

CHAPTER I

INTRODUCTION

1.1 Background

Since the human being is born, he cannot live alone, does not have the ability to maintain and meet the needs of his own life, how? Is with education. Why do humans need education? Man is in need of an education both formal and non-formal because through education humans can have the ability to manage, control and define himself, and through education, the ability of human behaviour can be repaired.

As written in the UU RI No. 20 year 2003 about National education systems Chapter I:1

Pendidikan adalah usaha sadar dan terencana untuk mewujudkan suasana belajar dan proses pembelajaran agar peserta didik secara aktif mengembangkan potensi dirinya untuk memiliki kekuatan spiritual keagamaan, pengendalian diri, kepribadian, kecerdasan, akhlak mulia, serta keterampilan yang diperlukan dirinya, masyarakat, bangsa, dan negara.

Not only to meet the needs by self, education also had an important role for development, defence, and development of the nation and the state.

In education there is the process of teaching and learning, is he doing his formal teaching and learning in schools. The activities of teaching and learning is a core activity in an effort to improve the quality of the students who are intellectual, moral, and social.

One of the subjects in schools that can be used to achieve students who are intellectual, moral and social subjects is math. Mathematics is one of the science education that is fundamentally developed in people's lives and highly needed in the development of science and technology. This is emphasized in the *Peraturan Menteri Pendidikan Nasional (Permendiknas)* 22-year 2006 about standard contents for Secondary basic education units (*Depdiknas 2006*) that:

Matematika mendasari perkembangan kemajuan teknologi, mempunyai peran penting dalam berbagai disiplin, dan memajukan daya pikir manusia, matematika diberikan sejak dini di sekolah untuk membekali anak dengan kemampuan berpikir logis, analitis, sistematis, kritis, kreatif, serta kemampuan bekerja sama. Semua kemampuan itu merupakan modal

penting yang diperlukan anak dalam meniti kehidupan di masa depan yang penuh dengan tantangan dan berubah dengan cepat.

KTSP (2006)-enhanced curriculum in 2013, makes math learning objectives as follows:

1. Understand the math concepts, explains the relation between concepts and apply concepts or algorithms, for flexible, accurate, efficient and precise, in problem-solving.
2. Use the reasoning on nature, patterns and doing mathematical manipulations in making generalizations, compile evidence, or explain the idea and mathematical statements
3. To solve problems that include the ability to understand the problem, designing a mathematical model, complete model and interpret the acquired solutions-
4. Communicating the idea of symbols, tables, diagrams, or other media to clarify the circumstances or problems, and
5. Have an attitude to appreciate the usefulness of mathematics in life, i.e. have curiosity, attention, and interest in learning mathematics, as well as a tenacious attitude and confidence in problem-solving.

Thus mathematics is indispensable as a discipline that needs to be mastered and understood by students at school so that makes it easy for students to follow the development of science and technology. As described by Abdurrahman 2009:253 that: "mathematics need to be taught to the students because (1) always used in every activity in life; (2) all majors require the appropriate math skills; (3) is a powerful means of communication, short, and clear; (4) can be used to present information in a variety of ways; (5) improve logical thinking and thoroughness, and (6) giving own satisfaction against the attempt to solve problems that challenge because most people think mathematics is difficult".

The sixth points above, learning mathematics it takes the ability to think to solve a problem, but the fact the students' problem-solving abilities in Indonesia is still very low. From detik.com, wrote that Indonesia was ranked the second lowest

of the 65 countries that follow survey of math skills, reading skills, and the ability (of science) students, organized by the Program for International Student Assessment (PISA) under Organization Economic Cooperation and Development (OECD), it is less than 1% Indonesian students are able to solve problem of math.

Results of the study (The Trends in International Mathematics and Science Study) TIMSS 2007 and Programme for International Students Assessment (PISA) 2006 for grade VIII, Indonesia is ranked 36th out of 48 participating countries in the mathematics test. While the result PISA 2006, student Indonesia ranks 52nd out of 57 participating countries.

The above survey as evidence that Indonesian students achievement Indonesia, especially in mathematics is still low and less satisfying. One of them is due to the ability of the mathematical problem solving of students is still low.

Learning mathematics is not just learning about formulas, but also teach the students to be able to resolve the various problems related to daily life. Within the thoroughness required mathematical problem solving to be able to finish it properly, although using other ways to get it done. However, if the way is wrong, or wrong answers, although one number only, then keep the end result is also wrong. That required honesty in resolving the existing problems in the right way and thorough. Obviously, if the mathematics contribute in life.

