CHAPTER I

INTRODUCTION

1.1. Background

In the history of human civilization, the role of mathematics is very important because mathematics is a basic science related to other sciences. All knowledge learned contains elements of mathematics, both of numbers and operations that involve mathematics itself. Because it is a basic science, the mathematics has to be learned and mastered to learn other sciences easier.

In mathematics there are several things that need to be considered so that the material can be conveyed and understood by students, namely as a teacher should be able to master the subject matter well and according to plan as well as the latest curriculum. Mastery of course material for mathematics is closely related to how the efforts components influence each other in education to understand the math, then improving the quality of mathematics teaching should always be sought so as to overcome the problems of education in line with the demands of time.

Parents assume that mathematics is the most severe lesson and as a frightening specter for students. Even parents also complained about this math lesson, so many parents seeking child to be tutoring or extra lessons in mathematics.

According to UNESCO (1982), there are several reasons why math is so important that (1) Means to solve everyday problems; (2) Means to recognize patterns of relationship and generalization of experience; (3) Means to develop creativity; (4) Means to raise awareness of cultural development.

Learning math is not only requires that students understand the material studied than at the time, but also learn with understanding and actively building new knowledge from experience and prior knowledge that the learning more meaningful. For this to be realized, the National Council of Teachers of Mathematics (2000) defined five processes necessary skills of the students

through the learning of mathematics are included in the standard process, namely: (1) Problem solving; (2) Reasoning and proof; (3) Communication; (4) Connection; and (5) Representation.

One of the goals of learning mathematics for students is that they have the ability or skills to solve a problem or question about mathematics, as a means for him to hone careful reasoning, logical, critical, and creative. Therefore, problem solving ability become focus in mathematics learning at all levels.

In the United States, the investigations about problem solving has been done decades ago. Which was commissioned by Dodson and Hollander (in Budhi, 2005: 3). According to them the problem solving abilities that should be grown are :

1. The ability to understand concepts and mathematical terms
2. The ability to note the similarities, differences, and analogies
3. The ability to identify the most important element and choose the correct procedure.
4. The ability to see things that are not related
5. The ability to assess and analyze
6. The ability to visualize and interpret quality and space
7. The ability to generalize by some examples
8. The ability to change the method known
9. Having enough confidence and feel good against the material

Based on the abilities above that problem solving have very good impact in life application. In addition to the above abilities, the students have certain stituation for the future so confidencely can develop those abilities. NCTM (2000: 52) states:

> "By learning problem solving in mathematics, the student should acquaire ways of thinking, habits of persistence and curiousity, and confidence in unfamiliar Situations that will serve them well outside the mathematics classroom. In everyday life and in the workplace, being a good problem solver can lead to great advantage. "

It is also disclosed by Dogru (2008) he asserted:

> "In modern science, for training the students, methods should be used for improving their thinking skills, make connections with events and concepts and scientific operations skills rather than giving information and definition. One of these methods are problems solving.With this study, it is shown that problem solving is not just solving a movement problem like in

the physics as it is understood by most of the science teachers but it can be used also in social problems like environmental problems. "

So to solve the problem is not just a goal of learning mathematics, but it is also the main tool to learn it. Therefore, problem solving ability become focus in mathematics learning at all levels, from elementary school to college. By studying problem solving in mathematics, students will find ways of thinking, industrious habits, and curiosity, as well as confidence in unusual situations, as they will face a situation outside the mathematics classroom. In everyday life and the world of work, be a good problem solver can bring great benefits.

Based on mathematical purposes as the main focus, the ability to mathematical problem solving in mathematics is a very basic and very important. But in reality, mathematical problem solving abilities of students in Indonesia is still very low, it can be seen from the results of the four-yearly TIMSS survey coordinated by the IEA (The International Association for the Evaluation of Educational Achievement), one of the cognitive measures assessed is the ability of students to solve non-routine problems. At first participation in 1999 Indonesia obtained the average value of 403 and ranked 34th out of 38 countries, in 2003 Indonesia obtained the average value of 411 and ranked 35th out of 46 countries, in 2007 Indonesia obtained the average value of 397 and ranked 36th out of 49 countries and in 2011 obtained the average value of 386 and ranked 38th out of 42 countries. Average standard value set by the TIMSS is 500, it means that the position of Indonesia in each of its participation always received grades below average set.

Low ability of Indonesian students in mathematical problem solving can also be seen from the results of the PISA's survey (in OECD, 2014) in 2012 which showed that Indonesia is ranked 64th out of 65 countries where the average value of Indonesian mathematical ability is 375. It is below of standard values set by PISA namely 494. In one of the indicators of cognitive measures assessed were problem-solving abilities.

