

CHAPTER I

INTRODUCTION

1.1. Background

National Education based on Pancasila and the Constitution of the State of the Republic of Indonesia Year 1945 described in Law Number 20 Year 2003 on National Education System. The function of National Education is to develop the ability, character, and civilization of the nation to enhance its intellectual capacity, and aim to develop the potential of learners so that they become people who are imbued with faithful and pious human values to one and only God. ; who cultivate moral and noble character; healthy, knowledgeable, competent, creative, independent; and as citizens, democratic and responsible (Seameo, 2015).

Education provides knowledge, good thinking, and a more systematic framework. Education requires logical thinking to connect the abstract in the mind to be applied in solving real-life problems. To build this logical thinking, it takes math. Mathematics is a field of study that is studied by all students at every level of education from elementary school (SD) to high school (SMA) and even also in universities. This shows that the field of mathematics studies is important in education, and is essential in life.

Hudojo (in Hasratuddin, 2014) says in his book that "*Matematika merupakan ide-ide abstrak yang diberi simbol-simbol itu tersusun secara hirarkis dan penalarannya deduktif. Sehingga belajar matematika itu merupakan kegiatan mental yang tinggi*". So it can be concluded that mathematics is a lesson that can improve the way of thinking in life.

The National Council of Teachers of Mathematics (in Kurniawati and Jailani, 2017) sets out five standards of mathematical ability that students must possess, namely problem solving skills, communication skills, connection capabilities, reasoning, and the ability of representation.

Salkind and Hjalmarson (in Andhani, 2016) state that representation is a configuration that can represent something in several ways. Representations that are often used in communicating mathematical ideas are diagrams, tables, mathematical statements, written texts, or a combination of them all. Andhani (2016) states that

"Representasi dapat dinyatakan secara internal dan eksternal. Representasi internal dari seseorang sulit untuk diamati secara langsung karena merupakan aktivitas mental seseorang dalam pikirannya. Representasi internal seseorang dapat diduga atau disimpulkan berdasarkan representasi eksternalnya. Representasi eksternal dapat mempermudah siswa untuk mengubah ide atau gagasan menjadi konsep yang nyata misalkan gambar, simbol-simbol, kata-kata, grafik, tabel dan lain-lain".

Our numbering systems, mathematical equations, algebraic expressions, graphs, geometric figures, and numeric lines are examples of external representations. This representation has been developed over time and is widely used. External representation also includes written and spoken language. Examples of internal representations include personal notation systems, natural language, visual imagery, and problem-solving strategies. The low representational ability shows the lack of skilled students in generating ideas, asking questions and responding to other people's questions or opinions.

Based on the above explanation, it can be concluded that representation is one of the important things in understanding mathematics. Mathematics can be understood if students have a good representation. So they are able to describe, interpret, express, symbolize or even model ideas, mathematical concepts and coherence between them and are contained in certain configurations, constructs or situations that arise in various forms to gain clarity of meaning, to show understanding or view for the solution of the problem.

Based on the initial investigation of researcher did on November 23rd, 2017 by interviews the vice principle and giving questions to students, this problem happened in SMA Negeri 1 Tebing Tinggi. There are many students who fail the exam. Their mathematical representation scores is lower than the KKM

required by the school, which is about 65%, while the KKM in this school amounted to 3.00 scale 4.00 or 75 on a scale of 100. By giving a question about trigonometry to 35 grade X students in SMA Negeri 1 Tebing Tinggi as follows:

1. Known a Right triangle ABC with angle $A = \theta$, length $AB = 16$ cm and length $BC = 12$ cm.
 - a. Determine the length of the AC!
 - b. Determine $\sin \theta$!
2. Given a right triangle, the value of $\sin \beta = \frac{2}{3}$ find $\cos \beta$?



Figure 1.1 Observation Question no.2

1. a. $10\sqrt{5}$ cm a. $10\sqrt{5}$ cm
 $\frac{3}{5}$ b. $\frac{3}{5}$
 2. $\frac{\sqrt{5}}{3}$ $\frac{2}{3} \times 100 = \frac{15}{3} = \frac{1}{3} \sqrt{5}$

Figure 1.2 Students Answer

From the 32 students who answered the question, there are 66.67% of them have not been able to build their visual representation in proper depiction of space, while 70.27% of students have not been able to build their mathematical representation skills in equations or aspects of mathematical expressions especially in making equations. Mathematical models of early representation were

also given and 65.49% of students had not been able to represent their ideas or knowledge in writing text form. The students' mathematical representation ability has not been fulfilled according to observations. This situation is due to their lack of understanding in trigonometry and the lack of something that represents from an abstract form to a more concrete form.