Based on early observations (Monday, January 22th 2018) by giving a test to students in grade 11th MIA U in SMA Negeri 1 Perbaungan. The test is a preliminary test like essay test or story test to see the students' ability to solve problems in mathematics. The questions are as follows:

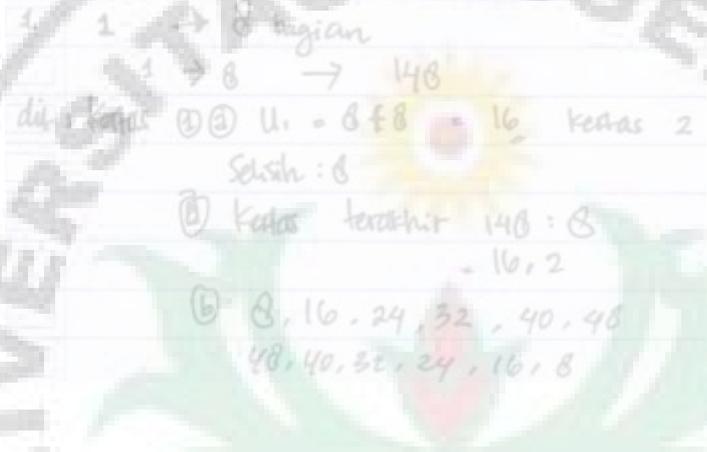
1. Leny is cut up the paper. Initially subdivided into 8 parts, take one part to cut again into 8. These activities continue to be carried out after that the last pieces into 148. Specify the value of the second pieces of paper, and the difference between the value of the first pieces and the second pieces of the paper!
 - a. From the above information what are known and asked?
 - b. Specify the paper cuts and formula to prove it through the first and second

- c. How to calculate?
 - d. Can you see at a glance the value of the third piece of paper? Explain!
2. A mother had five children who were forming a sequence of arithmetic. If now the youngest child age 15 years old and the eldest of 23 years, calculate the amount of the fifth child.
 - a. From the above information what are known and asked?
 - b. Write down the formula to solve the problem!
 - c. How to calculate?
 - d. Can you see at a glance the sum of the five children in the next years? Explain!
 3. Mother distributed candy to 4 children. younger children get more candy. second and third child respectively get 11 and 19 sweets. what is the total amount of mother's candy?
 - a. From the above information what are known and asked?
 - b. Write down the formula to solve the problem!
 - c. How to calculate?
 - d. Did you use all the data to solve the problem? Explain!

Following are the results of the work of some students and the reaction of students taking action against a given problem.

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Table 1.1. Errors of Students in Initial Tests the Ability of Problem-solving

No	Students' answer	Reaction to the problem
1	 <p>1 → bagian 8 → kertas 148 16 kertas 2 Selsih : 8 8 kertas terakhir 148 : 8 = 16, 2 8, 16, 24, 32, 40, 48 48, 40, 32, 24, 16, 8</p>	There are still students who are haven't been able in writing down what is known and can be said the students misunderstanding the problem
2	 <p>Dik: 10 tahun 10 tahun 20 tahun Dit: 10 tahun yang akan datang? jawab: 10 tahun 15 + 8 = 23 23 + 8 = 31</p>	Students cannot choose the concept that really can be used to solve the problem, although understand to write down and asked, it can be said the students were incorrect strategy planning.

3	<p>2. Dik: $U_5 = 15$ ✓ $U_1 = 23$ ✓ Dit: $U_0 = ?$ Jwb: $U_n = (n-1)b$ $U_5 = 15$ $U_1 = 23$</p> $U_n = a + (n-1)b$ $U_5 = 15 \rightarrow a + 4b = 15$ $U_1 = 23 \rightarrow a + 0b = 23 \quad -$ $-4b = -9$ $b = -9/4$ $b = -2.25$	Students use steps that is not relevant with what is asked in the questions.
4	<p>3. permen Bu → 4 orang anak kedua → 19 buah 3 → 11 buah</p> <p>3 . 11 = 19 + 27 jadi jumlah permen, 60 buah</p>	Students have not been able to check again are already true or not.

From the overall answer of students found constraints on the students problem-solving ability in grade XI MIA U in SMA Negeri 1 Perbaungan totalling 38 students who were given tests of the material line, i.e. it can be seen from the following table:

Tabel 1.2. Percentage of Understanding Problem Aspect from Students' Mathematical Problem-Solving Ability Test (Initial)

Range	Qualitative Value	Many Students	Percentage of Students	Average Ability Students
90-100	Very High	3	7.9%	23.7%
80-89	High	3	7.9%	
75-79	Standard plus	3	7.9%	
70-74	Standard	0	0%	
60-69	Low	3	7.9%	
<60	Very Low	26	68.4%	
	SUM	38	100%	

The ability of students in understanding the problem, at this level is to write down what is known and what is asked, there are just 23.7% of students achieve. Still under the minimum level problem-solving ability on aspects of understanding the problem

Tabel 1.3. Percentage of Devising Plan from Students' Mathematical Problem-Solving Ability Test (Initial)

Range	Qualitative Value	Many Students	Percentage of Students	Average Ability Students
90-100	Very High	7	18.4%	23.7%
80-89	High	2	5.3%	
75-79	Standard plus	0	0%	
70-74	Standard	0	0%	
60-69	Low	4	10.5%	
<60	Very Low	25	65.8%	
	SUM	38	100%	

Students who understand of devising plan for question No. 1 to 3 there are just 23.7% of the 38 students.

