

CHAPTER 1

INTRODUCTION

1.1 Background

Mathematics is a subject from primary to secondary education. It is an abstract nature and hard for understanding while a good understanding of mathematical concepts is very important to understand new concepts requires the preconceived understanding of previous concepts. That's way everyone is expected to use the language of mathematics goodly to communicate information and ideas obtained in mathematics.

Based on research (Hodiyanto, 2017) that, " Many Indonesian teachers are less concerned with *Permendiknas* and goals that exist in NCTM, that is learning to communicate "(P.10) . In (Asnawati,2017) NCTM (2000) stated that, "Mathematical communication ability is the ability to organize mathematical thoughts, communicate logical and clear mathematical ideas, analyze and evaluate thoughts and strategies employed by others, and using mathematical language to express ideas appropriately "(P.474). The ability of this mathematical communication is used when solving mathematical problems and able to improve mathematical thinking. This statement is reinforced by (Ramellan et al.2012) that, "By communicating students can improve vocabulary, write ideas systematically and have better learning skills"(P.77).

Based on the results of the International The Third International Mathematics and Science Study (TIMSS) survey in (Hermawan.2017) stated that, "students' ability in solving routine problems (mathematical problems) is very weak, but not in solving procedural problems, this is caused by the low ability of students' mathematical thinking "(P.48). Then Susanto (2013) stated in (Jumaisyaroh, et al.2015) that, "Critical thinking is an activity of mathematical thinking about an idea or ideas related to the concept or the given problem"(P.88).

Mathematics is needed in various aspects and various circles, both for daily life and in the development of science and technology (Science and Technology). Mathematics helps students to facilitate in solving a problem. Essentially the

education of mathematics requires students to think critically, logically, analyze , systematic, objective, responsible, openness and able to apply mathematics in everyday life. Mathematics has an important role to play in the background for study. Mathematics as a tool to solve problems by translating problems into mathematical symbols.

When problem solving is an application of concepts and skills. Problem solving is a strategy of the mathematics curriculum that involves skills in solving math problems. The learning of problem solving requires the process of thinking critically, logically, and mathematically. Problem solving aimed to train students 'mindset abilities and students' skills to solve problems rationally, effortlessly and thoroughly.

In addition, the results of mathematics learning in Indonesia is still very low. The low of learning outcomes of mathematics students are influenced by the difficulties experienced by students in learning mathematics. Difficulties in learning mathematics is resulted in low student learning outcomes. There are several problems faced today, that is, there is a misperception about problem solving and the lack of students' mathematical problem solving abilities.

According to (Rohmah & Sutiarmo. 2017. P.680),

Factor of error in solving the problem of mathematics are the students are not able to absorb the information well, the students have not understood the so-called problem transformation, the students do not comprehend the material completely, the weakness of the concept of prerequisite owned by the students, the lack of students experience in doing problem, and students are not careful and meticulous in the process of workmanship.

Based on the results of research conducted by Naiggolan (2014) in Ardilla and Hartanto, (2017 : 184) stated that ,

The factors that influence the low understanding of student concepts are: the learning that is done tend to focus on the teacher, the teacher gives the formulas and give examples and solutions. Student activity is only around doing the problem based on the existing formula and based on the example

ever given by the teacher without knowing where it come from the formula. With teacher-centered learning, understanding of mathematical concepts can not develop.

Therefore, a good understanding of the concept will also affect students' thinking ability on solving mathematical problems.

The academic quality among nations through the 2015 Programme for International Students Assessment (PISA) : "Shows that the students' mathematics score of Indonesia is 386 and Indonesia is in 67th position of 74 countries". So, Indonesia was still not able to escape from the row of residents under the board.

Students that have difficult in learning math is not able to learn, but have certain difficulties that make them not ready to learn. Students often assumed that mathematics was the most difficult lesson to learn and greatly feared by students.

Selection of appropriate and interesting learning model can increase student learning activities and will also affect the high quality of graduation. In addition, teachers should also be able to choose a learning model that is able to involve students participate actively in the process of teaching and learning in class so that students don't just sit and listen to the material submitted by the teacher absolutely. So the learning process is not only focused on teacher activity.

Therefore education needs to get attention, handling, and priority intensively from government, society and education manager. The learning model to achieve the learning objectives as well as develop and improve the activities of teachers and students. However, in fact, student activity is still low in learning mathematics this is because students do not play an active role during the process of learning mathematics because there are some teachers make students as objects that accept math lessons is not as an active subject during the learning process takes place.

Thus, it is expected that learning is not only centered on the teacher, but also the students should be active and directly involved in building an understanding of

the material. Students not only receive what is given by the teacher, but students should think in solving mathematical problems.