Based on the facts that have been discovered, this suggests that mathematical competence especially mathematical problem solving ability of

students is low. Lack of mathematical problem solving ability of students will affect the quality of student learning that will result in low student achievement in school. Efforts should be made to address this problem. One of them is to select and use appropriate learning models.

Romberg (in Anderson, Sullivan & White, 2005) shows the relationship of elements in the teaching of mathematics as follows :
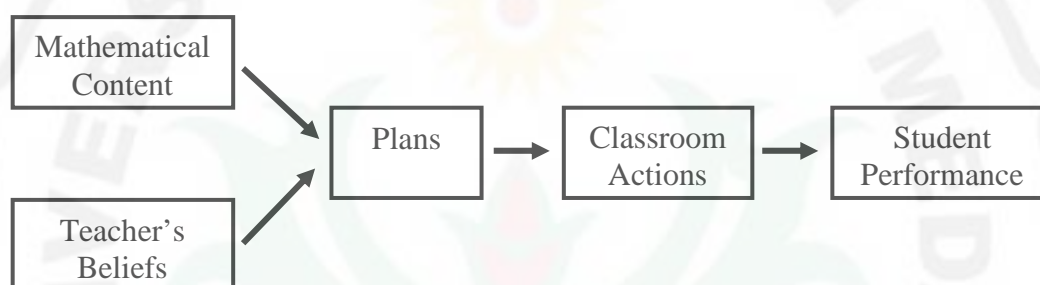

Figure 1.1 The elements of a model of mathematics pedagogy

The model above is a linear representation of the relationship between teachers' beliefs and practices and does not allow the possibility that actions and student performance could in turn impact on teachers' beliefs and future planning of mathematics lessons. However, it does recognise that teachers may teach different mathematics content in different ways.

Thus, the problem can arise from mathematics content or material, educator beliefs, plans are made, the conditions in the classroom implementation, and performance of learners. As expressed by Widjaja & Heck (2003) :

> "Indonesian mathematics education faces another problem: most pupils' attitudes towards mathematics are negative. Most of them perceive mathematics as difficult, and boring. This is not surprising when we look closely at the common practice of teaching and learning mathematics in Indonesian classrooms. "

And also Mullins (in Widjaja & Heck, 2003) he stated :

> "Although mathematics is considered important in all stages of education, Indonesian pupils' performances in this subject is generally still poor: for instance, Indonesian 8th graders ranked 34th among 38 participating countries in the TIMMS-R assessment."

It means to carry out reforms in teaching methods, namely the change of teacher-centered activities to a situation where students are the center of attention

or student-centered activity. Teachers as facilitators and mentors while students build their math for theirselves, do not just copy and follow the examples without understanding mathematical concepts.

The observation conducted by the researcher at SMAN 8 Medan in tenth graders in order to give the initial test where 42 students who follow the test, it is obtained that the average score is 54,67. Based on the mastery level in problem solving ability, there is none get very high level (0%), 4 person (9,52%) who has high ability, 10 person (23,81%) who has medium ability, 6 person (14,29%) who have low ability, and 22 persons (52,38%) who have a very low ability. There are only 14 persons (33,33%) who achieve the learning completeness.
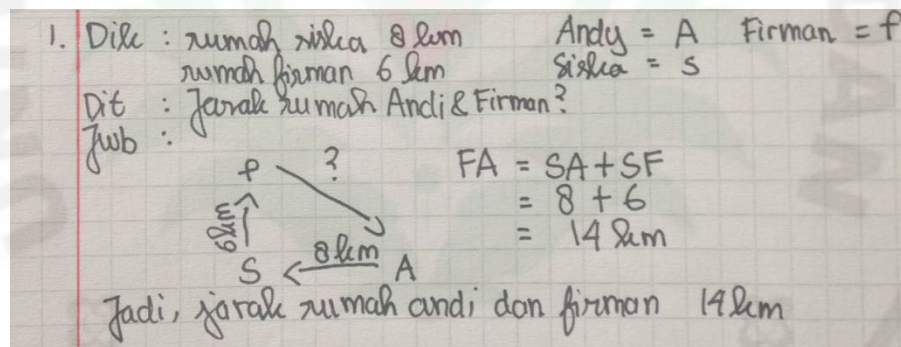

Figure 1.2 The weakness of student's answer in determining the distance between two points

From the description above it can be concluded that the students are not able to solve the problem due to the lack of meaningful learning process resulting low ability to solve mathematical problems. In addition, this may occur because of the level of concentration of students who are not optimal because it may be the method used does not match, the previous method may not make students motivated so that most students do not understand the material presented by teachers, especially material of three-dimensional space.

