

**EFFORTS TO IMPROVE STUDENTS' MATHEMATICAL COMMUNICATION ABILITIES BY IMPLEMENTING THE THINK-TALK-WRITE (TTW) LEARNING STRATEGY ON PLANE-SIDED SPACE TOPICS OF ELEMENTARY SCHOOL STUDENTS**

**Hendrikson R Panjaitan<sup>1\*</sup>, Melda Oktika Ginting<sup>2</sup>, Zulmawati<sup>3</sup>**

<sup>12</sup>Universitas Audi Indonesia, Medan, Indonesia

<sup>3</sup>Universitas Deli Sumatera, Medan, Indonesia

\*Correspondence email : [panjaitanhendrikrey@gmail.com](mailto:panjaitanhendrikrey@gmail.com)

**ABSTRACT**

*This project seeks to improve sixth-graders' mathematics communication abilities and find ways to teach prisms and pyramids at State Elementary School 060912. Classroom Action Research (CAR) was used. The subjects were 27 sixth-graders. The Think-Talk-Write learning technique was used to improve students' mathematics communication skills. Tests and observation were employed in this investigation. Both cycles of this study ended with a mathematics communication skills test. A validator checked the test before administering it. The first cycle survey found that 77.78% of pupils understood writing (moderate), 59.26% understood representation (poor), and 74.07% acquired classical mastery (adequate). The second cycle showed that 88.89% of pupils understood writing, 85.19% understood representation, and 88.89% reached classical mastery. Observers rated the researcher's learning management as good in the first cycle (83.33 points) and good in the second cycle (88.89 points). Learning through the TTW strategy, media additions, more extensive problem-solving procedures in the LAS than in the first cycle, and group size decrease to 3-4 students improved mathematics communication abilities. According to the above description, the Think-Talk-Write learning technique can improve sixth-grade students' mathematical communication skills when teaching prisms and pyramids at State Elementary School 060912.*

*Keywords : Communication Skills; TTW; Flat Side Space Building.*

## INTRODUCTION

Year after year, mathematics evolves to meet current needs. These demands inspire creativity in developing and implementing mathematics as a basic science. Math learning is one of these changes. Math learning is important because it helps pupils acquire conceptual knowledge, which leads to more mathematical development and everyday use. According to Cornelius (in Abdurrahman, 2012:204), learning mathematics fosters clear and logical thinking, problem-solving, pattern recognition, creativity, and cultural awareness.

Students usually learn math through lecture rather than discovery (Rusffendi in Ansari, 2009). Classrooms can cause student passivity. Expository learning is a common teaching style. One-way learning occurs between teacher and learner. Due to the teacher describing and solving difficulties, students learn by watching, which can reduce their engagement. Since the teacher dominates the classroom and promotes lower-level abilities, Brooks & Brooks (in Ansari, 2009) label this learning traditional. It limits kids to short-term goals and restricts their mental process. Mathematical rules and processes might make kids think math is a topic to memorize, which can limit their creativity. Lack of conceptual comprehension, material mastery, and unsuitable learning methodologies impact students' communication skills. Due to anxiety, many kids avoid approaching their peers, especially professors, for help. According to Polla (Kesumawati, 2009), Indonesian mathematics education need improvement, particularly in instruction. Because many kids find arithmetic tough and a nightmare, they dislike or hate it.

Researchers at State Elementary School 060912 were motivated by this. According to interviews with State Elementary School 060912 mathematics instructor Sumarto Manullang, "Many children despise prisms and pyramids. Students struggle to visualize the mathematical concepts in the puzzles. Thus, pupils cannot create a correct mathematical model to solve problems. They have trouble understanding known and asked questions in problems and computing the square root of a number." Without understanding prisms and pyramids, pupils are less confident in voicing their thoughts. According to interviews, more than 50% of pupils are still afraid to speak their ideas about prisms and pyramids. When presented questions different from those explained by the teacher, students struggle to solve them. Hasibuan (2014) stated:

Based on observations conducted in grade XI Science at SMA Negeri 1 Lubuk Alung, learning has not yet led students to a solid understanding of mathematics. Students still tend to memorize principles and procedures without understanding their meaning. This is evident when students are given problems that differ from the examples, and they struggle to solve them.

