue, as well as many opportunities to brainstorm at the time Discussion. So that students are able to be positive about the learning materials and to the problems given.

4. Conclusion

Based on the results of the study, it can be concluded that the achievement of mathematical communication skills of students using TTW learning model is assisted by interactive media in high category, while the access to the mathematical communication skills of students who Using ordinary learning models in very low categories. The mathematical communication skills of students using the TTW learning model with interactive media help are better than the mathematical communication skills of students using regular learning models. And the student attitude towards mathematical learning using generative learning models is largely positive.

References

- [1] Umar, W. *Membangun Kemampuan Komunikasi Matematis Dalam Pembelajaran Matematika*. Jurnal Ilmiah Program Studi Matematika STKIP Siliwangi Bandung. Vol 1, No.1, 2012. (2). 2012.
- [2] Kusumaningrum, R. *Analisis Kemampuan Komunikasi Matematis Siswa SMP Negeri 2 Karanglewas*. Skripsi Sarjana Pendidikan Matematika Universitas Muhammadiyah Purwokerto (UMP). Purwokerto. 2015. [Online]. Tersedia: <http://repository.ump.ac.id>.
- [3] NCTM. Curriculum and Evaluation Standards For School Mathematics Virginia: The National Council Of Teachers of Mathematics, Inc. 2000.
- [4] Sokoine, S. C. K.. "The Perceived Importance of Communication Skills Courses among University Students: The Case of Two Universities in Tanzania". *Jurnal International Journal of Education and Research*,. Diperoleh dari <http://www.ijern.com/journal/2015/February-2015/39.pdf>. 2015. 28(5), 497–508. 2015.
- [5] Nurahman, I. Pembelajaran Kooperatif Tipe Team-Accelerated Instruction (TAI) untuk Meningkatkan Kemampuan Penalaran dan Komunikasi Matematis Siswa SMP. Pasundan Journal of Mathematics Education. Tahun 1. 2011. Vol. 1 pp 96-130
- [6] Sumarmo, U. Berfikir dan Disposisi Matematik: Apa, Mengapa, dan Bagaimana Dikembangkan pada Peserta Didik. *Jurnal FPMIPA Universitas Pendidikan Indonesia* [Online]. Tersedia: <http://math.sps.upi.edu/wp-content/uploads/2010/02/BERFIKIR-DANDISPOSISI-MATEMATIK-SPS-2010.pdf>. 2019.15(1). 2003.
- [7] Silver, E.A. dan Smith, M.S. "Building Discourse Communities in Mathematics Classrooms: A Worthwhile but Challenging Journey". dalam *Communication in Mathematicss K-12 and Beyond*. 1996 year book. National Council of Teachers of Mathematics. 1996.