

CHAPTER I

INTRODUCTION

1.1. Background

Education plays an important role in developing human capital. Institutions must be able to keep up with the rapid developments in science and technology. Special attention is given to the progress and development of education for improving the quality of education (Ginting et al., 2022: 408).

According to Indonesian Law No.12/2012, Education is a positive and constructive attempt to create an environment and learning that allows them to develop their abilities to gain the faith, spiritual strength, self-control, behavior and skills they need for their education (Simbolon et al., 2020: 79).

In education, it cannot be separated from the name teaching and learning process or better known as learning. The teaching process is the process in which teachers and students work together to achieve goals. The activities of teachers and students interact to ensure that there are good conditions for learning (Isrok'atun & Rosmala, 2018: 34).

In accordance with Wahyuni (2016), one of the subjects that plays an important role in school is mathematics. In other words, improving students' abilities can be achieved by learning mathematics in schools, so that they have the provision of knowledge and the formation of attitudes and mindsets (Dewi & Ardiansyah, 2022: 135).

Mathematics is a globalized field of science. Its existence in the world is needed and its life continues to develop in line with the demands of humanity's needs, because there is no human activity that is separated from mathematics (Kamarullah, 2017: 22).

In the writings of Suwangsih and Tiurlina (2010: 3) the term mathematics originated from the Greek “mathematike” which means to study. The word “mathematike” comes from the word “mathema” which means knowledge. In addition, the word “mathematike” is also related to another word that is almost the same, namely “mathein” or “mathenein” which means thinking (Isrok'atun & Rosmala, 2018: 3).

Mathematics is a universal science that underlies the development of modern technology, has an important role in various disciplines, and advances human thinking. Mathematics needs to be given to all students from elementary school to high school to equip students with the ability to think logically, analytically, systematically, critically, and creatively. The objectives in learning mathematics according to the 2013 curriculum (Kemendikbud, 2013) are for students to have the ability to understand mathematical concepts, develop mathematical reasoning, develop problem-solving ability, develop mathematical communication ability, and develop an attitude of appreciating the use of mathematics in life.

The main standards in mathematics learning contained in the National Council of Teachers of Mathematics (NCTM) standards (2000) are problem-solving ability, communication ability, connection ability, reasoning ability, and representation ability. These five standards have an important role in the mathematics curriculum (Maulyda, 2020: 7).

Basically, the process of learning mathematics is not just about transferring ideas from teachers to students. More than that, mathematics learning is a dynamic process, when teachers provide opportunities for students to observe and think about the ideas given. Therefore, mathematics learning activities are teacher-student, student-student, and student-teacher interaction activities to clarify thoughts and understanding of a mathematical idea.

Mathematical communication ability an effective way to teaching mathematical concept intelligibly to friends, teachers, and others speech or writing. Communication can help students not only in building concepts but building links between ideas and abstract language with mathematical symbols. Students also be given the opportunity to express their ideas by speaking, writing, drawing or

graphing. Communication in mathematics is a fundamental skill that students and teachers must have while learning, teaching, and evaluating mathematics. Communication opens up space for students to exchange and discuss mathematics. Therefore, if students have good communication skills, their mathematics learning results will certainly be good (Dewi & Nuraeni, 2022: 155).

An important issue in mathematics education is the importance of developing students' mathematical communication skills. Research by Riyanti and Mardani (2021: 130) shows that approximately 80% of students find it difficult to convey the learning outcomes achieved and to teach the learning outcomes achieved. From the problem already given. In line with Asmara and Afriansyah's research (2018: 83), also states that it appears that most students have difficulty interpreting description problems into mathematical models and many are confused in interpreting problems, students also lack the courage to convey mathematical ideas orally or in appropriate language.

Based on the news that I obtained from the internet on the website mimbarumum.co.id and klikpendidikan.id, MAN 2 Medan Model is not included in the ranking of schools with the most students passing the SNBP in 2023, ranking 1 is SMAN 3 Medan, ranking 2 is SMAN 18 Medan, and ranking 3 is SMAN 3 Medan. Then for the ranking of the highest UTBK scores, MAN schools in Medan are also not included in the top 10 and are still defeated by other high schools, one of which is SMAN 1 Medan.