Tabel 1.4. Percentage of Carrying Out the Plan from Students' Mathematical Problem-Solving Ability Test (Initial)

Range	Qualitative Value	Many Students	Percentage of Students	Average Ability Students
90-100	Very High	3	7.9%	13.2%
80-89	High	1	2.6%	
75-79	Standard plus	1	2.6%	
70-74	Standard	0	0%	
60-69	Low	3	7.9%	
<60	Very Low	30	78.9%	
	SUM	38	100	

Students who apply for carrying out the problem-solving for question No. 1 to 3 there are just 13.2% from the total of students in class.

Tabel 1.5. Percentage of Looking Back from Students' Mathematical Problem-Solving Ability Test (Initial)

Range	Qualitative Value	Many Students	Percentage of Students	Average Ability Students
90-100	Very High	0	0%	5.3%
80-89	High	2	5.3%	
75-79	Standard plus	0	0%	
70-74	Standard	0	0%	
60-69	Low	3	7.9%	
<60	Very Low	33	86.8%	
	SUM	38	100%	

Students who apply for looking back problem-solving for question number 1 until 3 there are just 2 or 5.3% students can achieved the fourth indicator. Still under the average students in class, even question number 1 no students who can get it done for the indicator looking back.

Overall problem-solving abilities students on test II already done can be seen from the table in 4.14.

Table 1.6. Result of Problem-Solving Ability Test (Initial Test)

Range	Qualitative Value	Many Students	Average	Average Ability Students
90-100	Very High	0	0%	18.4%
80-89	High	3	7.9%	
75-79	Standard plus	4	10.5%	
70-74	Standard	2	5.3%	
60-69	Low	0	0%	
<60	Very Low	29	76.3%	
Total of Students		38	100%	

Based on preliminary test results obtained from the students in grade 11th MIA U SMA N 1 Perbaungan can know the ability of the mathematical problem solving of students is still low. Many students who have difficulties such as, not to understand the question, what the question was asked of the instructions reserved, it is hard to associate between the known and the question was asked, not understanding math concepts that will be used, not to be able to change the sentence reserved to in that sentence math (mathematical models). Students quickly concluded by doing operations in the question without understanding and think in advance what was desired in the question.

Students haven't been able to implement problem-solving planning from the first and second aspects, the first aspect, students do not understand the problem so until the next aspect, will be increasingly difficult to solve them. All begins with understanding the problem.

In solving a mathematical problem, if students already get it done properly, then the students indirectly improve their reasoning ability, thinking ability, and other skills that influence for the next other learning, as expressed by Mairing (2017):

Students can achieve five dimensions of learning by trying to solve mathematical problems in the class. The dimensions consist of developing positive attitudes in learning, acquiring and integrating knowledge, extending and refining knowledge, using knowledge meaningfully, and developing productive thinking habits.

In every step of the students' problem-solving activities from the initial tests already conducted, categorized in very low ability, because of that it can be concluded learning with daily life will better understand every problem in mathematics.

Based on information received from the mathematics teacher about sequences learning, the discussion has done but students still don't understand if the problem given in the form of stories. And the process of teaching and learning in schools is still conventionally.

To anticipate these problems, a teacher should be able to choose the right learning model which can improve students' mathematics problem-solving. The learning model must be able to make students active because can improve the knowledge of the students.

There are several learning models that can be used to help students become more active and to resolve the problem easily and systematically, one of them is Problem-based learning (PBL). In the Graaff, Erik (2003):

Problem-based learning is an educational approach whereby the problem is the starting-point of the learning process. The type of problem is dependent on the specific organisation. Usually, the problem is based on real-life problems which have been selected and edited to meet educational objectives and criteria.

Why should use the PBL? This question is important. Because of the problem-based learning can guide students to learn more useful learning, beginning with a real problem/visible to the eyes of the students, there are in daily life. As expressed by Rokhmawati, dkk (2016):

The implementation of PBL model can help students to be more aware of teaching material, encourage to be able to solve problems, and can motivate students to learn, investigation and resolution on real-world problems will motivated students engagement. Students engaged in PBL will establish the critical thinking pattern, creative thinking skills, and be learning in terms of independent leadership skills.

