

# The Influence of Team Assisted Individualization (TAI) Approach on Students' Mathematical Communication Ability

1<sup>st</sup> Annisa Rida Selvitry  
Universitas Negeri Padang  
Padang, Indonesia  
[annisaridaselvitry302@gmail.com](mailto:annisaridaselvitry302@gmail.com)

2<sup>nd</sup> Ahmad Fauzan  
Jurusan Matematika FMIPA  
Universitas Negeri Padang  
Padang, Indonesia  
[ahmad\\_fz@yahoo.com](mailto:ahmad_fz@yahoo.com)

3<sup>rd</sup> Mudjiran  
Jurusan BK FIP  
Universitas Negeri Padang  
Padang, Indonesia

**Abstract**—The low ability of mathematical communication of students in Gugus V Elementary School Kecamatan Lubuk Basung was the reason for this research. Students tend to be passive and often forget the lessons they have learned. This type of research is quasy experiment. The populations in this study were fifth grade students of Gugus V Elementary School Kecamatan Lubuk Basung. The sample of this research was the fifth grade students of SDN 35 Pasar Durian, the fifth grade students of SDN 62 Batu Hampar Kecamatan Lubuk Basung. The data were collected through questionnaires and test. The results showed that: 1) the students' mathematical communication ability was higher when they were taught using TAI than when the students were taught using conventional approach, irrespective of their motivation learning, 2) there is no interaction between TAI and students' motivation learning on communication ability. In the end, it can be concluded that the TAI approach contributed to the improvement of students' mathematical communication ability.

**Keywords**—TAI, communication, motivation learning

## I. INTRODUCTION

Mathematical communication skills can be interpreted as a student's ability in conveying something he knows through dialogue events or relationships that occur in the classroom, where there is a transfer of messages. The message that is transferred contains about the mathematical material that students learn, for example in the form of concepts, formulas, or strategies for solving a problem, by transferring the message orally or in writing.

Students should realize that mathematical communication skills become a characteristic of mathematics lessons that are needed in the face of increasingly developing times. Cockroft says that mathematics must be taught to students because: (1) it is always used in our lives, (2) all subjects need appropriate mathematical skills, (3) a strong, short, and clear means of communication (4) it can be used to present information in various ways, (5) improve the ability to think logically, accuracy, and spatial awareness, and (6) provide satisfaction with efforts to solve problems. [9]

Students must have and develop problem solving skills in mathematics, not only have problem solving abilities but have other abilities in the field of mathematics, namely students' mathematical communication skills, because after the students can solve problems, so the students will communicate the results of the problem solving

Mathematical problem solving and mathematical communication are two of the five process standards put forward by the National Council of Teachers of Mathematics which are the central focus of the mathematics curriculum [11].

This is in accordance with the objectives of learning mathematics in Indonesia which are listed in the Content Standards curriculum for Primary and Secondary Education Units including; (1) solving problems that include the ability to understand problems, design mathematical models, solve models and interpret solutions obtained, and (2) communicate ideas with symbols, tables, diagrams or other media to clarify the situation or problem [4].

Students are required to be able to develop problem solving skills and communicate ideas or concepts by using symbols, tables, diagrams, and other media in mathematics learning. Therefore, students' problem solving and mathematical communication skills are important to improve. To improve problem-solving skills it is necessary to develop skills to understand problems, create mathematical models, solve problems, and interpret solutions [6].

The ability of students to communicate mathematical ideas when solving problems or when conveying the process and results of problem solving is also an ability that can develop students' high-level mathematical thinking skills such as logical, analytical, systematic, critical, creative, and productive. This shows that the importance of problem solving and mathematical communication skills in mathematics learning. Mathematical problem solving also formed other mathematical abilities such as reasoning and evidence, mathematical connections, mathematical communication, and mathematical representations [8].