One of the factors that affect the score for SNBP and UTBK is the student's math score, therefore the researcher felt interested in conducting research into one of the madrasah-based schools in Medan, namely MAN 2 Medan Model.

This is also in line with the experience of researchers when carrying out field introduction activities at school during semester 7, namely at MAN 2 Medan Model school, it was seen that when giving daily mathematics exams to students there were still many students who got low scores, so the Pamong teacher at that time advised us to hold a repeat exam or often called remedial. Therefore, related to the problems experienced by researchers at that time, researchers are interested in conducting observations at MAN 2 Model Medan.

The researcher also gave one of initial test question which contained indicators of mathematical communication ability to class X – C and X-H students at MAN 2 Medan Model.

The following are the initial test questions given to students:

1. Seseorang membawa penyakit ke daerah A, dan penyakit tersebut dengan cepat menyebar ke orang-orang di daerah tersebut. Setelah dilakukan pemeriksaan, virus tersebut menyebar ke dua orang. Pada tahap berikutnya, ditentukan bahwa 2 orang yang terinfeksi menularkan virus tersebut ke 2 orang lagi. Pada tahap selanjutnya, masing-masing dari empat orang pada tahap sebelumnya menularkan dua orang lagi. Cara penularan ini terus berlanjut dan tidak ada yang tertular dua kali.
 - a. Buatlah sebuah tabel yang menggambarkan penularan virus dan banyaknya orang yang tertular di setiap tahap (fase) mulai dari fase pertama hingga fase ke-5?
 - b. Setelah kamu menggambarkan penularan virus di setiap fase pada tabel tersebut, dapatkah kamu menentukan berapa banyak orang yang terinfeksi virus pada fase ke-10?
 - c. Jika banyak tahap (fase) dimisalkan sebagai n , bagaimana mempresentasikan banyak orang yang akan terinfeksi virus pada fase ke- n tersebut?

As a conclusion for the results of students' initial test answers in class X-C, and class X-H, it shows that there are no students who are able to answer all questions correctly. Examples of student answers are shown in Table 1.1 below.

Table 1. 1. Sample of Student Answer Sheet

Answer Sheet		Error Detection												
A.	<table border="1"> <thead> <tr> <th>Fase</th> <th>Banyak yang tertular</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2</td> </tr> <tr> <td>2</td> <td>4</td> </tr> <tr> <td>3</td> <td>16</td> </tr> <tr> <td>4</td> <td>64</td> </tr> <tr> <td>5</td> <td>256</td> </tr> </tbody> </table>	Fase	Banyak yang tertular	1	2	2	4	3	16	4	64	5	256	In question number 1 part a, students able to make a table as instructed in the problem, but students unable to complete the information in the table correctly, this is because students have not understood all the
Fase	Banyak yang tertular													
1	2													
2	4													
3	16													
4	64													
5	256													

	information contained in the problem.
B. $1 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 : 1 \times 2^9 = 512$	In question number 1 part b, students unable to answer correctly how to solve the problem.
C. $n:2$ banyak fase = 10	In question number 1 part c, students unable to represent the mathematical model correctly because the solution in the problem should be expressed as pattern (exponential), so the answer is still incorrect.

The students' average scores after taking the test showed that in experiment class I is 43,43(Appendix 14). While in experiment class II is 43.95(Appendix 14). This means that students' mathematical communication ability are still low.