The another problems that might cause students are the problems given are non-routine and the problems given might be abstract or unreal condition. According to Lester (1987) there are a few reasons why mathematical problem solving are difficult for students :

"The first reason why students are often unable to solve any problems but the most routine problem is that solving a mathematics problem requires the individual to engage in a variety of cognitive actions, each of which requires some knowledge and skills, and some of which are not routine. Furthermore, these cognitive reviews actions are influenced by a number of noncognitive factors. A second reason why so many students have trouble becoming proficient problem solvers is that they are given too few opportunities to engage in real problem solving. "

On previous research conducted by Edenita (2008) that the initial problem solving average score is 53.3 with 8 students or 23.52% of students reached the learning completeness. In the first cycle obtained the problem solving average score is 72.3 with 24 students or 70.6% of students reached a learning completeness. In the second cycle obtained the problem solving average score is 80.9 with 30 students or 88.2% of students reached learning completeness.

Poor teaching methods can occur for example due to lack of teacher preparation and the lack of control of materials presenting a lesson so that the teacher is not clear or the attitude of teachers towards students or to subject itself is not good, so students are less happy about the subject or the teacher, as a result of students lazy to learn.

Learning mathematics should not only emphasize the students to understand the material being taught but also learn with understanding and seek new knowledge from experience and prior knowledge. Approach in learning mathematics usually done at school are tends to: (1) Teachers explain the definition of concept; (2) give and discuss examples from the concept; (3) convey and discuss application matters from concepts; (4) making summary and; (5) give homework. Through reviews such an approach above, the creativity of students is less developed. As a result, student achievement in mathematics lower and less student enjoys math. It also led to learning conditions in the classroom becomes monotonous and then make students become passive.

The learning approach becomes a very important thing, because from the perspective of psychology every child has different abilities to absorb the lessons, it is necessary for the appropriate approach to potential students.

One alternative to improve student learning outcomes is to develop cooperative learning model assissted Team Individualization (TAI), active students to find their own knowledge and competencies, or anything else that is needed to develop their own abilities. Slavin (1989) stated that TAI was developed to apply cooperative learning techniques to solve many of the problems of individualized instruction. This is consistent with the constructivism learning theory as proposed by Taber (2011) states that students have to find their own and transform complex information, check the new information with old rules and revising it if the rules do not apply anymore.

In the experiment of Slavin (1983) done by Slavin and friends in 504 students, they got the fact that the experiment evaluating Team Assisted Individualization (TAI) clearly indicate that this method increase of student's mathematics achievement more than traditional instruction method. The TAI students gained more than their control counterparts on every achievement measure in every study, although the differences were not statistically significant on some subsclaes at some grade levels.

Based on the background described above, the researchers interested in conducting the research entitle **"The Implementation of Team Assisted Individualization (TAI) Learning Model To Increase Student's Mathematical Problem Solving Ability On The Topic Of Distance In Three-Dimensional Space In Tenth Grade Of SMA Negeri 8 Medan"**.

1.2. Problem Identification

Based on the background of the problems described above, the problem can be identified as follows:

1. Problem solving ability at tenth grader of SMAN 8 Medan especially on the topic related to the distance in 3D-Space is still low.

2. The learning model often used by teachers is only conventional learning model which is less effective and less efficient.

3. Student's interest in learning mathematics is still low.

4. Problem solving ability of Indonesian student is below the standard of International criteria.

5. Most learning activities done is by teacher oriented instead of student oriented.

1.3. Problem Limitation

Based on the problem identification above then the researchers limit the problem on the implementation of Team Assisted Individualization (TAI) learning model to increase student's mathematical problem solving ability on the topic of distance in Three-Dimensional Space in tenth grade of SMA Negeri 8 Medan.

1.4. Problem Formulation

Based on the problem limitation above, then the problem formulation in this research is "Is Team Assisted Individualization learning model able to increase the mathematical problem solving ability on topic of Distance in Three-Dimensional Space at tenth grader of SMA Negeri 8 Medan?".

1.5. Research Objectives

The objective of this research is to know the increasement of mathematical problem solving ability through the implementation of Team Assisted Individualization (TAI) learning model to increase student's mathematical problem solving ability on the topic of distance in Three-Dimensional Space in tenth grade of SMA Negeri 8 Medan.

1.6. Benefits of Research

The results of this study are expected to be useful for the study of information users. The benefits of this research are:

1. Increase the knowledge or insight to author about the cooperative learning model of Team Assisted Individualization in improving students' mathematical problem solving ability.

2. As an alternative teaching model for teachers and schools in order to improve learning in school.

3. For the next researchers, the results of this research can be input or suggestion for other researchers to develop a research in the future.

1.7. Operational Definitions

1. The mathematical problem solving ability is a way to solve mathematical problems using a special strategies or mathematical concepts that had previously dominated.

2. Cooperative learning model is a learning model that emphasize collaboration among students to achieve the learning objectives.

3. Team Assisted Individualization (TAI) is a cooperative learning model where students are placed in small heterogeneous groups and followed by individual assistance to students who need it.