Communication is an essential part of mathematics. Besides being a way to share ideas and understanding, through communication ideas can become objects of reflection, improvement, discussion, and improvement. When students are challenged to think and reason about mathematics and communicate their thoughts verbally or in writing, they are invited to learn to gain an increasingly clear and convincing understanding. Two important reasons why mathematics learning focuses on communication are: (1) mathematics is essentially a language; mathematics is more than just a tool for thinking, finding a pattern, solving a problem, or making a conclusion, mathematics is also an invaluable tool for communicating ideas clearly, precisely and concisely, and (2) mathematics and mathematics

learning are, at heart, social activities; as a social activity in mathematics learning, interactions between students, such as communication between teachers and students, are important for developing students' mathematical potential [3].

Mathematics learning has been conveyed informally, meaning that students only get information from the teacher or can also be called a teacher using a conventional approach where learning is teacher-centered so that the degree of attachment can also be said to be low. With this learning process students are less involved in finding the concepts of learning that must be mastered so that the information given will only make students forget and confuse the material they receive. This is consistent with the research conducted by Sahrudin that mathematics learning has been less active in involving students and the teacher only provides information and directs students to memorize and remember them so that students become bored and quickly forget about the material that has been learned [2].

Reality in the field shows that mathematics learning outcomes from students' mathematical communication aspects are still low due to lack of motivation from students where the characteristics of students who are less motivated can be seen from students who get bored quickly in learning, daydreaming, lazy to solve problems and reluctant to pay attention to the teacher. Because if there is no motivation from students to learn, then forever students will not be interested in mathematics and not get satisfaction from learning mathematics and learning becomes meaningless. This is in line with the research conducted by Edriani to learn is needed the motivation its self, the existence of high motivation in learning will show good results. It is also in accordance with the results of observations and question and answer conducted at Elementary school Gugus V in Lubuk Basung Subdistrict on October 17 and 19, 2017 that the mathematical abilities and motivation of students to study mathematics are still very low [5].

As for the factor that can affect learning ability and student learning motivation is the need for learning innovation. The innovation can be in the form of the application of a learning model that is able to provide insight to students to be able to express ideas and concepts. Teachers as source of learning, determinants of learning methods and models, and also learning aid assessors for students who are effective and efficient to achieve the learning objectives themselves [15].

Mathematical learning must be designed through problems that allow students to be able to do good mathematical communication. The importance of improving mathematical abilities in learning mathematics requires a learning model that can encourage students to be actively involved and motivated in learning mathematics. One of the alternatives is through the Cooperative learning model that type Team Assisted Individualization. Cooperative learning is a learning strategy that spurs individual progress through groups. This is in line with the opinion of Slavin which states that TAI type cooperative learning was developed to solve classical learning problems including the problem of students' level of understanding of the material delivered by the teacher and the accuracy and speed problem of students' learning [12].

Cooperative learning model type Team Assisted Individualization (TAI) combines cooperative learning with individual teaching [12]. Learning with the model of cooperative that type Team Assisted Individualization (TAI) makes students understand the material by way of students do tasks individually and the results are taken to each group to be discussed with group members and all group members are responsible for the overall answers. So, TAI type cooperative learning will be able to provide opportunities for students who have more ability to help their group learning activities and in this learning of course students will have individual responsibility for the final goal and then able to improve their own abilities. In addition to this TAI cooperative learning model, students will be directly motivated in following the learning with the interaction with their peers and with the teacher. This is in accordance with Muhamad's study which mentions the TAI model has the following advantages: 1. Improving learning outcomes, 2) increasing learning motivation in students, 3) reducing disruptive behavior, 4) forming the weak students [13].

Student opportunities to express their ideas and concepts can improve students' problem solving and mathematical communication skills can be applied through the cooperative model that type Team Assisted Individualization (TAI) to encourage students to be actively involved in learning. This means that it is no longer a teacher who transfers knowledge to students, but students themselves construct their knowledge. In accordance with research cooperative learning models suitable for mathematics subjects is cooperative learning model that type Team Assisted Individualization (TAI) [16]. Cooperative learning model that type TAI provides a combination of motivational strength and classmate assistance in cooperative learning with an individual teaching program that is able to give all students material that is appropriate to their level of ability in the field of mathematics and allows them to start these materials based on their own abilities, and then communicate the results obtained in the group and account for the results of the group's work.