Based on the results of the researchers' interviews with mathematics teachers at MAN 2 Medan Model, namely Mrs. Syifa Hayaty Rangkuti, S.Pd, it was found that the learning model that was usually applied was only a conventional learning model, then giving project-based group assignments. Learning media such as PowerPoint is also rarely used, teachers only use digital books which are explained directly to students by using a projector. The low mathematical communication ability is also a result of students' responses to mathematical communication questions generally lacking. In addition, it is caused by conventional learning models that are more teacher-centered and do not involve students being active. Based on the results of interviews with several class X

students at MAN 2 Medan Model, also said they were still unable to solve story-based math problems, it was still difficult to understand the meaning of the problem, for example, such as story problems that convert mathematical problems into mathematical models (exponent material), they said they were still confused and found it difficult. In addition, students also still find it difficult to make conclusions or a statement in giving reasons for whether a solution is correct or not. They can only answer whether it is correct or not but are unable to explain why the solution is correct or why the solution is wrong, they also said they often feel doubt. Based on observations, there are also students who do not pay attention to the teacher explaining the material in front of the class, as a result students will not maximally receive and understand the subject matter.

Realizing the importance of mathematical communication ability, educators need to strive for learning by using learning models that can provide opportunities and encourage students to practice mathematical communication ability. Group discussion is one of the activities that can have a positive impact on students' mathematical communication ability. Through group discussions, students who do not understand the tasks given by the teacher can ask other group members. One of the learning models that can be applied to support group discussion activities is the cooperative learning model. The objectives achieved from the cooperative learning model include:

1. Academic learning outcomes
2. Acceptance of diversity
3. Development of social skills and group skills

Cooperative learning aims to teach students cooperation and collaborative skills (Rahmiati & Pianda, 2018: 20).

In this case, researchers chose two types of cooperative learning models, namely the Think Pair Share (TPS) and Numbered Head Together (NHT) learning models.

Think pair share is a type of cooperative learning developed by Frank Lyman, et al. Think pair share gives students time to think and respond and work together with others. This cooperative learning model guides students to be actively involved in learning through the process of thinking and exploring abilities

individually (Think), discussing the understanding obtained in pairs (Pair), after discussing in pairs, the results of the discussion are explained to all classmates (Share). In this learning model, students are also trained to think a lot and exchange opinions both with their classmates and with classmates, so that it can improve students' cognitive learning outcomes because students are required to follow the learning process in order to answer every question and discuss. Through TPS learning, students have good time management in thinking and can be actively involved in the thinking process. Thus, students will be able to focus more when discussing the learning topic with their group partners (Lestari, 2023: 8).

In addition, there is an idea of thinking time or waiting time in this model which is a strong factor in improving students' ability to respond to questions. The Think Pair Share cooperative learning model is relatively simpler because it does not take a long time to arrange the seating or group the students. In the research conducted by Hartini, Zhana Zhefira Maharani, and Bobbi Rahman (2016: 135) stated that the application of the think pair share learning model at MTs. Negeri Pagedangan can improve students' mathematical communication ability, this can be seen during the learning process in the classroom, namely in learning by using the think pair share model students are required to communicate with their friends to express their thoughts.

In addition to the Think Pair Share cooperative learning model, the Numbered Head Together cooperative learning model is also designed to influence students' interaction patterns. NHT is often known as "Numbered Heads", meaning that each individual in each group is given a number. The NHT learning model is a cooperative learning model that consists of quite a lot of members in each group (Anindita & Banjarnahor, 2017: 63).

Numbered Head Together (NHT) cooperative learning was first developed by Spencer Kagan in 1993. Numbered Head Together prioritizes student activities in a heterogeneous group to exchange new ideas, process, and consider the most appropriate answer to answer problems related to the material studied by presenting it in front of the class. Students are divided into groups of 4 - 6 students and each member is assigned a number. The characteristic of the numbered head together (NHT) cooperative learning model is that the teacher will appoint a student who

represents the group without telling in advance who will represent group, so the NHT cooperative learning can encourage students to be able to communicate the results of their thoughts in the form of ideas and reasons they have (Lestari, 2022: 18).

Both types of learning models emphasize the need for students to communicate or explain the results of their mathematical thinking. These two learning models are also both cooperative learning models (group learning models), but these two cooperative learning models have differences. The differences between TPS and NHT cooperative learning models can be seen from the definition, syntax, and number of members in the group. Not only that, the two cooperative learning models have their own advantages and disadvantages in the learning process.