Students experience many difficulties in mathematics learning, particularly on the topic of prisms and pyramids. During the researchers' observations, several difficulties were identified, particularly in mathematical communication. When the researchers asked students to respond or ask questions, only 30% expressed their opinions or asked questions. This is due to a lack of interest in learning and a lack of enjoyment of mathematics, which ultimately leads to students not understanding the lesson. In mathematics learning, specifically on prisms and pyramids, students experience difficulties in solving problems, as shown in the student work below:

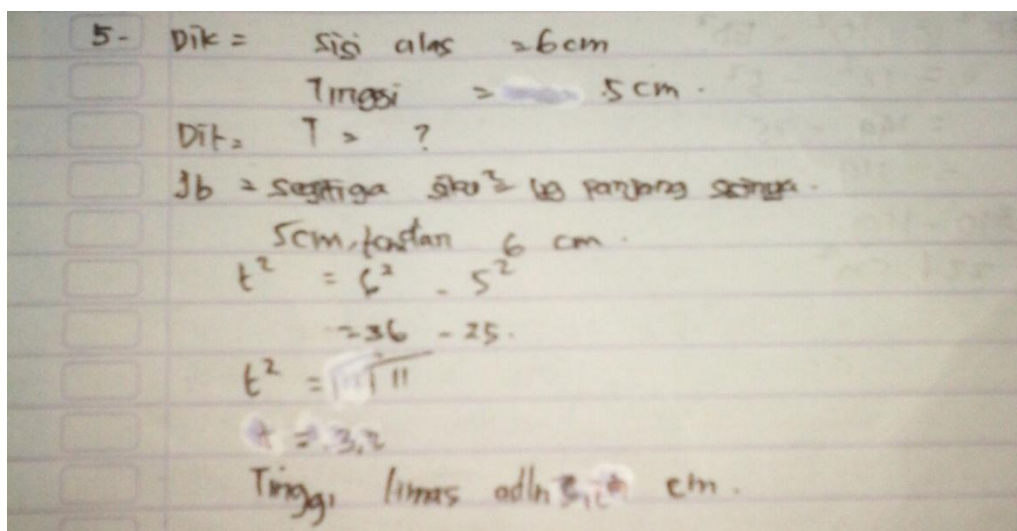


Figure 1. Student Work

Student's work above shows a lack of understanding of the problem. Instead of grasping the problem, the learner enters what is understood into the right triangle formula. So, pupils must be more motivated to study hard at school and home. Students must listen to the teacher's explanations while learning. This shows pupils' poor mathematical communication, especially when teaching prisms and pyramids. (Darkasyi, 2014) said "The low mathematical communication skills in junior high schools (SMP) are due to teachers' tendency to be more active, using a lecture-based approach to conveying material to students, resulting in students' mathematical communication skills being severely lacking." The learning tactics employed by instructors affect low math achievement. According to Usman (Carolina, 2010), students' inability to grasp basic mathematical ideas might lead to poor mathematics learning outcomes. Teachers' learning practices are one of several factors that hinder pupils' mathematics understanding.

To overcome the issues above, teachers must improve their learning practices to increase students' communication abilities by fostering active learning. To improve students' mathematical communication skills, the teacher must now motivate them to learn (stimulate learning) by helping them construct their own knowledge through problem-solving, reasoning, and communication (doing math) to develop critical and creative thinking.

Silver and Smith (in Ansari, 2009) also state that the teacher's tasks are (1) involving students in every mathematical task, (2) managing students' intellectual activities in the classroom, such as discussions and communication, and (3) helping students understand and monitor their mathematical understanding. Teachers must use activities to engage pupils in learning to achieve this. According to Elida (2012), implementing the Think-Talk-Write (TTW) learning strategy in schools can enhance students' mathematical communication skills by encouraging active and communicative learning. This active student involvement should improve mathematical communication skills.

This learning technique relies on small-group problem-solving thinking, discussing, and writing. Think-Talk-Write (TTW) helps students build mathematical communication skills, making it simpler to understand and express their ideas in writing and speech. This method was selected for numerous reasons: First, students are given questions to ponder about in the ponder-Talk-Write (TTW) technique. (2) A Talk (communication) activity lets students express ideas to peers, construct theories, share solution strategies, and define terms. Students generate several concepts to express through dialogue when invited to speak, which improves conceptual knowledge. (3) The Think-Talk-Write (TTW) technique is supplemented by a Write task to assist students understand the content. Teachers can also observe students' concept development with this practice. Teachers can also monitor student misconceptions, errors, and ideas about the same topic. Math communication abilities, especially pupils' written math skills, are still low. He wants to investigate "Efforts to Improve Students' Mathematical Communication Skills by Applying the Think-Talk-Write (TTW) Learning Strategy to the Material of Flat-Sided Solids".