This statement is corroborated by the results of (Antika.2014) that, "Learning will work optimally when actively involved in the learning process. Implementation is not a ready-made item that is ready to be taken or transferred from teacher to student, but the result is the interaction with the environment "(P.261).

Based on the experience of researchers at the time of implementing the Field Experience Program (PPL) in SMA Negeri 1 TebingTinggi for approximately 3 months that there were still many students who had difficulty in solving on the questions that were given by teachers. This was because the teacher only explains the material through examples rather than giving concepts so that students didn't understand the concepts in learning only understand the examples and similar problems and force students to memorize the formula instead of understanding the concept of the formula itself. The teacher still used the lecture method or the learning was still centered on the teacher, so that the teacher more dominates the process of learning activities in the class than the students, and also there are many exercises are given without the lack of opportunities to ask the teacher. This causes students' learning outcomes are still low and student learning activities in the learning process are still passive.

Based on the initial test results, 36 students of class XI IPA SMA Negeri 1 Tebing Tinggi with one of the subject matter in mathematics that is Integral Equation shows that still low level of problem solving ability of students. This is also shown by the results of the semester exam on mathematics that class XI IPA was 69 while the KKM to be achieved was 75. Giving prerequisite material by cultivating material prerequisite Indefinite Integral showed that there was still a difficulty in working on problem solving. Preliminary test results on student problem-solving abilities based on indicators of problem-solving assessment can be seen from the results of the following student work:

Based on the assessment indicators shortly problem solving sequence Polya (1973) the obtained results of preliminary tests on students' problem solving is shown in Table 1.1

Table 1.1 Preliminary Test Results on Student Problem Solving

Assessment Indicators	Quantity of Students
Understanding the problem	27 students
Planing the problem solving	19 students
Solving the problem	18 students
Looking back	11 students

So it could be concluded that the results of student problem solving test abilities were at low indicator because all aspects of problem solving assessment were at low indicator .

As well as some interviews are conducted by researcher on students, most students experience obstacles in learning and solving mathematical problems due to the way teachers teach less satisfactory and difficult to understand by students so that students' motivation to learn math dropped dramatically. Though students learn because of encouragement by mental strength. Mental strength is a desire, concern, willingness, or ideals. The mental power that drives learning was called learning motivation. This was supported by (Dimiyati & Mudjion.2009) that, "Motivation is seen as a mental impulse that moves and directs human behavior, including learning behavior"(P.80).

The reasons for the importance of learning motivation for students and teachers according to Dimiyati & Mudjiono (2009) are as follows:

- (1) Awaken the position at the beginning of learning, process, and outcome.
- (2) Inform about the power of learning effort, which is raised by peers.
- (3) Directing learning activities.
- (4) Increasing the spirit of learning.
- (5) Awakening about the existence of study trip and then continuous work.

And some are assuming that the model of learning process is boring. In fact, according to (Sudjana.2002) " The model of teaching is the way teachers use in establishing relationships with students at the time of teaching. A good teaching and learning process should use different types of teaching models in turn " (P.76),.

Even from the observations of researcher, researcher got some students who immediately refused when they were given the word of math problem, it was very concerned, how most students felt depressed and even fear to face the actual mathematical problems that are surrounded in their daily lives.

Many teachers have difficulty to teach students how to solve problems so that many students also have trouble in learning. This difficulty usually arised because the paradigm that the final answer as the sole purpose of solving the problem. Students often use the wrong technique to answer the problem because of the emphasis on the final answer. Though we need to realize that the process of solving the problem is much more important and fundamental. When the final answer is preferred, the students may only learn to solve a particular problem, but when the process is put, the students seem to be learning more stages to solve other problems.

This condition directly or not will give birth to the assumption that learning mathematics is nothing more than just remembering then forget the facts and concepts, whereas the goal of learning mathematics is that students are able to solve problems encountered.

Related to the above problems, teachers as educators are less applying variations in learning model. The use of improper learning model can lead to boredom, lack of understanding in the material taught and ultimately can reduce the motivation of students in learning, it is necessary appropriate learning strategy, which is choosing a model of learning in accordance with the ability of students in the classroom, for example by using the model of problem based learning (PBL).

According to (Astriani, Surya, & Syahputra. 2017),” student who have been tough by using problem based learning model, math problem solving ability is higher when compared to the students problem solving abilities in the class by

conventional learning model". This is also supported by the results of the 2012 PISA study in (Crowley.2015) stating that ,

From 34 countries, the USA ranks 27th in math. And the top ranking was achieved by Shanghai-China. So the question arises, what strategies could improve student ability? The researchers found that students' skills could be improved by improving visual thinking, inquiry-based learning, scaffolding and group activism, problem solving and the application of everyday life. And the combination of all the above techniques is a mass-based learning model (PBL).

