CHAPTER I
INTRODUCTION

1.1 Background Of Research

Mathematics is the main subject that exists at every level of education. Through mathematics, human are capable of critical thinking, logical, systematic and initiatives to respond the problem. Mathematics has a very important role in education. The National Council of Teachers of Mathematics (NCTM, 2000) formulates five basic capability standards: problem solving, reasoning and proof, communication, connections, and representation. One of the goals of learning mathematics is that students have problem-solving skills that include the ability to understand the problems, devise mathematical models, carry out and interpret the solutions obtained (BSNP,2006:139). These goals assign the problem solving as an important part of the mathematics curriculum. NCTM also proposes that problem solving should be the focus of mathematics and mathematics should be organized in problem solving, as a method of discovery and application, using problem-solving approaches to investigate and understand mathematical material, and build new mathematical knowledge through problem solving.

Problem solving is the ability of students to understand the problem, then plan the settlement and solve the problem according to the plan. According to Gunantara (2014) problem solving ability is a skill or potential owned by a person or student in solving problems and applying it in everyday life. Problem solving ability are very important for students because students are able to solve a problem, gain experience, use the knowledge and skills that students already have to apply in everyday life. Therefore, in the learning process the teacher is able to stimulate student creativity in solving a problem.

However, the importance of problem-solving skills does not seem to be in line with the results of the TIMSS (Trends in Mathematics and Science Study) survey. Based on the facts, the results of an international study survey on mathematics and science achievements of TIMSS in 2007, Indonesia was ranked 36 of 49 countries with a value of 400. In addition, the results of the TIMSS study in 2011 showed that Indonesia's achievements in math decreased from the

previous year with a value of 386, and was ranked 38 of 42 countries that participated. This shows that Indonesia's mathematical ability is still relatively low when compared with other participating countries with an international average score of TIMSS that is 500 (Mullis et al., 2011).

The data shows that some Indonesian students have not been able to solve the TIMSS test questions consisting of routine and non-routine questions which are a matter of problem solving. According to Lambertus (2010:6), the weaknesses that found in solving problems is the weakness of students in analyzing the problem, monitor the completion process, and evaluate results. In other words, students do not prioritize the settlement technique but rather prioritize the end result.

In fact, research on problem solving skills is still low. One of them is the Setiawati research (2014: 64-65), showing that the scores obtained by students with M-APOS model are 29.03% of students who reach Minimum Criteria, while the modeled Problem Based Learning class only 3,22% of students who reached with KKM set at SMP Negeri 7 that is 75. Meanwhile, improvement of mathematical problem solving ability of students who got M-APOS model based on the average of gain index is 0,39, while improvement of problem solving ability mathematical students who get Problem Based Learning based on the average gain index is 0.26. It can be seen that the improvement of mathematical problem solving ability of students who got M-APOS model is in moderate category, while the students who got the model of Problem Based Learning improvement is in low category.

According to Hidayah (2015) the roots that cause of the low ability of problem solving mathematics due to: (1) in the learning process of mathematics in the classroom teachers still use the lecture method, (2) in the process of teaching mathematics teachers do not push the students to be active or less stimulate the students (3) some students do not pay attention to the subject matter presented by the teacher, and (4) the teacher does not give enough exercise to the students so that they experience confusion or difficulty when faced with various problems. In addition, Floden & Klinzing (1990) states that:

Little is known regarding the mathematical behavior of mathematics teachers particularly during their problem-solving endeavors that is, there is still lack of resources and valuable and important information. Moreover, there is lack of clear understandings, and what and the know-how among mathematics teachers when they do mathematics.

Based on observations in class VIII-5 with 38 students on February 13, 2018 by tests on rectangular concept showed that students have difficulty in solving problems given by researcher:

Seluruh kelas VIII di salah satu SMP Berastagi disuruh untuk membuat taman kelas berbentuk persegi panjang, dengan keliling taman itu adalah 40 meter. Jika selisih antara panjang dan lebar taman itu adalah 4 meter, tentukan panjang dan lebar taman tersebut!

a. Tuliskan apa yang diketahui dan ditanya pada soal.
b. Bagaimana cara menentukan panjang dan lebar taman tersebut?
c. Berapakah panjang dan lebar taman tersebut?
d. Ana berpendapat bahwa panjang taman itu adalah 10 meter dan lebarnya 2 meter, sedangkan Tasya berpendapat bahwa panjang taman itu 12 meter dan lebarnya 8 meter. Menurut anda pendapat siapakah yang benar?