## **RESEARCH METHODS**

This research is a classroom action research (CLRS), which aims to improve the quality of classroom learning practices. This research aims to improve students' mathematical communication skills and uncover obstacles or difficulties experienced in learning about Planar-Sided Solids through the Think-Talk-Write (TTW) learning strategy.

The subjects in this study were 27 students from Grade VI of State Elementary School 060912, selected from one of two classes: Grade VI-B. The object of this research is an effort to improve students' mathematical communication skills through the application of the Think-Talk-Write (TTW) learning strategy to the topic of Planar-Sided Solids in Grade VI of State Elementary School 060912 for the 2025/2026 academic year. As this research is a classroom action research (CLRS), it has several stages, each cycle. Each cycle is implemented according to the desired change.

## **RESULTS AND DISCUSSION**

### **Data Analysis of Communication Ability Test I**

To determine the level of mathematical communication ability and the category of student completion in the students' mathematical communication ability, the total score of each indicator of mathematical communication contained in the questions and the total score of all questions are used. To see the level of mathematical communication ability and the category of student completion in

detail, From the results of the mathematical communication ability test I, from 27 students, 20 students (74.08%) have completed the mathematical communication test I. while 7 students (25.92%) have not completed it.

**Table 1. Description of Student Ability Levels in the Cycle I Communication Ability Test**

Category	Ability Level	Many Students	Percentage of Number of Students	Average Ability Score
18 - 20	Very High	3	11,11%	14,33 Currently
16- 17	High	6	22,22%	
13 - 15	Medium	11	40,74%	
11 - 12	Low	5	18,52%	
< 11	Very Low	2	7,41%	
$\Sigma$		27	100%	

Based on the data above, it can be seen that out of 27 students, 3 students are in the very high communication ability category (18 - 20), 6 students are in the high communication ability category (16 - 17), 11 students are in the medium communication ability category (13 - 15), 5 students are in the low communication ability category (11 - 12), and 2 students are in the very low communication ability category (<11).

The results indicate that classical learning has not been completed. To strengthen students' mathematical communication skills for addressing prism and pyramid issues, more instruction is needed. The second cycle continues. According to the first mathematical communication test answer sheets, pupils had trouble handling prism and pyramid problems, although the number has decreased. The table above shows pupils' insufficient mathematics communication skills. Students' poor classical completion scores and many problem-solving errors demonstrate this. Cycle I action implementation triumphs and failures:

- a. The Prisms and Pyramids Think-Talk-Write (TTW) learning technique worked well.
- b. Student group activities, class presentations, and learning activity participation showed that some students could solve problems.
- c. Some pupils had trouble communicating mathematical ideas.

The exam data showed that Cycle I students' mathematics communication skills had improved but not reached classical mastery. Cycle II requires upgrades. Cycle I used the TTW technique to have students discuss in groups of four or five. Learning outcomes in this cycle were disappointing, requiring additional teaching in Cycle II. Cycle II changed the intervention by limiting discussion groups to 3-4 students. So each group's students are more active. The LKPD includes questions and media to help pupils comprehend.

### Planning and Implementation of Cycle II

To determine the level of mathematical communication ability and the category of student completion, the total score for each communication indicator contained in the questions and the total score for all questions were used. To examine the level of mathematical communication ability and the category of student completion in detail,

Based on the data, of the 27 students, 7 students scored in the very high communication ability category, 4 students scored in the high communication ability category, 13 students scored in the medium communication ability category, 2 students scored in the low communication ability category, and 1 student scored in the very low communication ability category. From the results of the second mathematical communication ability test, 24 (88.89%) of the 27 students completed the test. The remaining 3 students were not yet completed the mathematical communication test.