Problem-Based Learning Model is one of the learning models that spur student activeness in the pivot. The purpose of applying this PBL model is to improve students problem solving skills by demanding students to think critically and be able to interact and establish good relationships with other students to ensure through several stages so as to provide knowledge related to the problem and also have the skills solve the problem.

According to Herman (2006) in (Hia & Chairunisa.2016) that,"one of the alternative solution that can solve the problem in mathematics education is the improvement of education quality by using Problem Based Learning Model"(P.53). Because one of way to improve the students' mathematical problem solving ability and make students will be active maximaly is by using problem based learning model. It is forced by Moffit in (Hia.2015) that "Problem based learning is a learning model that use problem as the context for student to learn about critical thinking and problem solving ability even to get the knowledge and concept of the problem"(P.79). As the result of (Fatade, Mogari, & Arigbabu. 2013) that, "PBL approach made students more creative, act purposefully, think rationally and relate effectively with their peers in the Further Mathematics classroom"(P.39).

Based on the description of the problem above, it seems clear that the learning with the model of Problem Based Learning is a solution of the problem, then students are trained to analyze a problem. Since there is no teacher in that school that use problem based learning before. In this learning model, the problems that have been the main focus of learning can be solved by forming discussion

groups so that students can work together and conduct group interaction in solving the problem by putting their new ideas into their own groups as learning experiences students. Based on the description above, the authors were interested to conduct research with the title:

Application of Problem Based Learning Model To Improve Mathematical Problem Solving Ability of XI Grade SMA Negeri 1 Tebing Tinggi.

1.2 The Identification of The Problem

Based on the background, this research was conducted because of the emergence of symptoms of the problems found . As for some symptoms of the problems found are :

1. Learning method in class XI IPA SMA Negeri 1 Tebing Tinggi doesn't vary
2. Learning process is still teacher-centered learning
3. The mathematics value of student is low
4. Redability learning of students in math is still low
5. The students' mathematical communication ability is low
6. The students' mathematical thinking ability is low
7. Capacity of students' mathematical problem solving on an integral material is still low

1.3 The Delimitation of The Problem

In order problems in this study are clear and focused, then this research is limited on improving students' mathematical problem solving ability of XI grade SMA Negeri 1 Tebing Tinggi on integral material after Problem Based Learning Model.

1.4 The Formulation of The Problem

Based on the constraints of the problem , then the formulation of the problem in this study are:

How the improvement of students' mathematical problem solving ability of XI grade SMA Negeri 1 Tebing Tinggi on integral material after Problem Based Learning Model applied?

1.5 The Aim of The Research

In accordance with the formulation of the problem, the purpose of this study are:

Knowing the improvement of students' mathematical problem solving ability of XI grade SMA Negeri 1 Tebing Tinggi on integral material after Problem Based Learning Model applied .

1.6 The Significance of The Research

Based on the above objectives, the results of the expected research can provide the following benefits:

1. For Master

As an input to choose more appropriate learning model in learning mathematics as an effort to increase student's interest in learning

2. For Students

It can improve mathematical problem solving skills of students and can establish better relationships with other students so it will increase students' interest in learning mathematics.

3. For School Parties

As an input material to improve the quality of mathematics learning.

4. For Researchers

As a guide and stock of science in teaching students of mathematics learning in the future.

5. For Other Researchers

As an input and consideration for researchers and readers to do research in the same problems in the future.

1.7 Operational Definition

To be able to do research variables quantitatively then the variables are defined as follows:

1. The ability to solve mathematical problems is the ability that will make learners to be able to create new ideas that support their creativity in applying various concepts of mathematics, so that in the end they are able

to use the various concepts of science they have learned to solve problems in everyday life.

2. Problem Based Learning (PBL) is a lesson that emphasizes the students' cognitive aspects and students-centered learning. The role of teachers in this learning model is only as a mentor and facilitator so that students learn to think and solve problems in their own way. Problems that occur not only in the real world alone, but complex problems to finally generate an understanding of knowledge, principles, and concepts and ideas of solving the problem.

The logo of Universitas Negeri Semarang (UNIMED) is a circular emblem. It features a central green plant with a red flower. The text "UNIVERSITAS NEGERI SEMARANG" is written around the top inner edge, and "UNIMED" is written at the bottom. There are two small square symbols on the left and right sides of the emblem.

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