



The Effectiveness of Think Talk Write (TTW) Learning in Improving Students' Mathematical Communication Ability

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ABSTRACT

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Learning mathematics is useful for students to be able to think critically, count, reason, and be able to analyze a problem. Not only that learning mathematics has an impact on improving mathematical communication skills related to everyday life. The purpose of this study was to test the effectiveness of using the Think Talk Write (TTW) learning model in improving students' mathematical communication skills at the junior high school level. This research took place at SMP Muhammadiyah 01 Medan. The population of this study was all students in class IX and the research sample was students in class IX-T1 at SMP Muhammadiyah 1 Medan, TA 2022/2023. This study used a quantitative pre-experiment design one-group pretest-posttest method. The test of mathematical communication skills is the instrument of this research. The research data was tested for its hypothesis using the paired sample t-test with the normality assumption test. While testing the effectiveness of increasing their mathematical communication skills using the N-Gain test.

Learning Mathematics, Think Talk Write (TTW), Mathematical Communication Skills.

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INTRODUCTION

Mathematics is the language of symbols (Rahmah, 2018) (Riasari, 2018) where everyone who studies mathematics is required to have the ability to communicate using the language of symbols. Mathematical communication skills (Kurniawan & Hidayah, 2021) will make someone able to use mathematics for the benefit of oneself and others so that it will increase a positive attitude towards mathematics both from within oneself and others. Mathematical communication skills (Heryan, 2018) are important in the learning process. Mathematical communication helps teachers understand students' abilities to interpret and express their understanding of mathematical concepts and processes (Qolbi & Aini, 2022) (Yuniarti, 2016) and what they learn. Without mathematical communication, we will have little information, data, and facts

about students' understanding of the processes and applications of mathematics, including in the world of technology (Kamarullah, 2017).

Mathematics is a language and the language is the best discussed in the community, so it is easy to understand that communication is the essence of teaching, learning, and accessing mathematics. So it is clear that communication in mathematics is a fundamental ability that must be owned by actors and users of mathematics while learning, teaching, and accessing mathematics (Rizqi, 2016). Because the ability to communicate an idea, thought, or opinion is very important (Purwati & Wuri, 2019). Mathematical communication functions to communicate ideas and symbols, tables, diagrams, or other media to explain situations or problems (Rahmah, 2018). The quality and success of learning are strongly influenced by the ability and accuracy of the teacher in selecting and using learning models.

Math learning (Sholihah & Mahmudi, 2015) is implemented based on the process of communication or interactive activities between teachers and students (Radiusman, 2020). This is the teacher's effort to help students carry out learning activities. The goal of good mathematics learning is the realization of the efficiency and effectiveness of student learning activities (Hendi et al., 2020). A student will be able to follow the learning well and achieve optimal learning results if it is supported by adequate learning environment conditions and chooses an approach that is appropriate to the characteristics of students. In learning activities, it is students themselves who actively build their knowledge based on mathematical connection abilities (Siagian, 2016). This is in line with the educational paradigm which changes the orientation of learning from teacher-centered learning to student-centered learning. (Simangunsong et al., 2022).

Furthermore, the teacher is a component that has a big influence on the process of learning mathematics, because the teacher is the spearhead who has direct contact with students as subjects and learning objects. (Novitasari, 2016). So that teachers need to carry out learning effectively and efficiently in improving student learning outcomes, one of which is improving mathematical communication skills. Effective and efficient mathematics learning can be done by choosing the right learning model according to the characteristics of the ability to be improved. When we talk about mathematical communication skills, the Think, Talk, Write (TTW) learning model (Sinaga, 2019) is a learning solution in which the learning outcomes are a mathematical communication ability (Yanti et al., 2017).

Mathematical communication itself, namely the skills of students in terms of explaining an algorithm and efforts in solving problems, the skills of students

in compiling and describing presentations of events in the real world, be it graphic, sentence, table, or physical presentation (Sumirat, 2014). Mathematical communication is also a way of learning to convey mathematical ideas possessed by students. The ability of a learner when carrying out mathematical communication depends on the ability of knowledge or knowledge he has. While the Think, Talk, Write (TTW) learning model is a learning model to train students' skills in writing and emphasizes the need for students to communicate the results of their thoughts orally and in writing smoothly (Wardani et al., 2015).

At SMP Muhammadiyah 1 Medan, students have not mastered mathematics optimally, such as reading tables, presenting graphs, and so on. So it is necessary to have learning that can stimulate the exponentialization of these mathematical communication abilities. Furthermore, to improve mathematical communication skills, the discussion leads to the selection of learning models or strategies. one of those learning is Think, Talk, Write (TTW). Through learning Think Talk Write (TTW) students can improve their mathematical communication ability. Students individually think about possible answers (completion strategies) and make notes on what they have read, whether it is in the form of what they know, or the completion steps in their language. (Suparya, 2018). Furthermore, mathematical communication will help students solve problems that are given through discussion (Zalmonetasari & Reinita, 2021), to write the conclusion of an idea at the end of learning (Aini et al., 2021).

Furthermore, the discussion above shows that the right model in learning is very important to be applied to improve learning outcomes. Because teachers are required to use interesting and fun models so students don't feel bored and can increase learning motivation and learning outcomes according to student characteristics, especially in learning mathematics (Suprapti, 2018) moreover it is also done effectively. So this research is directed to effectiveness application of the Think Talk Write (TTW) learning model in improving students' mathematical communication skills (Nasrulloh & Umardiyah, 2020) at the junior high school level. The results of this study are expected to become a reference for subsequent research and become the latest scientific literature in the application of the Think Talk Write (TTW) learning model in improving students' mathematical communication skills.