The questions in this study are stated as follows: (1) Are the students' mathematical communication skills that take part in learning with the TAI model better than those using conventional approaches? (2) Are students' mathematical communication skills that have high and low learning motivation that follow learning with the TAI model are better than those using conventional approaches? And (3) are there interactions between the TAI model and learning motivation in influencing mathematical communication skills?

## II. METHOD

This research is a quasy-experiment which aims to compare the influence of the TAI model with conventional approaches to students' mathematical communication skills. The variables in this study are communication skills as independent variables, the TAI model as the dependent variable, and learning motivation as a moderator variable.

The study was conducted on fifth grade students of Gugus 5 Elementary School in Lubuk Basung District who have the same curriculum, KKM, and accreditation. From each school, two classes were randomly selected as research samples. 20 students class V at Elementary School number

35 Pasar Durian as an experimental class who will take lessons with TAI and 20 students class V at Elementary School number 62 Batu Hampar as a control class who will take part in learning using a conventional approach.

The research data was collected using questionnaires and tests. Questionnaire is used to identify students' learning motivation, while tests are used to measure students' mathematical communication skills. Questionnaires and tests are validated by experts first, and then tested to meet the criteria for validity and repayment. Mathematical communication indicators used in the test are (1) the ability to express mathematical ideas through spoken, written, and demonstrate them and describe them visually; (2) Ability to understand, interpret, and evaluate Mathematical ideas either orally and in other visual forms; (3) Ability to use terms, Mathematical notations and their structures to present ideas, describe relationships and situation models. Scores of students' mathematical communication skills are determined using the assessment rubric created. Furthermore, the data were analyzed using t-test and two-way ANAVA after conducting a series of normality and homogeneity tests.

### III. RESULTS AND DISCUSSION

Based on data analysis, the students' mathematical communication abilities were classified according to their motivation learning, as can be seen on Table I.

TABLE I. THE AVERAGE SCORE OF SYTUDENTS' MATHEMATICAL COMMUNICATION ABILITY ACCORDING TO THEIR MOTIVATION LEARNING

Kelas	Motivation Learning	N	Communication
Eksperimen	High	12	82,74
	Low	8	71
Kontrol	High	9	70,63
	Low	11	56,2

Table I shows that the average value of students who participated in learning using the TAI model was higher than those who followed learning using conventional approaches. Based on motivational learning, the average value of the experimental class students was higher than in the control class.

After conducting a series of normality and homogeneity tests, it was concluded that the t-test was used for three hypothesis testing and two-way ANAVA was used to test the interaction between the TAI model and learning motivation in influencing mathematical communication skills. A summary of hypothesis testing, with the help of Microsoft Excel, is presented in Table II.

TABLE II. THE RERSULT OF HYPOTHESIS TESTING

Motivation Learning	Result			
	$\alpha$	$t_t$	$t_h$	Ket
Total	0,05	2,025	3,339	Accept $H_1$
High	0,05	2,093	2,276	Accept $H_1$
Low	0,05	2,110	2,247	Accept $H_1$

Hypothesis testing results in Table II show that all hypotheses are accepted. That means that the mathematical communication abilities of students who take part in learning with the TAI model are higher than those who follow learning with conventional approaches. This finding also applies to students with high and low motivation Learning.

The next hypothesis testing uses two-way ANAVA which is used to find out the interaction between the TAI model and motivation learning in influencing students' mathematical communication skills. Ft 4.09 with  $\alpha = 0.05$  greater than Fh 1,322 so that  $H_0$  is accepted. That is, there is no interaction between the TAI model and motivation learning in influencing students' mathematical communication skills. According to Risvirenl that the absence of interaction can occur if more than one variable carries a significant separate influence or main effect. 14]. The TAI model is a learning model that helps students to be more active in constructing and expressing their own ideas so that the material learned is more durable in students' memories. In addition, the application of the TAI model can increase students' learning interest so that it also impacts on improving student learning outcomes [10].