**Table 2. Description of Student Ability Levels in the Communication Ability Test, Cycle II**

Category	Ability Level	Many Students	Percentage of Number of Students	Average Ability Score
18 – 20	Very High	7	25,93%	15,44 Currently 100%
16– 17	High	4	14,82%	
13 – 15	Medium	13	48,15%	
11 – 12	Low	2	7,40%	
< 11	Very Low	1	3,70%	
$\Sigma$		27	27	

The average class score obtained by 27 students in the second cycle of the mathematical communication ability test was 77.22. From the results of this second mathematical communication ability test, of the 27 students, 24 students (88.89%) had completed the test, while 3 students (11.11%) had not completed it. To see the comparison between cycle I and cycle II, see the following table:

**Table 3. Comparison of Average Scores for TKKM I and TKKM II**

Communication Aspect	Cycle I	Cycle II	Improvement
Writing	3,06	3,20	0,14
Representation	2,71	3,00	0,29
Class Average Score	71,67	77,22	5,55
Classical Completion	74,08%	88,89%	14,81%
Teacher Observation	3,33	3,55	0,22

After being given action II in class VIII-B of SMP Negeri 4 Muara, students' mathematical communication skills increased by 0.14 in writing and 0.29 in representation. Likewise, there was an increase in the class average score of 5.55, classical completeness increased by 14.81%, and teacher observation increased by 0.22%.

The classical completion rate obtained in cycle II was 88.89%. This means that the class has completed communicating students' mathematics classically, namely  $88.89\% \geq 85\%$  of students who have a mathematical communication ability level  $\geq 65$  and the teacher's ability in implementing learning activities is in the very good category. Thus, the researcher was satisfied with the research conducted so that it stopped in cycle II or did not continue to the next cycle. From the data obtained, because there was already an increase and classical learning completion had been achieved, learning was not continued.

## Discussion

The research results and debate revealed the following: Students took a pre-test to assess their Prisms and Pyramids knowledge before the intervention. The pretest showed that pupils' prism and pyramid problem-solving communication skills were remained low. In Cycle I, researchers used TTW learning based on pre-test issues. Each of six groups of 4-5 kids received a Student Activity Sheet in this cycle. The first communication test showed that 21 students met expectations and six did not. Classical completion was 74.08%, with an average score of 71.67. Some pupils were inactive during the lecture, resulting in a mathematical communication score of  $\geq 65$  not achieved. The second cycle used TTW learning. Students were placed into 3-4 groups in this cycle to maximize discussion engagement. Student Activity Sheets were distributed to each group. The second communication test showed that 24 students learned communication skills, whereas 3 did not. Classical completion was 88.89%, with an average score of 77.22. Four pupils failed to get a mathematical communication score of  $\geq 65$  due to inactivity during the lecture. The initial exam, communication test I, and communication test II showed that TTW learning enhanced students' Prisms and Pyramids communication skills. Each cycle saw a higher number of classical learners learning communicative skills.

## CONCLUSION

Based on data analysis and observations, we can conclude: From Cycle I to Cycle II, the Think-Talk-Write (TTW) learning technique improves students' mathematical communication skills, especially in solving prism and pyramid problems, with the greatest progress in writing. In Cycle II, researchers used the TTW learning framework and addressed students' deficiencies in Cycle I to maintain and improve teaching and learning activities. Learners improved mathematics communication abilities after using TTW. Media was added, LAS problem-solving strategies were expanded from Cycle I, and group size was reduced to 3-4 students. The TTW learning technique enhanced students' mathematical communication test scores, especially on prisms and pyramids. Students' classical mastery following TTW learning shows this. The initial test showed a student average of 61.43, which increased to 71.67 in cycle I with 20 students (74.08%) scoring  $\geq 65$ , and to 77.22 in cycle II with 24 students (88.89%) scoring  $\geq 65$ . Results of this study suggest: To develop students' mathematical communication skills, math teachers should employ the Think-Talk-Write (TTW) learning technique. Researchers with similar goals should consider this study's weaknesses: students should not be placed into too many groups so that each group may engage in the conversation, facilitating teacher supervision of the class. With good class management, the Think-Talk-Write (TTW) learning technique may improve students' mathematical communication skills.