From the research conducted by several researchers relevant to this study, it can be seen in the research of Illiyyin Darojatil 'Ulal, Murtono, & Himmatul Ulya (2018: 57) the results showed that the mathematical communication ability of students who received Think Pair Share (TPS) model learning can achieve the qualification of effectiveness, and it is suggested that teachers should pay more attention to students who still have difficulties in their mathematical communication ability. Then on the results of research conducted by Endang Istikomah and Nurmaliza (2021: 75), it is stated that the application of numbered heads together (NHT) cooperative learning can improve the learning process and improve the mathematical communication ability of students in class VIIIIG SMP 1 Negeri Siak Hulu. And the research conducted by Ariati Dara Anindita and Humuntal Banjarnahor (2017: 66), the results showed that students' mathematical communication ability using the Think Pair Share (TPS) cooperative learning model was higher than that using the Numbered Head Together (NHT) cooperative learning model at SMP Negeri 2 Hinai.

By applying the cooperative learning model of TPS and NHT types, it is expected to generate students' connection to mathematics material and make students more active, encouraging cooperation between students in learning material, so as to improve students' mathematical communication ability. However, between these two types of learning models, it will be investigated which

cooperative learning model is more effective so that it can be applied in the learning process to improve students' mathematical communication ability. Therefore, of the two learning models the researcher intends to conduct research to see the difference between TPS and NHT cooperative learning models on students' mathematical communication ability.

Based on the description above, the researcher wants to conduct research with the title "Comparison of Students' Mathematical Communication Ability between Think Pair Share and Numbered Head Together Cooperative Learning Model".

1.2. Problem Identification

1. There are still many students who have difficulty and do not understand in solving math problems.
2. Students' mathematical communication ability are still low, that makes students less able to understand mathematical problems.
3. Students are not actively involved in the learning process.
4. The conventional learning model applied in learning is still teacher-centered and cannot improve students' mathematical communication ability.
5. Some students do not pay attention to the teacher's explanations in front of the class.
6. ICT-based learning media is rarely used in learning mathematics.
7. Think Pair Share (TPS) and Numbered Head Together (NHT) cooperative learning models are suitable to be applied to improve students' mathematical communication ability, but it is still unknown which learning model is better between the two of them.

1.3. Scope of Study

Based on the problem identification described above, the scope is needed so that this research is not too broad. The scope of this study is limited to the low mathematical communication ability of students, the lack of use of media in learning, and the learning model applied by teachers that do not involve students being active.

1.4. Problem Limitation

In order for this research to be carried out properly and in a directed manner, the problem limits in this study namely comparing communication ability between Think Pair Share and Numbered Head Together cooperative learning models on trigonometry material and finding out which learning model is better to use during the learning process.

1.5. Research Question

Based on the background that has been described previously, the problem formulation in this research was, “Is the students’ mathematical communication ability using Think Pair Share cooperative learning model is better than using Numbered Head Together cooperative learning model? ”

1.6. Research Objective

Based on the problem formulation that has been stated earlier, the objectives in this research is to find out whether the students' mathematical communication ability using Think Pair Share cooperative learning model is better than using Numbered Head Together cooperative learning model.

1.7. Research Benefit

The benefits of this research include:

1. For researchers, the use of Think Pair Share (TPS) and Numbered Head Together (NHT) cooperative learning models can provide additional insights into knowledge and skills in making learning sequences and improve their competence as prospective teachers. In addition, researchers can gain direct experience in choosing the right model for mathematics learning.
2. For teachers, this research can add insight for teachers about learning models that can be used to improve students' mathematical communication ability, so that in the end it can improve teacher performance.
3. For students, this research is useful for students who have difficulty understanding mathematics lessons and the learning model used in this

study can help improve students' mathematical communication ability in the subject of trigonometry. In addition, this research can increase students' motivation to learn and become more active in the learning process.

4. For other researchers, it can be used as a reference for similar research.



THE
Character Building
UNIVERSITY