In general, experimental class students have reached mathematical communication indicators. This can be seen from the answers given by students in solving mathematical communication problems. One of the students' answers to mathematical communication questions in indicators explains ideas, situations, and mathematical relations in writing with graphs and algebra.

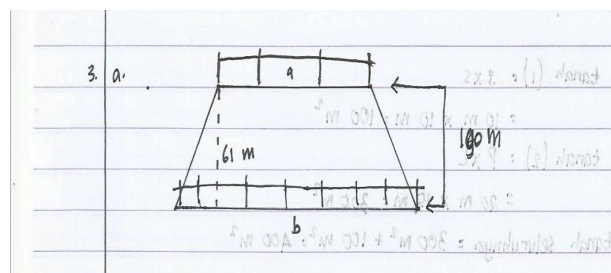


Fig. 1. The answer to Students' Mathematical Communication Questions in Experiment Class

From Figure 2 it can be seen that students have been able to explain mathematical ideas, situations, and relationships in writing with graphs and algebra. Students also describe clearly so that it does not cause confusion for those who see. Whereas in the control class students only describe and provide complete information but only partially correct. The results of the control class students' answers can be seen in Figure 3.

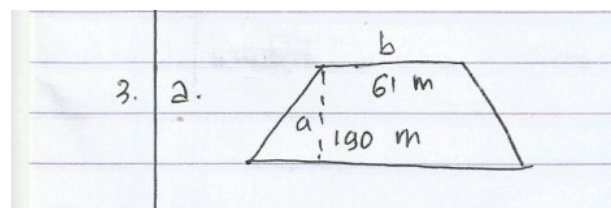


Fig. 2. The answer to Students' Mathematical Communication Questions in the Control class



Furthermore, on the indicator of the ability to communicate a solution to a mathematical problem, the experimental class students communicate the strategies that are used in great detail so that the reader can immediately understand the purpose of the student's answers. This can be seen in the following student answers.

Handwritten student answer for Figure 3:

$$\begin{aligned} \text{b. Luas kebun pak Sambera} &= \text{Luas trapesium} \\ &= \frac{(\text{alas} + \text{sisi sejajar}) \times t}{2} \\ &= \frac{(a+b) \times t}{2} \\ &= \frac{(190 \text{ m} + 61 \text{ m}) \times 6}{2} \\ &= 5795 \text{ m}^2 \end{aligned}$$

Fig. 3. The answer to Students' Mathematical Communication Problems in Experimental Class

Similar to control class students have been able to communicate problem solving strategies but are not yet clear, as shown in Figure 5.

Handwritten student answer for Figure 4:

$$\begin{aligned} \text{b. Luas kebun} &= \text{sisi sejajar} \times t \\ &= 190 \text{ m} \times 61 \text{ m} \\ &= 5795 \text{ m}^2 \end{aligned}$$

Fig. 4. The answer to Students' Mathematical Communication Questions in Control Class

TAI is a learning model that is structured to solve problems, the TAI model is a combination of individual and group strategies by providing real problems to students and training students to communicate mathematical ideas by making pictures, symbols and explanations in writing in their own language to solve the problem. Students solve problems individually then students communicate them in groups to be discussed and discussed with each other, where all group members are responsible for the whole answer as a shared responsibility and present it in front of the class. So that students can be trained in mathematical communication skills [12].

In conventional learning, learning also begins with problems, but learning activities have not constructed students' knowledge to solve their own problems and have not trained students in mathematical communication. Because students only know what is given by the teacher and are guided by what the teacher has explained [1].

Kalimatillah entitled The Effect of the Use of Cooperative Learning Models type Team Assisted Individualization (TAI) on the Connections Ability and Mathematical Communication Ability of MTS Students. This study states that students' mathematical communication skills that take part in learning with the TAI model are better than students who follow learning with conventional approaches [7].