## BIBLIOGRAPHY

- Abdurrahman, Mulyono. (2009). *Pendidikan Bagi Anak Berkusulitan Belajar*. Penerbit Rineka Cipta: Jakarta.
- Anggoro, Bambang S. (2014). *Komunikasi Matematis*. <https://bambangrianggoro.wordpress.com/2014/01/01/komunikasi-matematis/>
- Ansari, Bansu I. (2009). *Komunikasi Matematik (Konsep dan Aplikasi)*. Penerbit Pena: Banda Aceh.
- Arikunto, S., Suhardjono., dan Supardi. (2010). *Penelitian Tindakan Kelas*. Penerbit Bumi Aksara, Jakarta.
- Arikunto, Suharsimi. (2013). *Prosedur Penelitian*. Penerbit Rineka Cipta: Jakarta.
- Bambang. (2007). *Membangun Keterampilan Komunikasi Komunikasi Matematika*. <https://rbaryans.wordpress.com/2008/10/28/membangun-keterampilan-komunikasi-matematika.html>. (Accessed 7 Juni 2009)
- Darkasyi, Muhammad. (2014). *Peningkatan Kemampuan Komunikasi Matematis dan Motivasi Siswa dengan Pembelajaran Pendekatan Quantum Learning pada Siswa SMP Negeri 5 Lhokseumawe*. *Jurnal Didaktik Matematik*, Vol 1, No.1, April 2014, ISSN : 2355-4185.
- Djamarah, Syaiful B. (2011). *Psikologi Belajar*. Rineka Cipta : Jakarta.
- Elida, Nunun. (2012). *Meningkatkan Kemampuan Komunikasi Matematik Siswa Sekolah*
- Hasibuan, Haryani. (2014). *Penerapan Metode Penemuan Terbimbing Pada Pembelajaran Matematika Kelas Xi Ipa Sman 1 Lubuk Alung*. *Jurnal Pendidikan Matematika*, Vol 3, No.1, 2014, Part 1 Hal. 38-44.
- Huda, Miftahul. (2014). *Model-model Pengajaran dan Pembelajaran*. Pustaka Belajar: Yogyakarta.
- Hudojo, H. (2005). *Pengembangan Kurikulum dan Pembelajaran Matematika*. Penerbit Universitas Negeri Malang : Malang.
- Kadir. (2008). *Kemampuan komunikasi matematik dan keterampilan sosial siswa dalam pembelajaran matematika*. Makalah disampaikan dalam Seminar Matematika dan Pendidikan Matematika, pada tanggal 28 November 2008, di Yogyakarta.
- Kesumawati, Nila. (2009). *Peningkatan Kemampuan Pemecahan Masalah Matematis Siswa Smp Melalui Pendekatan Pendidikan Matematika Realistik*. Seminar Nasional Matematika dan Pendidikan Matematika Jurusan Pendidikan Matematika FMIPA UNY, pada tanggal 05 Desember 2009, ISBN : 978-979-16353-3-2.
- Menengah Pertama Melalui Pembelajaran Think-Talk-Write (Ttw)*. *Jurnal Ilmiah Program Studi Matematika STKIP Siliwangi Bandung*, Vol 1, No.2, September 2012, hal 178-185.
- Sabri, Ahmad. (2010). *Strategi Belajar Mengajar*. Quantum Teaching: Ciputat.
- Sianturi, Roland E. (2013). *Upaya Meningkatkan Kemampuan Komunikasi Matematik Siswa Dengan Penerapan Strategi Pembelajaran TTW Pada Materi SVLDV Siswa Kelas VIII SMP Swasta Methodist 8 Medan*. Skripsi, FMIPA, Unimed, Medan.
- Slameto. (2013). *Belajar dan Faktor-Faktor yang Mempengaruhinya*. Penerbit Rineka Cipta : Jakarta.

- Sudjana, Nana. (2009). *Penilaian Hasil Belajar Proses Belajar Mengajar*, Penerbit Remaja Rosdakarya : Bandung.
- Suprijono. (2010). *Cooperative Learning*. Pustaka Belajar : Yogyakarta.
- Suryosubroto, B. (2009). *Proses Belajar Mengajar di Sekolah*. Rineka Cipta: Jakarta.
- Trianto. (2011). *Mendesain Model Pembelajaran inovatif-progresif*. Jakarta: Kencana Prenada Media Group.
- Zainab. (2011). *Komunikasi Matematis dalam Pembelajaran*. <http://mgmpmatoi.blogspot.com/2011/12/komunikasi-matematis-dalam-pembelajaran.html>.