RESEARCH METHODE

Quantitative research (Sugiyono, 2019) This is a one-group pretest-posttest pre-experiment design. Mathematical communication ability test instrument

adopted from the development of the instrument(Qohar, 2016). This research took place in early November 2022. The research data was tested using the paired sample t-test with the condition that the data was normally distributed. While testing the effectiveness of the increase using Normal Gain (N-Gain) with the Melzer gain criteria in(Kurniawan & Hidayah, 2021). Statistical analysis was tested using JASP software. The population in this study were all students of class IX at SMP Muhammadiyah 01 Medan TA. 2022/2023 with a total of 340 students. While the sample in this study was students of class IX-T1 SMP Muhammadiyah 01 Medan, totaling 30 people who were selected using a simple random sampling technique.

Effectiveness test increase in this study uses the g-factor (N-Gain) with the following criteria:

Table 2.
Criteria for Testing Effectiveness

G	Criteria
$g > 0.7$	Tall
$0.3 < g \leq 0.7$	Currently
$g \leq 0.3$	Not enough

(Kurniawan & Hidayah, 2021)

RESULT AND DISSCUSSION

Result

Statistic test shows the results of the research which can be seen in the explanations of several tables below:

Table 3.
Statistical Description

	N	Means	SD	SE
KKM Pre-Test	30	46,000	15,447	2,820
KKM Post-Test	30	65,667	15,466	2,824

Description: KKM (Mathematical Communication Skills)

The statistical description above shows that the average post-test score with the average pre-test score differs by 19.667 scores. After looking at the average pre-test and post-test scores before we see the effectiveness of the learning, it can be seen that the influence of the Think, Talk Write (TTW) learning model on students' Mathematical communication can be seen in Table 4 below:

Table 4.
Normality Test Results

	Shapiro Wilk	p.s
KKM Pre-Test	0.958	0.277
KKM-Post Test	0.961	0.332

The prerequisite for statistical analysis is the normality test which shows the significance of the pre-test and post-test data > 0.05 . So that the pre-test and post-test data are normally distributed. Furthermore, to see the effect of Think, Talk Write (TTW) learning on students' mathematical communication, a t-test is carried out below:

Table 5.
Paired Samples T-Test

measure 1		measures 2	t	df	p.s
KKM Pre-Test	-	KKM-Post Test	-59,000	29	< .001

The effect of using the paired sample t-test shows that there is a significant effect of Think, Talk Write (TTW) learning on students' mathematical communication with a significance value of < 0.05 . Further to test the effectiveness of learning using Think Talk Write (TTW) in improving students' mathematical communication skills can be seen in Table 6 below:

Table 6.
Improvement Effectiveness Test

N-Gain Score	Criteria
0.4015	Currently

Based on the effectiveness test of improving mathematical communication skills through learning think talk, write (TTW) shows the effectiveness of moderate improvement or it can be said that learning think talk, write (TTW) is effective in improving students' mathematical communication with quite high criteria.

Discussion

Analysis based on statistical descriptions showed that the average pre-test score was 46,000 while the average post-test score was 65,667. So, based on observations from the statistical description in this study, it shows that the difference between the average score is 19.667, and the average post-test score is higher than the average pre-test score. However, the effectiveness test is

incomplete before entering into other statistical studies, namely hypothesis testing using the paired sample t-test, and effectiveness testing using the normal gain (N-Gain).

In this study, the prerequisite normality test was first carried out, so that normally distributed data could be continued with the parametric paired sample t-test. Based on the results of the analysis of the prerequisite normality test using Shapiro Wilk in the JASP software, the data is normally distributed with a significance value > 0.05 , namely pre-test 0.277 and post-test 0.332. Furthermore, using the parametric test using the paired sample t-test shows that there is an influence between students' mathematical communication before and after using think talk write (TTW) learning with a significance value in the JASP software $<.001$ or <0.05 . The effectiveness of improving students' mathematical communication skills is then discussed based on the normal gain test (N-Gain) in this case using Melzer's criteria which shows that the N-Gain score is 0.

Based on the statistical analysis above, shows that a learning model that is expected to improve students' mathematical communication skills is the think-talk-write (TTW) strategy.(Murwatiningsih et al., 2019). This strategy is built through thinking, speaking, and writing. So that students are involved in thinking or dialogue with themselves after the reading process, then talk and share ideas (sharing) with friends before writing. Such learning, if accustomed to it, will improve students' mathematical communication skills as a result of the fun process of learning mathematics(Rustiana et al., 2021).

Mathematical communication skills(Arifin et al., 2016) (Purnamasari & Hanifah, 2021) are the ability of students to use mathematics as a means of communication (the language of mathematics). Because in mathematics is very important in mathematical communication especially in the development of language(Nashihah, 2020)and symbols in mathematics which aim to communicate mathematics so that students can reflect and explain students thoughts about mathematical ideas and relationships, formulate mathematical definitions and generalizations through discovery methods, express mathematical ideas orally and in writing(Rashid, 2020), reading mathematical discourse with understanding, clarifying and expanding questions on the mathematics he is studying to appreciate the beauty and power of mathematical notation and its role in the development of mathematical ideas(Fitriani & Latifah, 2021).

CONCLUSION

Based on the results of statistical analysis of quantitative data, this study shows that there is a significant effect of learning think-talk write (TTW) on mathematical communication skills. This study also shows that the effectiveness of the application of think talk write (TTW) learning is in the criteria of being or quite effective in improving students' mathematical communication skills at SMP Muhammadiyah 01 Medan.

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