In the results of the above research, an important issue emerged. First, the mathematical communication skills of students who take learning with the TAI model are better than those who follow conventional learning. Secondly, students' mathematical communication skills with high and low learning motivation that follow learning with the TAI

model are better than those who follow conventional learning. Third, there is no interaction between the TAI model and learning motivation in influencing students' mathematical communication skills.

#### IV. CONCLUSIONS

Based on the results of research and discussion it can be concluded that the TAI model gives a better influence than conventional approaches in improving students' mathematical communication skills. This conclusion also applies to students with high and low motivation Learning. And there is no interaction between learning models and learning motivation in influencing students' mathematical communication skills.

#### REFERENCES

- [1] A. Majid, Strategi Pembelajaran, Bandung: Rosdakarya, 2015
- [2] A. Sahrudin, Implementasi Strategi Pembelajaran Discovery untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis dan Motivasi Belajar Siswa SMA, Jurnal Pendidikan Unsiska, 2(1), 2014.
- [3] A.J. Baroody, Reasoning, and Communicating, K8. Helping Children think Mathematically. New York: Macmillan Publishing Company.
- [4] BSNP, Standar Isi untuk Satuan Pendidikan Dasar dan Menengah, Jakarta: BSNP, 2006.
- [5] D. Edriani, Pengaruh Model Pembelajaran Kooperatif Tipe Team Assisted Individualization (TAI) Terhadap Hasil Belajar Matematika Siswa Kelas VII SMP N 3 Sungai Limau Kabupaten Padang Pariaman, Jurnal KomTekInfo Fakultas Ilmu Komputer, 1(2), 2004.
- [6] Depdiknas, Kurikulum Tingkat Satuan Pendidikan, Jakarta: Pusat Kurikulum Balitbang, 2006.
- [7] K. Irfa, Pengaruh Penggunaan Model Pembelajaran Kooperatif Tipe Team Assisted Individualization (TAI) terhadap Kemampuan Koneksi dan Komunikasi Matematis Siswa MTS, Koleksi Perpustakaan Universitas Terbuka, 2014.
- [8] Kadir, et al, Penerapan Pembelajaran Kontekstual Berbasis Potensi Pesisir Sebagai Upaya Peningkatan Kemampuan Komunikasi Matematika Siswa SMP, Thesis UPI, 2010.
- [9] M. Abdurrahman, Pendidikan Bagi Anak Berkesulitan Belajar, Jakarta: Rineka Cipta, 2003.
- [10] M. Huda, Model-Model Pengajaran dan Pembelajaran: Isu-Isu Metodis dan Paradigmatik, Yogyakarta: Pustaka Pelajar, 2014.
- [11] National Council of Teacher of Mathematics, Principles and Standards for School Mathematics, Reston, VA: NCTM, 1989.
- [12] R.E. Slavin, Cooperative Learning Teori, Riset, dan Praktik. Terj. Nurulita. Bandung: Nusa Media (Buku asli diterbitkan 2005), 2009.
- [13] S. Muhamad, et al, Penerapan Model Pembelajaran Kooperatif Tipe TAI (Team Assisted Individualization) untuk Meningkatkan Hasil Belajar Siswa pada Materi Persamaan Kuadrat di Kelas X MIPA 2 SMA Negeri 5 Palu, AKSIOMA Jurnal Pendidikan Matematika, 6(2), 2017.
- [14] Rivirenlol, Pengaruh Strategi Pembelajaran Berbasis Masalah terhadap Hasil Belajar Mahasiswa yang Memiliki Gaya Kognitif Berbeda. Jurnal Sains dan Teknologi Tadulako, 4 (1), 80-91, 2015.
- [15] S. Sagala, Konsep dan Makna Pembelajaran untuk Membantu Memecahkan Problematika Belajar dan Mengajar, Bandung: Alfabeta, 2009.
- [16] S. Sharan, The Handbook Of Cooperative Learning. Inovasi Pengajaran dan Pembelajaran Untuk Memacu Keberhasilan Siswa di Kelas, Yogyakarta: Familia, 2012.