It can be concluded that the mathematical representation in SMA Negeri 1 Tebing Tinggi is still low. There are many factors that can lead to low mathematics student achievement. There are three dimensions – the school environment, teacher-student relationships and value orientation among teachers affect the overall educational process in the classroom situation. The school environment is an external factor and the teacher-student relationship is an internal factor. We know that the value among teachers determines and controls both factors

That's means , not only the students themselves who can affect students' ability in understanding mathematics, but also teachers and the environment. Teachers can reduce this problem by providing innovative learning strategies that are perceived as developing students' cognitive abilities and independence. One of them by giving "learning by doing" in teaching and learning process. Stalheim and Smith (1998) said :

“ People have known for hundreds of years that they remember what they see and do. The 2000 year saying goes: "I heard and I forgot I saw and I remember, I and I understand." Experience has taught me the wisdom of this proverb. The data provided by Stice (1987) also supports this proverb. He shows that learners remember 10% of what they read, 26% of what they hear, 30% of what they see, 50% of what they see and hear, 70% of what they say and 90% from what they say as they do something”

One of the models that provides such learning is Cooperative. Cooperative learning is a learning that can increase student participation actively in teaching and learning activities. With the active students in the learning expected learning outcomes and student retention can be increased (Wena, 2010: 190). Similarly put forward by Johnson & Johnson (in Trianto, 2009: 57):

“Tujuan utama pembelajaran kooperatif adalah memaksimalkan pembelajaran siswa untuk meningkatkan prestasi akademik dan pemahaman baik secara individu maupun kelompok”

In cooperative learning, there are several variations of models that can be applied, including Student Team Division (STAD), Jigsaw, Team Games Tournament, Group Investigation, Rotating Trio Exchange and Group Resume. Of the several models that are widely developed are STAD Model, Jigsaw and Team Games Tournament.

STAD Cooperative Learning Model is a Cooperative Learning approach developed by Slavin that emphasizes the activities and interactions among students to motivate each other and help master the subject matter to achieve maximum performance. Trianto (2009: 72) state that: *"Model pembelajaran kooperatif tipe STAD adalah model pembelajaran yang sederhana"*.

This Learning Model is expected to improve students' mathematical representation through activities that stimulate representational skills by giving presentations to Group Friends. Give their opinions verbally, in writing in the form of words, symbols, or expressions of mathematical notation, graphs, diagrams, tables or physical objects in group presentations. In this observation, observers will compare the PBL learning model with the Cooperative learning model STAD Type. PBL is one of the active learning models that are being done. Arends (2012: 396) said "the essence of problem-based learning consists of presenting students with authentic and meaningful problem situations that can serve as a diving board for investigation and investigation".

PBL make students work with classmates to solve complex and authentic problems that help develop content knowledge and problem solving, reasoning, communication, and self-assessment skills. In this research will adapted PBL cycle by Silver. This issue also helps to retain students' interest in the subject matter as students realize that they are learning the skills needed to succeed on the ground.

Montague (in Kurniawati and Jailani, 2017) defines problem solving of mathematical words as a process involving two stages: the problem of "representation" and "problem execution". Both are essential for successful problem solving. Successful problem solving is not possible without first representing the problem correctly. The exact representation of the problem indicates that the problem solver has experienced a problem and serves to guide the student toward the solution plan.

Based on the general description above, then researchers have been interested to conduct research with the title “ **The Difference of Students' Mathematical Representation Ability By Using Problem Based Learning Model And Cooperative Learning Model Student Team Achievement Division (STAD) Type in SMA Negeri 1 Tebing Tinggi** ”

1.2. Identification of Problems

Based on background explanations, identify the problem:

- a. The results of Students' mathematics learning in SMA Negeri 1 Tebing Tinggi is still low.
- b. The ability of students' mathematical representation in SMA Negeri 1 Tebing Tinggi is still low.
- c. Students at SMA Negeri 1 Tebing Tinggi are still having difficulties in completing math test representation.
- d. Teacher's learning model is still less varied and the learning process is still conventional.

1.3. Problem Limitation

For more directing this research so focused and specific to the problem in this study in limited to the students' mathematical representation ability on at SMA Negeri 1 Tebing Tinggi TA. 2017/2018 as well as the learning model is applied in the model limit by PBL dan Cooperatif Learning Model STAD Type.

1.4. Problem Formulation

Based on the limitations of the above problems, the problem formulation in this research : "is there the difference in the ability of mathematical representation of students by using PBL Model and using Cooperative Learning Model STAD Type in SMA Negeri 1 Tebing Tinggi?"

1.5. Research Objective

The purpose of this study is "to find out whether there are differences in the ability of mathematical representation of students using PBL model and using Cooperative Learning Model STAD Type in SMA Negeri 1 Tebing Tinggi".

1.6. Research Benefit

The benefits of this research are:

1. Being an entry material for researchers as a potential mathematics teacher to apply PBL as an alternative model of mathematics in school.
2. For teachers and prospective teachers, this research can be a reference in learning planning mathematics subjects.
3. For students, it is expected to use PBL and Cooperative Learning to improve students' mathematical representation.
4. For schools, is expected to be a source of information or contribute ideas for improving the teaching of mathematics, especially in schools where researchers do and schools in general.

1.7. Operational Definition

To avoid differences in the meaning of the important terms contained in this study, the operational definition will be recorded as follows:

1. The ability of mathematical representation is the ability of students to express mathematical ideas (problems, statements, definitions, etc.) into forms: (1) Drawings, diagrams, graphs, or tables; (2) Mathematical

notation, numerical symbol / algebra; (3) Written text / word interpretation of their mind.

2. Cooperative Learning STAD type is one type of cooperative learning model using small groups with members of each group of 4-5 students heterogeneously.

3. PBL is one of the active learning models being performed. PBL is a student-centered approach that regulates curriculum and teaching around "unstructured" problematic situations and real-world situations. Learning is active rather than passive, integrated and not fragmented, and connected rather than disjointed.



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