Model learning begins with student orientation on the issue and then organizing the students to learn that deal with the issue. The problem is analyzed is the real-life problems related to subtopics of learning.

Teachers guide individual and group investigations to collect the appropriate information and problem-solving. Then the students were asked to present the result of solving the problem in front of the class. The final stage is to do the reflection or evaluation of student investigation and problem-solving processes that their used (Trianto, 2009:98). The role of the teachers in this study is giving authentic problems, ask questions, provide ease of communication, facilitating the investigation of the students, and support the learning of students.

Problem-based learning as a learning model that uses the existing problems in the real world as a context for students to learn about how critical thinking and problem-solving skills, as well as to receive knowledge and essential concepts from the learning (Rusman, 2012:234). Students are expected to do solving problems with a way to find the information as much as possible.

Based on the background that has been presented before, that the ability of problem-solving is the primary purpose of learning math. Then one of the learning models that can improve students to solving problems is problem-based learning, so they do a study with the title: **"The Implementation of Problem Based-Learning Model to Increase the Students' Mathematical Problem Solving Ability in SMA Negeri 1 Perbaungan"**.

1.2 Problem Identification

Based on the background, then the identification of the problem in this research are:

1. Students in grade 11th SMA Negeri 1 Perbaungan less able to understand math concepts, it is difficult to associate between the known and asked the question, and yet can change a sentence into a question of mathematical sentence (mathematical models), it is still difficult to plan problem

solving, and have not been able to prove whether or not the answer is correct or not done.

2. The problem-solving ability of the students in grade 11th SMA Negeri 1 Perbaungan still low.
3. Teachers haven't been able to choose an appropriate learning model in accordance with the learning will take place

1.3 Limitation Problem

Seeing many aspects of the problem that identified over time and ability of researcher. So that the problem in this research is more clear and directed, so in this research, the researcher limit the problem to be researched, that is to the problem-solving ability of the students in grade 11th SMA Negeri 1 Perbaungan with the learning material three-dimensional.

1.4 Problem Formulation

In accordance with the limitation above, then the problem formulation of the research are:

1. Does the implementation of problem-based learning increase students' mathematical problem solving ability in grade 11th MIA U SMA Negeri 1 Perbaungan?
2. How does problem-based learning increase students' mathematical problem solving ability in grade 11th MIA U SMA Negeri 1 Perbaungan?
3. Do students' activities increase after the implementation of problem-based learning in grade 11th MIA U SMA Negeri 1 Perbaungan?

1.5 Research Objective

Based on the above problem formulation, then that becomes the goal of the research are:

1. Knowing whether students' problem solving ability increase after implementation problem-based learning model
2. Improving students' mathematical problem solving ability through problem-based learning model

3. Knowing the increasing of students' activities after implementation problem-based learning model.

1.6 Research Benefit

The results of this study are expected to provide information and to provide the following benefits:

1. For a teacher, it can broaden the knowledge of Problem Based Learning model to help students in solving a mathematics problem.
2. For students, through Problem Based Learning model expected gives positive learning attitude and creative in solving problems.
3. For a researcher, this research can increase researcher's knowledge, especially about the development and ideal instructional that needed by students, before entering the real learning process.
4. For school, has to benefit to taking the right decision in improving quality of teaching, as well as consideration or reference materials to improve students' achievement especially in mathematics
5. As a matter of information and comparisons to the readers or other researchers are interested in doing similar research.

1.7 Operational Definition

The title of this research is The Implementation of Problem Based Learning Models to Increase the Mathematical Problem Solving Ability of Students in 11th Grade SMA Negeri 1 Perbaungan, then in order to avoid misunderstandings in the study, researchers gave limitation of operational definitions as follows:

1. Problem-based learning Model

Problem-based learning is a student-centered learning, where students learn about learning based on topic or experience problems or real life. Students were given the problems with the aim to train their problem-solving abilities and the teacher acts as a facilitator.

The steps in problem-based learning, the research is:

- a. Orient the students to the problem
- b. Organizing the learners to learn
- c. Guide the investigation independently and in group
- d. Develop and present the results
- e. Analyze and evaluate problem-solving process

2. The ability of mathematical problem solving

Problem-solving abilities is the knowledge that requires special expertise in finding solutions to the problems faced by combining the concepts and rules that have been obtained beforehand in order to reach the desired goal, with the following indicators:

- a. Understand the problem
- b. Devising plan
- c. Carry out the planning problem-solving
- d. Looking back

3. The ability of the mathematical problem solving of students is said to be increased if at least 85% of the number of students who take the test problem-solving ability by reaching a value of at least a minimum standard of 75.

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