The following is an analysis of student answers in solving the problem:

1. **Understanding the Problem**

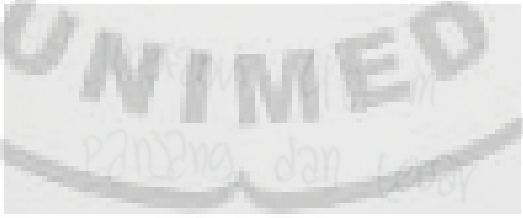

Figure 1.1 Observation result of student's answer number 1a

Students are unable to understand the problem by not writing down what is known and being asked correctly. From the tests that have been given then the number of students who already understand the problem is 25 students or about 65.79%

2. **Devising a plan**

Figure 1.2 Observation result of student's answer number 1b

Students are unable to plan a solution by not writing out the formula to be used to solve a given problem. From the tests given the number of students who can already plan the completion is 10 students or about 26.31%.

3. **Carrying out the plan**

Figure 1.3 Observation result of student's answer number 1c

Students are unable to solve the problem, because the solution is still wrong and the formula used is not correct so the end result is wrong. From the test that has been given, there are 2 students or about 5.26% who are able to carry out the completion.

4. **Looking Back**

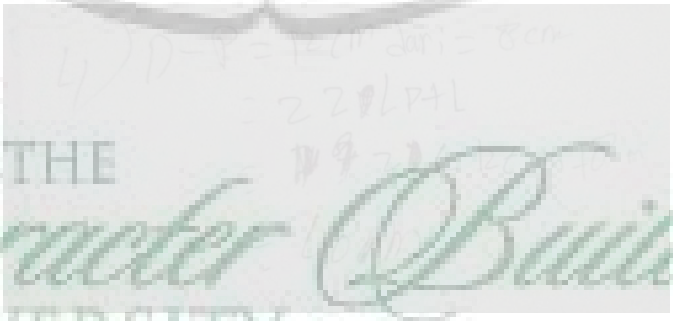

Figure 1.4 Observation result of student's answer number 1d

Students are not able to conclude correctly. Students try to relate the problem given by the formula, but the answer process is incorrect. From the tests, only 1 student (2.63%) who is able looking back the process.

The researcher also observes when teachers teach in class VIII of SMP Negeri 1 Berastagi. In the classroom, the learning process still uses direct instruction. It can be seen from how the teacher directly give and explain the material, while the students just sit and hear to receive the material. When teaching, the teacher still dominate the class. Wahyuni (2013) in the journal of mathematics education reveals that:

> *Dalam pembelajaran matematika dengan model konvensional, pembelajaran berpusat pada guru, siswa cenderung pasif dan hanya mendengarkan penjelasan dari guru, sehingga pembelajaran menjadi membosankan dan kurang bermakna bagi siswa. Oleh karena itu, guru harus menemukan cara-cara pembelajaran yang dapat meningkatkan kemampuan pemecahan masalah matematika siswa.*

In addition to the conventional learning process, the media used by teachers in explaining the material is still traditional such as the using of whiteboards as the image media as a visual aid in delivering learning materials. The learning process like this can make students bored, low interest in learning, and not interested in the material being studied. Jumady (2016) states that:

> *cara tradisional yaitu dengan menggambarnya di papan tulis atau menggunakan kertas karton sebagai alat bantu visualisasi dapat siswa kurang tertarik dan menunjukkan minat yang rendah dalam mempelajari materi tersebut, sehingga materi yang diajarkan oleh guru tidak benar-benar melekat dalam ingatan siswa.*

Based on the description has explained above, to responds the problems that appear in the learning of mathematics and obtain an effective teaching-learning process than needed a method that can improve students problem-solving ability. There are several learning models that can train student problem solving ability. One is the Problem Based Learning (PBL) model. In the learning process with problem-based learning model, the role of students is large because learning is not centered on the teacher but on the students. According to Fatimah (2012) Problem Based Learning is always starts and centered on the problem. In the PBL, students can work groups or individuals. Students should identify what is known and unknown and learn to solve problems. Sahyar (2017) states that PBL not only help students actively involved in learning but prepare students for real life. PBL models can involve students to solve problems through the stages of a scientific

method with an authentic investigation of the problems that occur in everyday life. Adopting PBL in a teacher education context involves the need to focus attention on making explicit connections for students.

During the process of problem based learning, students will be easier to do if using ICT media, especially on the matter of building a flat side space. The use of ICT is one of the six principles of Mathematics school. Asyhar (2011: 7) states that the learning media is everything that can convey or distribute messages from a source in a planned manner, resulting in a conducive learning environment where the recipient can make the learning process efficiently and effectively. NCTM (1991) states "Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances the students' learning". Learning media that can be is GeoGebra software.

GeoGebra is one of the software for mathematics education. GeoGebra has recommended by NCTM on Curriculum and Evaluation Standards for School Mathematics (1989) that states:

> All student should have a calculator, possibly one that has graphing capabilities, a computer should be available at all times in every classroom for demonstration purposes and all students should have access to computers for individual and group work.

GeoGebra can be used for learning (visualization, computation, exploration, and experimentation) and teaching materials of geometry, algebra, and calculus. The simplest thing to do with GeoGebra is to draw dots, segments of lines, vectors, lines, polygons, cone slices and two-dimensional curves. Building a flat side room is one of the geometry concepts that can use GeoGebra software.

Exposure to GeoGebra can improve the student problem-solving ability when learning about Geometry because it can accommodate students who are slow in accepting lessons, because it can provide effective, more individualized, never forgetful, never bored, stimulates students to do the exercises. In addition, the use of GeoGebra as a medium of learning can facilitate teachers in preparing the material, facilitate students to absorb what is conveyed by teachers, and the occurrence of stimulation due to the availability of dragging movements that can provide visual experiences more clear to the students.

Based on this background, the authors are interested to conduct research with the title **"The Effect of Problem Based Learning Using GeoGebra to Improve Students' Problem Solving Ability Grade VIII SMP NEGERI 2 BERASTAGI A.Y 2017/2018.**

1.2 Problem Identification

In accordance with the background of the problem, then the identification of problem in this study are:

1. The problem solving ability of students in solving math is relatively low.
2. Learning mathematics in the classroom still conventional.
3. The use of GeoGebra media is still not widely used by teachers as visual media, especially in the concept of Flat Side Three Dimensional Object (Cube and Rectangular Prism).

1.3 Problem Limitation

To overcome such a broad discussion of the researchers restricted their study on:

1. The problem solving ability of students in solving math is relatively low.
2. Learning mathematics in the classroom that still conventional.
3. The using of problem-based learning model in SMP Negeri 2 Berastagi.
4. The using of GeoGebra software as learning media in the concept of Flat Side Three Dimensional Object (Cube and Rectangular Prism).

1.4 Problem Formulation

Based on the background of problem and problem limitation above, then the problem formulation that will be studied in this research are:"Does the problem-based learning model with assisted GeoGebra effect the problem solving ability in class VIII SMP Negeri 2 Berastagi?"

1.5 Research Objectives

The research objectives in this research is: "Determine and examine whether the problem-based learning model with assisted GeoGebra effect the problem solving ability in class VIII SMP Negeri 2 Berastagi."

1.6 Research Benefits

1. For Students

   By applying problem-based learning using GeoGebra, expected the students can improve the problem-solving ability in mathematics.

2. For Teachers

   As input materials to improve students problem solving ability as well as input or consideration in implementing the teaching and learning process.

3. For the researcher

   As a learning material for researchers in the application of problem-based learning models to improve math problem solving ability.

1.7 Operational definition

1. Problem-based learning is characterized by students working in pairs or small groups to investigate puzzling, real-life problems. The phase of PBL are:(1)Orient students to the issue; (2)Organize students for study;(3)Assist Independent and Group Investigation;(4)Develop and Present Artifacts and Exhibits;(5)Analyze and evaluate the problem solving process.
2. Student's problem-solving is the ability of students in solving math, starting from understanding the problem, devising a plan, carrying out the plan untill looking back to the plan.
3. GeoGebra is a software that combines geometry, algebra, and calculus and designed to simultaneously defend both geometry and algebra. GeoGebra has the presence of algebraic appearance, namely: the existence of graphical display, and the presence of numeric views.
4. The Effect is the action that exists or arises from something either a person or object. In this study PBL is said to affect if the probem solving ability taught by problem based learning using GeoGebra is higher than direct instruction.